

the alliance

always aligned with clients in mind

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Volume TWO
Issue ONE

let's shed some light on

illumination

Our Mike Libby explains the art and technology behind beautiful, cost-effective and sustainable lighting design

also in this issue:

- Andy Geurts, Strang's Director of Mechanical Engineering, shares his global perspective on engineered systems
- Jim Lambricht reveals his guidance on IT/low voltage design and the "Internet of Things"



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INSIDE

The alliance eZine

Volume TWO
Issue ONE



GOOD LIGHTING DESIGN

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A GLOBAL PERSPECTIVE

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SMARTER SMART SYSTEMS

16. Fast-developing internet technology has made it critical to include ITS early in the design stage of our projects.



The Benefits Of Exceptional Lighting Design

There's so much more to lighting than you may think

We enter a room and we flip on the light switch. It's that simple, right?

We know lighting is important, but mostly we underestimate the science and art that goes into quality illumination. While lighting is often discussed only in terms of "too much or too little," it has an impact on aesthetics, ergonomics, safety and more.

So much goes into lighting design: photometry, lighting calculations and control systems. But let's leave that for the experts and look at what the lighting can do for your space.

In all spaces, lighting is an important – if not the most important – design element. Lighting can stand alone as an artistic design element in an otherwise empty room, said Mike Libby, Strang's Director of Lighting/Engineering.

"You don't necessarily want it to stand on its own, but the point is it can," Mike said. "It has a powerful impact on any room. Conversely, if you don't think through your lighting, you can ruin all the other aesthetic decisions in the space."

Mike works closely with architects, interior designers, and the electrical team at Strang to enhance the design of a variety of spaces. They consider all sorts of techniques including direct lighting, indirect lighting, diffuse lighting, focused lighting, the color of the light, what surfaces the light strikes or avoids and how that lighting interacts with furniture, windows, etc.

While there are some aspects of lighting that are easily quantifiable, there are many other physiological and psychological affects that can't be defined by a formula. This is where the art and psychology of lighting come into play.



The lighting fixtures themselves are the defining features of the space and can add interest and excitement.



Balancing the effects of multiple lighting sources and considering how they can work together (or work against) each other is critical. This requires careful programming of the lighting levels at the end of construction to ensure they are balanced.

Every space, every design project is different and comes with different lighting strategies. What works in one space may be a disaster in another. A strategy that one person loves may leave another person underwhelmed. Light distribution, brightness, textures of light, placement and direction all are factors in creating the right type of aesthetic for the space. It has the potential to create interesting shadows but also produce annoying glare.

“It isn’t all about having enough or not having enough light. It’s about what you’re doing with



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It isn't about having enough light It's about what you're doing with the light

the light,” Mike explained. Lighting shapes behavior; you can use lighting to lead people to a particular location. Light and contrast can focus attention on an object or area of a room.

A good lighting design can make a room appear more spacious or cozy, higher or wider. It can create space that helps people to either focus or relax.

“Lighting can make rooms feel more intimate or more exposed,” Mike said. “Lighting a room down the middle as opposed to around the perimeter can make it feel like a totally different space.”

Major upgrades aren't always necessary to make a difference. In many cases, small changes create a whole different look. The occupant of a room might not even notice the change,



Lighting was designed to supplement the daylight needed for the trees to thrive. It also provides dappled light on the nearby seating. Without this, the space would feel flat and dull, even in daylight.



Lighting designed to highlight interior elements can also provide functional lighting, providing soft illumination for the work surfaces.

except in their comfort level.

“Making even subtle touches can have a big effect,” Mike explained. “Even designing variation in the lighting between desk spaces and adjacent corridors can make a person's day more interesting.”

The functional is as important as the creative side of lighting. Proper lighting can provide good ergonomics in the workplace so people don't strain their eyes to see. Light is proven to influence mood, attitude and productivity.

Lighting can have a more direct impact on personal comfort in a room. Sure, subdued lighting can be relaxing. But if you need to do delicate work or read small text, it will lead to eyestrain and performance issues. Conversely, high levels of



Lighting can be used to help define spaces and make them feel bigger or smaller. Large decorative fixtures almost envelope the countertop here, while small directional fixtures make the open space feel expansive and open.

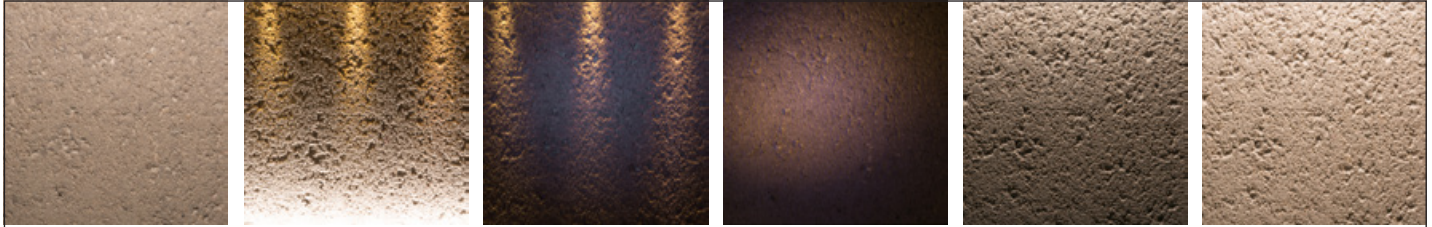


Mike Libby
Strang's Director of
Lighting | Engineering

lighting can help people do these tasks, but can cause discomfort when trying to read a computer monitor. We need to take all of the activities of the room into account and often will specify controls to allow users to make adjustments depending on what they are doing.

A quality lighting design can also save money in the long run. Not just with worker efficiency, but with energy costs. Of course LED lighting is more cost-effective to use, but has a higher initial cost. While the numbers need to be calculated to fit the client's need, one no longer needs to give up design elements in lighting to gain energy savings.

"It used to be that you would have to sacrifice aesthetics in lighting in order to be cost-effective or sustainable. And if you wanted to create a space with interesting highlights and shadows, you



This mockup shows the effect that different lighting can have on an ordinary surface. All of these images were created using the same painted concrete block and different lighting color temperatures, directions and beam spreads. Different lighting can alter the perception of a material, finish or even a person's face in drastic ways (good or bad depending on the desired effect).



The need for thoughtful lighting doesn't stop in feature areas of a building. It is important to carefully consider the needs of the people working in the building. Ample daylighting, via skylights, is supplemented by LED lighting that provides an interesting look whether it is on or off, while providing balanced direct and indirect lighting.

often had to give up energy efficiency,” Mike explained. “LED has given us many more precise, interesting lighting tools we can use throughout the building since they are also efficient. It used to be that interesting often meant inefficient. That’s not so much the case anymore.”

A good lighting plan It can also save on electric costs by making the most of daylighting as LED lighting can be controlled more easily and precisely than other efficient sources (like fluorescent and HID). Daylight in a space can have a big impact on savings, when combined with lighting controls that respond to automatically adjust electric lighting.

To get the most out of daylight in your space, it is important to consider the effects of building shape, configuration and orientation



The lighting in this space provides enough light to use the space after dark. Even when there is ample daylight in the space, the small directional fixtures provide sparkle and shadows to help the space feel sunny and warm even when it is dull and drab outside.

very early in the process. It may even impact where you decide to build. All these early decisions need to be made with input from the lighting designer and must be verified with data from a solar study done as part of an energy model. Making useful sunlight to enter deep into the building will affect many aspects of the architectural and interior design.

Ergonomics and aesthetics also play into the economics of lighting. Good lighting helps employees be more productive and quality aesthetics creates great first impressions and builds a good image for your company.



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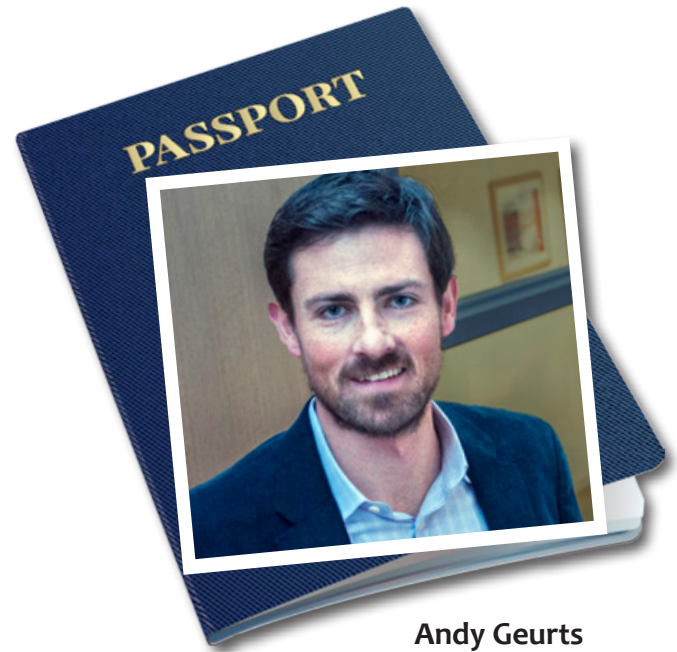
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Bringing A World Of Experience To Our Clients

Andy Geurts has worked on some of the tallest buildings in the world and some of the oldest in the nation. Strang's Director of Mechanical Engineering understands the energy-related questions many organizations face.

How much energy do we really consume? Have our carbon emissions fallen commensurate with lowered consumption? Is renewable energy a viable option? Which alternative technologies, i.e. LED lighting, biofuels, photovoltaic, or wind turbines make sense for us? Have we considered buying clean energy? Can we capture waste heat for heating and cooling purposes?

Yes, there is much to consider. Particularly when you consider that your energy decisions can significantly influence - among other things - your costs structures, brand equity, stakeholder perceptions or general operating performance. Gone are the days where energy was "simply a cost to be managed." Today, we take a far more proactive (and quantitative) approach to



Andy Geurts
Strang's Director of
Mechanical Engineering

mitigating risks and capturing rewards inherent within a robust, enterprise-wide energy strategy.

Recently, we sat down with Andy to learn more about several key components within an effective energy strategy, such as energy modeling, commissioning and specifying value-added engineered systems.



Q: Wisconsin will potentially be adopting the latest energy codes this year. How will this impact mechanical system selection and costs?

The new energy codes have impacts to both mechanical systems and building design. For example, the maximum allowable area of glazing will go down and the insulation R-values required will go up. These components reduce the “passive” energy use of a building, while reducing the heating and cooling equipment size. From a mechanical equipment perspective, the latest energy code is stricter in providing energy recovery systems, economizer, or “free cooling” systems and controls optimization, such as temperature resets. Generally, the installed cost will likely increase due to these additional components, but with reduced energy use, comes reduced energy and operational costs. Life-cycle costs will become even more important to show the owner the effect on the bottom line. Lastly, all projects will be required to have an energy model to compare with a baseline.

Q: What is the value of energy modeling? How does it affect mechanical system design?

Much of the value of energy modeling is in the front end of new building projects. The size, form and orientation of a building, quantity and type of glazing, and shading components can have a significant impact on the total energy use. The real value here is the energy optimization of a building based on four to eight hours of creating and iterating a simple “box” energy model. Additional value comes with in-depth energy modeling. Whether it’s done to achieve LEED points, or because the owner understands the value, an in-depth energy model for a new building or renovation project can guide the mechanical, lighting and passive system designs. An energy model can show how much energy can be saved by using condensing boilers vs. non-condensing, or comparing the energy use of packaged rooftop units vs. air-cooled chillers vs. water-cooled chillers, or comparing different types of energy recovery systems. However, typically the most value comes from the low-hanging fruit, like controls optimization, which cost the owner nothing.



Q: What is the value of commissioning?

The biggest value from a commissioning process comes from verification that the completed project will meet the client's needs when the keys are turned over. Independent detailed testing of mechanical, electrical and plumbing systems is the most obvious way the commissioning process delivers. Other activities such as the development

of an Owner's Project Requirements document at project conception and design review help the entire design and construction team keep track of the most important aspects of the project. The commissioning agent participates through the entire project to make sure all members of the team keep the end goal in sight.

Q: What are the biggest challenges limiting mechanical system solutions for clients?

Cost can be the largest sticking point and often the most difficult thing to justify for a client. There are many types of mechanical systems, components and control strategies that can be solutions for a particular client and building type. During initial design phases, we often use a Good, Better, Best strategy.

After listening to the client's needs, we develop various design strategies, with different levels of first cost, maintenance costs, and energy costs. The key to overcoming a client's fear of high construction costs is to describe in detail each system and - with the assistance of an energy analysis - prepare life-cycle costs and show the return on investment.

This will become even more crucial when the new energy codes are enacted and clients will be forced to look at potentially higher first cost, lower energy cost systems.

ANDY'S WORK AROUND THE WORLD

Chicago Temple Building, Chicago, IL

Managed the HVAC replacement in a 23-story office building.

Kingdom Tower, Jeddah, Saudi Arabia

Assisted the HVAC design for a 2 million square-foot mixed-use tower - to be the world's tallest when completed in 2020.

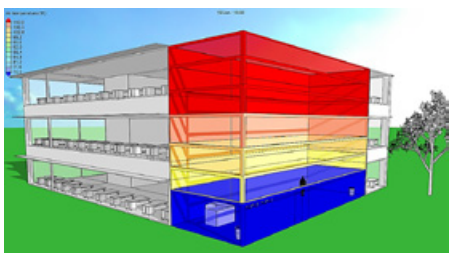
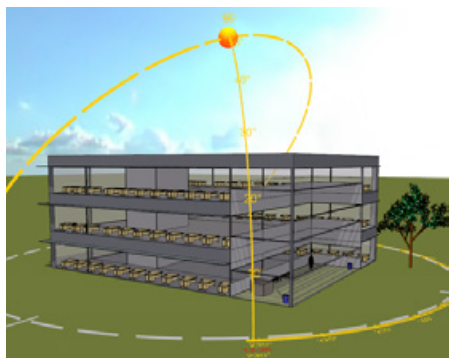
St. Elizabeths Campus, Washington, D.C.

Lead HVAC designer for several historic building renovations on the 175-acre government campus.

Hamel Music Center,

University of Wisconsin - Madison

Lead HVAC designer for the Hamel Music Center currently under construction.



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Q: What new technologies have impacted the industry in recent years?

HVAC technologies are always changing and evolving. The biggest evolution in the past five years has been smart system controls. Having a building automation system or a stand-alone system that can be controlled with a smart phone or tablet has become standard.

Heating and cooling system technologies are always pushing the limits of efficiency. Magnetic bearing chillers provide higher efficiencies as well as improving maintainability, with oil-free bearings. Condensing boilers are becoming the standard in heating systems, due to their efficiency over non-condensing. To take advantage of these efficiencies, care must be taken in the system design to maintain proper water temperatures. Ice storage is a system that has been around for long time, but recently has been scaled down to offer its capabilities in smaller projects.

The key is producing ice at night when electric rates are low and then using the ice as the cooling source during the day. A technology that has been around for decades, but has recently become more common due to the drastic energy savings are geothermal heat pump systems.

They take the relatively consistent temperatures of the ground or large body of water as the source of heat rejection, and can drastically reduce energy use in the summer and winter months. These systems will generally have the highest first cost, but with the push for energy reduction and sustainable systems, they are more popular.



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Low Voltage High Expectations

Jim Lambright talks about how fast-developing technology is impacting his clients' work



James Lambright
Strang's Director of
IT & Low Voltage Engineering



Part of my job is to sort through a client's wants and needs to create

a solution that both meets their desires and optimizes their budget.

Q: What is the basic premise people need to understand when asking for state-of-the-art IT?

A: It's been requested of me many times that a client desires to provide their staff with state-of-the-art technology with a goal of being 100 percent wireless. Unfortunately, you can never be 100 percent wireless because you have to connect to the network somewhere via either a hardwired connection or wireless access points installed throughout the building, each connected via wire to the network equipment.

A hardwired connection is always the fastest and most secure connection, although wireless is improving dramatically. Wireless is always going to be restricted by the limitation of the current technology. But manufacturers continually strive to improve their ability to process and pass data as fast as possible, utilizing limited frequencies and the inherent restrictions physics puts on data transmission.

Accommodating state-of-the-art information transport systems (ITS) infrastructure means one of two things: Utilizing today's readily available and tested products,

or utilizing existing legacy systems currently installed and leveraging these to the greatest extent possible. This takes careful planning and a little bit of crystal ball forecasting of future needs.

Q: What's the biggest change happening in the industry today?

A: There are continual updates in ITS infrastructure components and cable types to support the Internet of Things (IoT). Staying on top of these technologies is a big part of my design responsibilities. There are amazing new products and a plethora of legacy products being enabled and enhanced to utilize network connectivity.

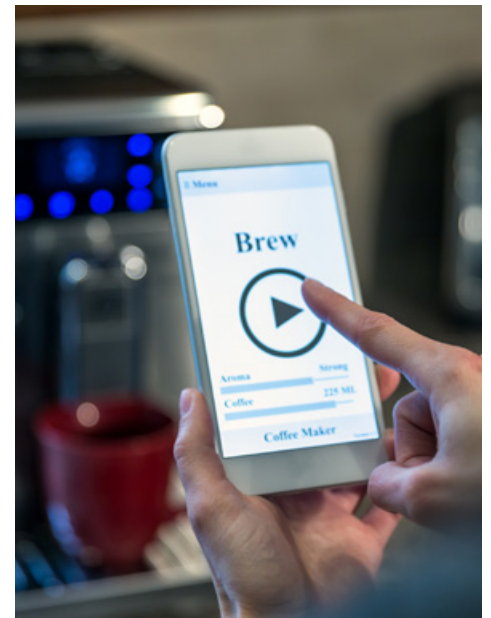
In the past, we used to jest about smart coffee makers and refrigerators. A hard-wired connection for these devices was not available. But now, with the advent of wireless fidelity (Wi-Fi), they're a reality. These devices are putting pressure on infrastructure equipment manufacturers to develop products to support all those devices competing for network connectivity.

This effects everything from the simple data jack you plug into (even wireless access points plug into a data jack) and the network electronics' ability to instantaneously process the tremendous amount of data passing onto the ITS infrastructure via Wi-Fi devices. The network link, which include the jacks and cable and are an integrated component of a building's construction for many years, must be designed not only

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enabled and enhanced to utilize network connectivity.





We've always accommodated mechanical and electrical system equipment. ITS is now one of the

critical systems to be included in the design process early in the design stage.

to accommodate devices available today but to support future technologies.

Q: What are your predictions for what we'll see in the next few years?

A: It is being predicted the Internet of Things is expected to reach 10 billion devices by the year 2020 (not including a quarter billion vehicles predicted to be enabled with Wi-Fi by 2020 as well).

Those devices will be brought into our buildings. As we plan to accommodate what the "experts" are predicting we'll obviously need to ensure our network infrastructure designs are pushed into the forefront of the building design process.

Architecturally we've always accommodated mechanical and electrical system equipment. ITS is now one of the critical systems to be included in the design process early in the design phase.

The Client's Information Systems teams manage and maintain the network electronics which use the ITS infrastructure after construction is completed. ITS managers are being required to provide constant and continuously uninterrupted data connectivity.

People have become accustomed to, and will be dependent on, the convenience of wireless intelligent devices. They will expect constant and consistent connectivity whether at

home, out socializing, or in their workplace.

I also foresee that the increased use of both new and legacy cable systems will not only provide data connectivity but provide power as well. Products are being developed to be more energy efficient, requiring less power. This enables those devices to receive power not from the traditional 110-volt receptacle but straight from the data jack.

We will see a need for more data jacks incorporated in spaces not normally accounted for such as in kitchens and meeting spaces and closely associated with many common building systems such as security, building automation, paging, and ever-increasing uses by the Audio Visual (AV) industry.

AV has taken such a big step toward networking their systems, utilizing networking techniques to the extent that AV professional organizations are recognizing the advantages of having readily available standards which have been developed, vetted, and adopted by the networking cabling industry.

With the continued integration of power and intelligence into products, ITS designers must have a clear understanding of a growing number of systems and be able to communicate to, and just as importantly, for our clients to ensure their projects are fully integrated, code and standards compliant and will support emerging technologies.

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The network link, an integrated component of a building's construction, must be designed not only to

**accommodate
devices available
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NOTEBOOK

> A Chili Winter Day At Strang

Strang hosted its annual Chili Cooking Throwdown on January 13, as staff members cooked up more than a dozen varieties of chili set in creative displays. Prizes were given for the best-tasting chili, best display and best name. The event was topped off with a build-your-own sundae bar. Pictured, from left to right, are Nathan Zach, Charlette Jaegler and Alec Hembree.



> Professional Development

Strang Senior Architectural Designer Drew Martin has been certified by the State of Wisconsin as an Architect. Drew received his Bachelor's Degree in Architectural Studies at the University of Illinois and a Master of Architecture

Degree from the University of Wisconsin – Milwaukee. He received his certification after passing a series of tests and accumulating the required number of hours working in the profession.





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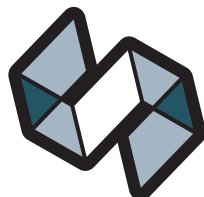
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