

# *The Best of* **LODGING ENGINEER**

Spring 2015

THE ELECTRONIC MAGAZINE FOR HOTEL & LODGING ENGINEERS

19

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**2009 - 2015**



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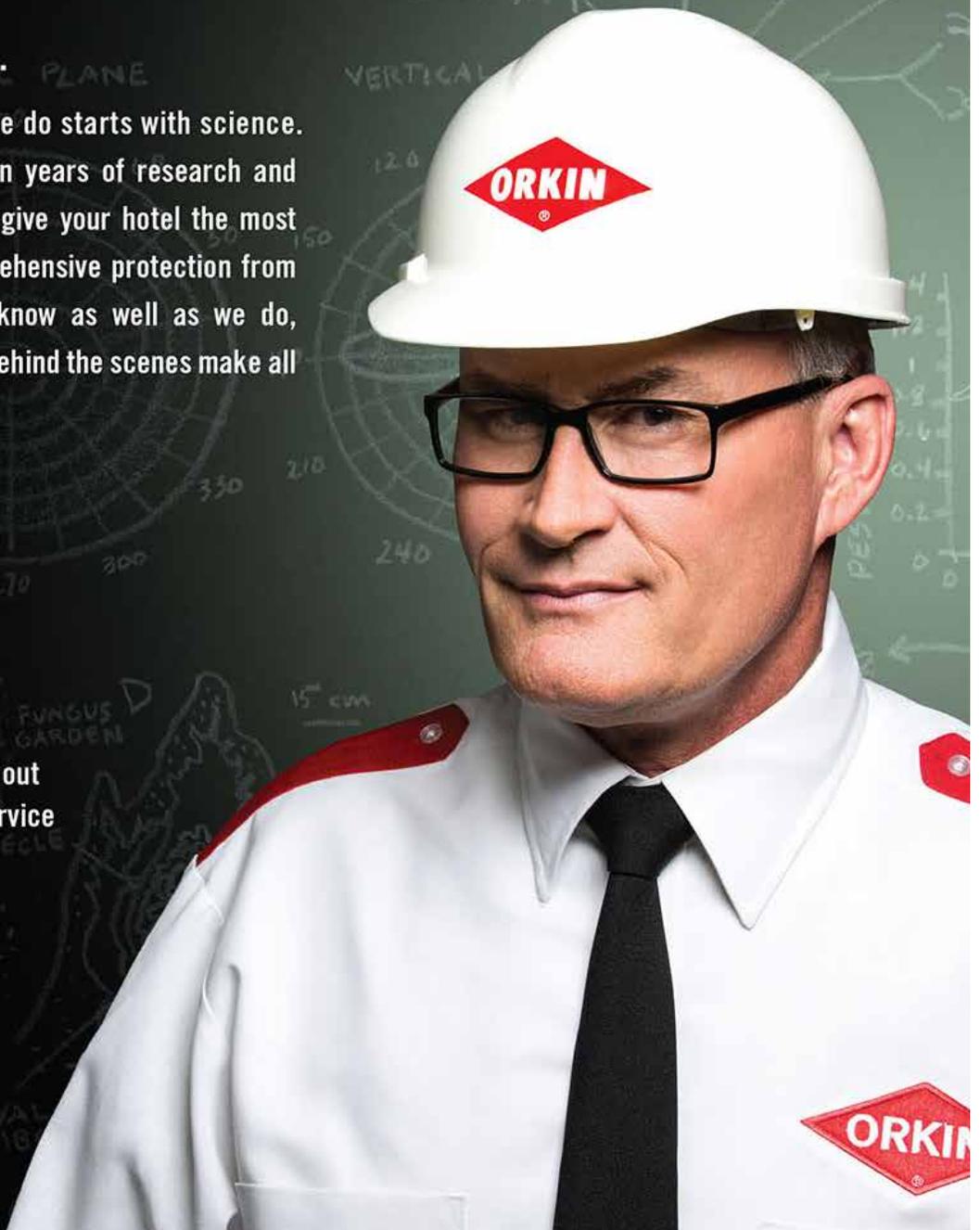
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**Here is what NAHLE certified engineers across the U.S. are saying about the program:**

### **Certified Chief Engineer – Select Service Properties**

*“I think the program is great, it definitely was a reinforcement in some areas that I was familiar with and a great learning experience in others that I didn’t have much knowledge. Very straight forward, seems to me that whoever put this course together must have been in the field.”*

“In my opinion the course was very informative because it covered very important themes focused on the system or the equipment we work with everyday at the hotel. Everything was explained with basic examples and simple words.”

*“I think that the course benefits every Chief Engineer that takes it and also the company. Because it helps them to do their work in more organized way and it also helps them understand the functions of each system they work with.”*

*“As a Reference source the Book was informative. There were nuggets of information in each section. The high points were the HVAC chapter and the Building Design and Construction chapters.”*

“The information was presented well and was easy to understand. The online tracking was easy to get to and follow along with. The program overall was very good but I would maybe have liked to see a section for finance and include more general HVAC’S knowledge (heat pump’s and chiller’s.)”

### **Certified Director of Engineering – Full Service Properties**

“I’ve been a engineering manager for over 14yrs, 10 in limited serve and the last 4 in full serve at the Renaissance Plantation. For a while I’ve been searching for a certification designed specifically to enhance my knowledge and competency in hotel engineering. My supervisor recommended the CCE certification from NAHLE and I must tell you this course hits all areas and key points from what you need to know to keep your facility maintained and running efficiently to being compliant with most city, state and federal codes and regulations. It’s an all around great self study course for the hotel Chief Engineer and DOE, and to this day I keep my study guide on my shelf as a reference if ever needed. I am also honored to be the first person to be designated CDOE (Certified Director of Engineer) from NAHLE and a proud member.”

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- 24 THE WRONG EXTENSION CORD CAN DAMAGE YOUR POWER TOOLS – August Craanen**. Every year, motors in thousands of power tools burn out for one simple reason, the tool was plugged into an extension cord not suited for the job. August provides valuable information from the *Leviton Institute* about properly choosing extension cords.
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- 28 A CALL IN THE MIDNIGHT HOUR – TIM ARWOOD, CEOE**. If you are a Chief Engineer, then you have experienced that sound of the phone in the middle of the night. Not knowing whether it is a situation that warrants you coming out in the middle of the night or is it something that someone on duty can handle with a little instruction, this is the decision that may determine your future with the property.
- 29 THE HIDDEN RISKS OF GREEN BUILDINGS: WHY BUILDING PROBLEMS ARE LIKELY – DAVID ODOM**, forensic building engineer, teams up with Hilton and discusses some of the shortfalls associated with building green. “The great irony of building green is that the very concepts intended to enhance a building’s performance over its entire lifetime are many of the same things that make a building highly susceptible to moisture and mold problems during its first few years of operation.”
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- 55 DIAGNOSING THE WARNING SIGNS OF HOTEL INDOOR POOL PROBLEMS – Ralph Kittler** Chlorine odors in non-pool areas, surface mold growth, condensation on windows, corroded metals and other dysfunctional and irreversible problems associated with indoor pools are not acceptable. Learn how to remedy and prevent these problems, protect your asset, improve guest comfort and generate serious savings.
- 58 THE 2013 GRAINGER SHOW – LARRY WILHELM** reports on Grainger's annual tradeshow and educational conference in Orlando, Florida. Their 2013 show combined hundreds of companies and suppliers with literally thousands of building and facility maintenance professionals from all across the country representing multiple commercial building types and use groups.
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- 76 EVOLVING TECHNOLOGY IN THE HOTEL INDUSTRY – AUGUST CRAANEN** takes us over a timeline of technology beginning with indoor plumbing in 1829 through the introduction of televisions in the 1970s (be sure and click on the Beatles for our first embedded video) to the 21st century where cell phone apps may be tomorrow's guestroom remote control.

# 1<sup>ST</sup> PERSON



## INTERVIEW

### Eric Geen

#### Confessions of a Hotel Chief Engineer Working in Paradise

by

Robert Elliott, CCE

I recently had the opportunity to visit Eric Geen, Chief Engineer at the Key West Marriott Beach Hotel. The property is beach front and absolutely beautiful. During my visit, the weather was unseasonably cold for February, all the way down to the 70s. We also met some vacationers from Alaska and they had just left weather that was 30 degrees below zero; a full 100 degree differential.

#### HI ERIC, CAN YOU TELL OUR READERS A LITTLE ABOUT YOURSELF AND YOUR PROPERTY?

My name is Eric Geen and I am the Chief Engineer at the Key West Marriott Beachside Hotel (KWMBH). Our hotel is the first hotel you pass on your way into Key West, on the water with two small beach areas. We are a four star four diamond; full amenity resort with 213 suites and over 6000 square foot of banquet, ballroom, and conference area.



*Key West Marriott Beach Hotel  
Key West, Florida*

#### **YOUR PROPERTY CAN EASILY ACCOMMODATE THE VACATIONER AS WELL AS THE CORPORATE TRAVELER NEEDING MEETING SPACE. TELL ME ABOUT MEETING THEIR NEEDS.**

Yes, we have different sizes of hotel suites from 300 to 1200 sq. ft. and one to three bedrooms. At 6000 sq. ft. we have the largest conference facility on the island, yes we refer to Key West as an island or living on the rock. Our restaurant Tavern and Town has received numerous awards for fine dining and our executive chef Kevin Montoya has placed first on many occasions in Celebrity Chef Fine Dining competitions, yes we keep his two kitchens running, or rather they insist we keep them running! All of our suites have individual split A/C systems, with major DX systems for our offices and conference center. Each of these units utilizes a scroll compressor. Thermostats are set for the convenience of guests. Our hotel is fully ADA compliant including a hydraulic handicap lift for our 65,000 gallon swimming pool and 2,000 gallon hot tub that has been with the hotel since 2007. KWMBH is split into seven three story buildings, six buildings for guests and the other building for banquets, offices, and yes the usual closet for the engineering and maintenance office and shop. You have to love the Architects and Accountants who without fail absolutely know

the engineering shop requirements of size and storage capacity required to run a hotel!

#### **SO HOW DID YOU EVER BECOME THE CHIEF ENGINEER OF A LUXURY HOTEL?**

Starting my career as a marine engineer for eight years gave me the best foundation any engineer could ever ask for. I switched careers and became a mechanical design consulting engineer progressing to owning my own mechanical contracting company. Since 1993 I have been involved with troubleshooting projects for various surety companies throughout the US, including the completion of the Loews Hotel on Miami Beach and Foxwoods resort and casino in Connecticut. I set up the engineering facility and preventive maintenance schedule for the Loews Hotel, and post construction completion, I worked as Director of Engineering at Foxwoods for 18 months. Finally, arriving to live permanently in Key West, my fiancé stated that I needed to get a job as I was having too much fun in retirement. So, here I am in Paradise as the chief engineer of a fabulous hotel and a great engineering and maintenance staff of eight. A lot less of a headache than the 386 staff I had at Foxwoods engineering group.

**"Best of Lodging Engineer"**  
Celebrating Six Years



*Sonny Bojtas rebuilding an electronic door lock*

**SO BEING ON AN ISLAND, FUEL MUST BE SCARCE AND EXPENSIVE. DESCRIBE SOME OF THE EFFICIENCIES YOU USE AT YOUR PROPERTY.**

We strive to be as energy efficient as we can be, however there is always room for improvement. All of our light bulbs, ballasts, batteries, computer monitors, printed circuit boards are all recycled to their specific recycling facilities. Our engineering team is constantly rebuilding various items with parts scavenged from previously used equipment. Jozsef, our engineering supervisor, rebuilds electronic door locks, electronic safe locks, balcony door handles

Alan came to work second shift with his uniform khaki pants wrinkled. When asked if he owned an iron – he said yes – when asked if he knew how to use an iron – he said yes – when asked if he would like the guys to get his pants ironed here in our laundry room – he said yes – I think everyone that saw from the engineering office all the way to the laundry room were laughing so much when they saw a couple of the engineering guys carrying Alan to the laundry; so he would not have to take his pants off going through the Chicago industrial iron machine. Yeah, we are a fun group.

**WHAT ARE SOME OF THE CHALLENGES OF RUNNING AN ENGINEERING DEPARTMENT FOR A HOTEL PROPERTY THAT IS LOCATED, FOR ALL INTENTS AND PURPOSES, ON AN ISLAND?**

The nuts and bolts running the KWMBH is fairly simple but not without challenges; we are on an island. Getting spare parts and replacement or upgraded parts is difficult. Fortunately we have several companies in Miami who really go the extra mile, specifically Grainger. Grainger is basically overnight for virtually everything in their catalogue and to that end KWMBH spends a lot of money with them. HD Supplies in Miami is also a very dependable group.

**DO YOU SUBCONTRACT A LOT OF YOUR WORK OR HANDLE IT IN-HOUSE?**

We sub-contract all our HVAC and refrigeration, major plumbing jobs, major electrical jobs, landscaping, telecommunications and IT works. It would be remiss of me not to thank our major subs here in Key West that take exceptional care of our requirements and make my job a lot easier at KWMBH. Sub-Zero, Gary's Plumbing, Unlimited Electric, Quality Lawn Care and Protection Plus.

**LIVING HERE IN THE KEYS, PEOPLE MUST ASK YOU IF YOU ARE AFRAID OF HURRICANES?**

Well, yes we are, but we do get notice prior to them arriving. KWMBH was built in 2007 as a Category 5 rated building with windows, doors, exterior walls and roof rated for 200 mph winds. On top of this we have a 1 mega watt diesel generator capable of keeping our complex alive for 7 days utilizing 8,000 gallons of oil from our on-site storage tank.



and various other components including housekeeping machinery with parts scavenged from units previously considered beyond repair. This saves our engineering group thousands of dollars per year. Sonny's specialty, apart from door locks, is hotel furniture. He repairs everything from high-end bar stools to shelving that collapses under extreme weight in our closet engineering office.

**GOT ANY FUNNY STORIES OR HUMOROUS ANECDOTES?**

Our engineering group is a very hard working, fun loving group of guys; even when

**THIS HAS BEEN A LOT FUN, ANY LAST WORDS?**

Well I guess that's just about most of the info I can share; apart from the fact that I now have to get back to the daily grind of my job here in paradise. Next project; walk the property again to find any deficiencies, check the temperature at the pool and hot tub; Oh, by the way, did I mention it is February 15, 2012, 83 degrees, clear skies, bright and sunny with sunshine glistening off the various shades of ocean blue water at the edge of our hotel. ■



## What Do You Call a Snooping Chief Engineer?

If you answered a Manager on Duty, then you are correct.

By Manny Mercado, CDOE

Yes I say snooping because how often do we get to snoop around and take part in other department's operations? Many times we as engineers only know engineering language— not Chinese or well done, medium well, etc. jargon. For me, I want to know only about engineering things when it comes to fixing, taking things apart or just breaking them. I did not mean to say break, but anyway we do it often without getting caught. When it is time for me to become someone other than an engineer it actually transforms my views on many things regarding operations of my hotel. We tend to focus on our daily responsibilities as engineers and not really pay mind to other daily operations that complete a successful day.

I like when I say snooping because it is a privilege given to me for a short period of time to get the feel in other departments of operation from a different view as Manager On Duty. This opportunity has opened my eyes by actually stepping out of the box of engineering to interacting with other departments with a different title. My experience to see the operation from within each department has taught me a lot about teamwork. My day-to-day activity is making repairs in engineering. I never had the chance to see all the hard work that contributes to our success. As Manager On Duty you get to go behind the scenes and interact with many team players. The great part that I like is having a meal at YOGI's All American Grill and Sports Bar. We get served like regular guests and we write our report about our experience.

I look forward to my next scheduled date as Manager On Duty. Overall this program gives us a great idea on where we need to improve or where we stand with the services we provide. We know that it is better that we catch our failures before the company inspector does. This is the only day I get to show off, so I dress up to look important. When I interact with our hotel guests they have no idea I am their engineer in disguise. You can actually learn a lot from behind the scenes. On many of my tours I take that pertain to my department, I sometimes wonder how we missed that. For

example every morning I go to get coffee and walk through the kitchen then back to my office. What did I observe? Nothing really. I had tunnel vision, I wanted my coffee and that was all. When I was Manager On Duty I snooped around all areas of the hotel and found myself in the kitchen, watching the operation. I found a few minor repairs that were overlooked for some time by me of course.

Next with our program we get to stay at the hotel. This experience has given me a better view of our product up front. Every day I deal with these rooms but never got to know them. What I mean is that my experience staying in one of the rooms actually gave me the real feel of what we have to offer our guest. I spend no more than 20 minutes in any given guestroom, now with this program and spending more hours in the room, it opened my eyes to what guests really see. You really get to know more about a room and know more about each unique feature. I will explain. One room, the location was nice and quiet. The other was nice and quiet as well, but you could slightly hear our water booster pump on the lower floor when it comes on. I will go in a room closer to the roof and hear the bathroom vent, but in the room closer to the ground floor you hear a whisper. While in your room you can hear all doors from guest entering their rooms slamming at different speeds because of different tensions on the spring loaded hinges. You have an idea on what can be learned, just minor tweaks and turns that need attention. Next part I like is ordering room service breakfast from once again YOGI's All American Grill and Sports Bar. This is part of our evaluation on presentation and service. I will say that from my experience here at the Crowne Plaza in Monroe New Jersey I give it a thumbs up, not because I work here, but to know that all of our team players give it their all to make it a success. Yes, I will gather my notes from what I have observed as Manager On Duty and as I fix what needs fixing I will be more observant in the future as Chief Engineer. ■

## Safety Tip



### Hand Tools:

OSHA Standard 1926.300(a) & 1926.301(a)

Employees shall not issue or permit the use of unsafe hand tools, including tools that may be furnished by employees or employers. All hand tools must be properly maintained.

OSHA Standard 1926.301(b)-(d)

Wrenches shall not be used when jaws are sprung to the point that slippage occurs. Impact tools shall be kept free of mushroomed heads. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

Find more info. on safety and regulations at [nahle.org](http://nahle.org).

# Hotel Maintenance: The Basics

By August H. Craanen

Preventive and scheduled maintenance are needed for protection of the building's / owner's assets. This includes the structure from the facade or building envelope to the integrity of the floors, walls, ceilings and all of the furniture, fixtures, and equipment (FF&E) contained therein. In addition, poor maintenance will influence the guest's perception of the property and will be a factor in the guest's decision to return to the property on another occasion (repeat business).



creasing evidence of poor and declining maintenance both for equipment and guestrooms.

## Possible reasons for the poor / declining maintenance:

- Preventive maintenance program lack detailed instructions for tasks to be performed
- Inadequately trained maintenance staff
- Inadequate supervision / quality control
- Understaffed

Surely, there are more reasons that can be added to this list. It is essential that the above listed reasons are corrected. In future articles we will review the individual items and suggested ways to correct them.

## Guestroom Preventive Maintenance

Inspections in several hotels have revealed that there is "significant" evidence of lack of maintenance in the average guest room / suite. To combat this unfavorable condition, a "ROOM MAINTENANCE program (R.M.P.)" is to be used as a management tool. This program should provide a set schedule and routing tool for the preventive maintenance of the guest rooms / suites, eliminating potential guest complaints and aggravations.

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***“Inspections reveal increasing evidence of declining maintenance for both equipment and guest rooms.”***

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Many hotels, both chain and single operations have Preventive Maintenance and Work Order Software in place. This combined with proper execution of the maintenance and repairs should keep costly breakdowns to a minimum, however in many hotels the execution of the preventive/scheduled maintenance and repairs leaves much to be desired.

Inspections in several hotels industrywide, reveals in-

Use of the room maintenance program will increase employee productivity since tools and materials required for the repairs are in the R.M.P. cart. Time spent locating parts, waiting for elevators, chasing tools, is an area of expense, seldom considered, frequently overlooked, or just considered as a built-in factor. The 'go-get it time' almost always involves wages for more than one person.

### The R.M.P. Program / Checklist

The program can be set up in one of the following methods, or both:

- A Crash-Type methodology where 20 or more rooms are blocked at a time on a given floor, opening all doors, assigning a task force to perform general cleaning, painting and maintenance.
- A systematic, preventive maintenance plan where maintenance persons are scheduled on a room-to-room basis, eventually completing the entire house. When the last room is completed, the cycle will possibly be started again, enabling him / her to thoroughly inspect and perform maintenance where needed in each room twice a year.

A standard R.M.P. checklist contains in most cases 50 to 70 items, depending on the type of room and / or hotel. A sample list is shown at the end of this article, which should be modified to fit the hotel's operation and room configuration.

Another option is to start with a modified checklist containing approximately five to ten items based on the most frequent guest complaints. At the end of the first cycle, guest complaints should again be reviewed. The original top five to ten complaints will have substantially been resolved. The checklist should be expanded to include the next five items.

When completing the third cycle through the rooms, guest complaints are usually dramatically reduced.

### The R.M.P. Person

The R.M.P. person / maintenance person(s) should have knowledge of all preventive guest room maintenance and depending on his or her skills might need to be trained in some of the phases of the work. He / she should always look presentable and should be able to handle him / herself well with the guests.

### Summary

Like any Management Tool or Program, there has to be a follow-up and training. The chief engineer should go through several rooms completely with the R.M.P. person / maintenance person(s), prior to letting him go on his own, and should periodically spot-check the results. In some situations it might be advisable to have the R.M.P. person / maintenance person(s) trained by an outside consultant. The biggest advantage of this program is that the guest rooms get a thorough inspection and the necessary repairs at the same time. ■

*In addition to 7 seven years in the Dutch Merchant Marines, August Craanen has over 31 years experience of facility management and project management experience with companies such as Hilton International, Sheraton, Four Seasons Hotel, and Manhattan East Suite Hotels and has worked in USA, Europe, the Middle East and the Far East.*

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R.M.P. Check List (SAMPLE)

Please note that the following list should be extended and adapted to the different room / suite types found at your property and is shown here for demonstration purposes only. This list is not all inclusive and you should develop your own list to match your property and its rooms with your R.M.P.

**ABC Hotel Engineering / Maintenance Dept.**  
Preventive Maintenance: Room Checklist

Room / Suite #: \_\_\_\_\_ Type: \_\_\_\_\_ Date: \_\_\_\_\_ Completed by: \_\_\_\_\_

**LIVING ROOM:**

- Check all switches, outlets and cover plates. *(All covers have to be the same color)* \_\_\_\_\_
- Check drape shade, blackout and inspect for repair \_\_\_\_\_
- Open / close all windows, test lock and tighten screws as needed \_\_\_\_\_
- Inspect sofa, bed, and chairs for damage and loose legs \_\_\_\_\_
- Center pictures and mirrors and secure properly \_\_\_\_\_
- Check all lamps *(for single, 3way bulbs & fluorescent)* \_\_\_\_\_
- Check telephone faceplate (dirty, etc.) \_\_\_\_\_
- Check telephone ringer and message light \_\_\_\_\_
- Test T.V., remote, programming and connectors \_\_\_\_\_
- Check movie box (On Command etc.) \_\_\_\_\_
- Check all furniture drawers for damage & handles for repair \_\_\_\_\_
- Check closets and lubricate door \_\_\_\_\_
- Check HVAC unit operation and clean filter \_\_\_\_\_
- Check smoke alarm \_\_\_\_\_
- Check front door lock, lubricate hinge and check doorbell \_\_\_\_\_
- Make sure all doors have doorstoppers \_\_\_\_\_
- Check back of the front door for posted signs \_\_\_\_\_
- Check latch guard for proper operation \_\_\_\_\_
- Check entrance ceiling fixture *(60 watt clear or sufficient lumens / brightness)* \_\_\_\_\_
- Check dining room table and chairs for damages \_\_\_\_\_

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**KITCHEN:**

- Check refrigerator temp. *(set at 5)*, bulb, door seal and shelves \_\_\_\_\_
- Check sink faucet for leaks and loose handle \_\_\_\_\_
- Check sink drain and make sure it has a strainer \_\_\_\_\_
- Check stove pipe for leaks and stove knob for damage \_\_\_\_\_
- Check cabinet doors for alignment and tighten knob \_\_\_\_\_
- Check switches, outlets and cover plates *(All have to be the same color)* \_\_\_\_\_
- Check ceiling fixture \_\_\_\_\_
- Check dishwasher \_\_\_\_\_
- Check electrical breakers \_\_\_\_\_

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**BATHROOM:**

- Check sink & tub faucets for leaks and loose handles \_\_\_\_\_
- Check sink & tub drains and make sure they have stoppers \_\_\_\_\_
- Check spout and shower head(s) for leaks \_\_\_\_\_
- Check toilet for leaks, check toilet seat and secure properly \_\_\_\_\_
- Check shower rod and clothes line \_\_\_\_\_
- Check towel racks & bars for damages, etc. \_\_\_\_\_
- Make sure mirrors are properly secured \_\_\_\_\_
- Check medicine cabinet for damages, etc. \_\_\_\_\_
- Make sure medicine cabinet door is working properly \_\_\_\_\_
- Check cabinet door(s) under sink \_\_\_\_\_
- Check light fixture(s) \_\_\_\_\_
- Check switch(s) \_\_\_\_\_
- Check GFI outlet \_\_\_\_\_

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**BEDROOM:**

- Check all switches, outlets and cover plates. (*All covers should be the same color*) \_\_\_\_\_
- Check drape shade, blackout and inspect for repair \_\_\_\_\_
- Open / close all windows, test lock and tighten screws as needed \_\_\_\_\_
- Inspect bed frame, casters, legs, head-board and center support \_\_\_\_\_
- Check all furniture for damage & handles for repair \_\_\_\_\_
- Check all drawers for proper working (guides etc.) \_\_\_\_\_
- Pictures and mirrors secured properly and centered \_\_\_\_\_
- Check all lamps (*for single, 3way bulbs & fluorescent*) \_\_\_\_\_
- Check telephone faceplate (dirty, etc.?) \_\_\_\_\_
- Check telephone ringer and message light \_\_\_\_\_
- Check movie box (*On Command, etc.*) \_\_\_\_\_
- Check smoke alarm \_\_\_\_\_
- Check entrance ceiling fixture (*60 watt clear / sufficient lumination ?*) \_\_\_\_\_
- Test T.V., remote, programming and connectors \_\_\_\_\_
- Check HVAC unit operation and clean filter \_\_\_\_\_

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**SERVICES OFFERED BY CRAANEN TECHNICAL SERVICES, LLC**



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- Prepare policies and procedures for engineering / maintenance departments
- Emergency & contingency planning
- Review of job descriptions
- Staffing schedules, competency evaluation
- Training need assessments
- Maintenance contracts review

**DEVELOPMENT & TRAINING**

- Review and preparation of job descriptions
- Development profiles and training

**EVALUATION OF PROPERTY MAINTENANCE CONDITIONS**

- Review preventative maintenance programs
- Review of work order and maintenance request procedures
- Evaluation of maintenance programs
- Property maintenance inspections
- Maintenance contracts review

**SURVEY INVESTIGATE AND INSPECT PROPERTIES**

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- Condition surveys
- Determine useful life of equipment and systems
- Prioritize system and equipment replacement (prioritize expenditures)

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# From Greenwashing to Platinum Smelting

By Art Attaway

Greenwashing, being the practice of doing a little green and a lot of advertising; and platinum, being the LEED program's most environmentally complete package of property compliance. There is a broad range in between.

What does it take to be a green hotel? I think it can be argued that any real effort to help the environment is a step in the right direction of environmental responsibility, and should be acknowledged. Agencies and associations are doing just this. The Florida Green Hotel program has three palm tree rewards, but will hand out acknowledgements with one palm tree for a partially compliant property. Two palms for more effort. The LEED (Leadership in Energy and Environmental Design) program has silver, gold, and platinum ratings. The private group Green Seal isn't so easy. You either meet their compliance standards or you don't. The internet based travel group, Green Travel Hub (Rezhub.com), allows a self evaluation and checklist (don't be a greenwasher!). But soon, very soon, expectations are going to increase, and guest's expectation is going to be the salient point.

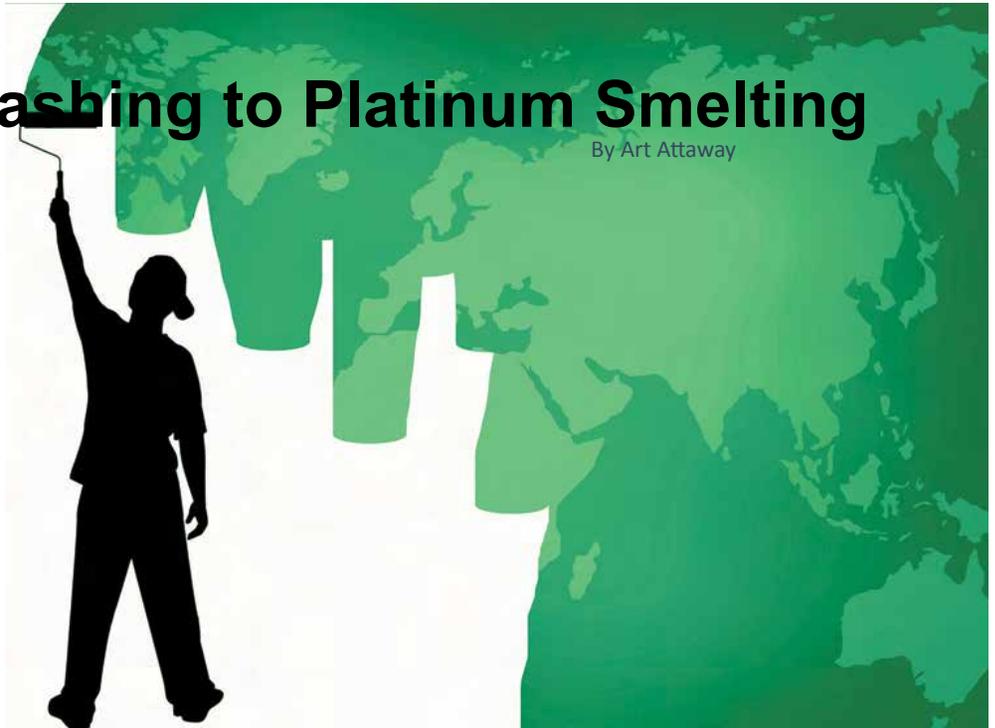
Forbesonline.com recently rated the top ten "Green Hotels" in the country. And I cannot say it was solely based on LEED criteria. Cited were elements of focus from ladybugs being used in place of pesticides to using dead standing pines to timber and use for walls, floors, and furniture. Washable fabrics, free of Scotch-guard, indigenous plants, recycled paper products, organic fiber beds and bed linens, paper key cards... all considered. Some had significant capital investments like wind and solar energy plants and hy-

drocarbon powered dry cleaning plants. One property used solar energy to provide heat for the floor, so your feet do not get cold. In Alaska, they used native driftwood to make furniture, and for all of the wood surfaces such as flooring. I really think the 5-Star and 4-Diamond rating are soon to include these "type" luxury amenity expectations.

I remember, just a decade ago, being amazed on the Emerald Coast of Florida, when we had to specially select and position exterior lights on the Oceanside so as not to interfere with the sea turtles coming ashore to lay their eggs. We also could not cut, and had to plant extra, sea oats. An acquaintance of mine recently described a Caribbean resort property that included the guest in the release of baby sea turtles during the annual migration to the sea. If you are as old as I am you will remember when "safety meeting" and "safety committees" were introduced. Well, it will soon, very soon, be "eco committees and meetings". One small but well known hotel chain has a Vice President of Environmental Affairs in their corporate office. I doubt they are alone.

We should embrace the program and use it for its many purposes, to help save the earth, cut cost, and as a Public Relations opportunity. Other industries have rushed to compete as being the most green. The Prius is the current gold standard in the auto industry, Whole Foods in organic and whole foods in the grocery industry, and Starbucks Fair Trade products in the food supply industry. Starwood's "Element" Properties all are required to be LEED certified from the ground up. Most states now have a green hotel certification program. The EPA Environmental Protection Agency) with it's Energy Star program, and private organizations are all in the game. But the hotel industry lags significantly behind in finding ways to be green. The hospitality industry is in the top five largest industries in the country, meaning sales income, employment, and taxes. We have the ability to make a significant impact in this area of focus.

So, what can you do? Well, start with getting all of these rating systems. I will tell you where. But there are several areas that won't even hurt, because they make an immediate impact and actually "save"



money. Return on investments range from 3 to 24 months, and then dollars start falling to the bottom line. In fact, most of the programs will ultimately save money and help make an environmental difference at the same time; things like guest room energy managements systems, fluorescent lighting and bulk soaps and citrus cleaning products. One company offers free parking if you are driving a hybrid automobile. Be creative. Look at your property. See what is innovative and insightful to be done. Urban properties may not be able to use ladybugs for pesticides, but you can find other responsible and creative ways. Did you know indigenous plants require far less water and maintenance than transplants? And, even though most properties have guest towel and bed linen savings programs, the housekeeping staffs are not properly trained to follow the system. Many frequent travelers report that even though they said "don't change the bed" and hung up their own towel, they came back to find all fresh linen products anyway. EcoMeet and Green Wedding programs are cropping up in more than one location.

And deeper, the LEED program just announced the LEED EB: OM program. EB meaning "existing building" and OM meaning "operations and maintenance". In the past, the LEED program compliance was largely up to architects, designers, owners, and anyone who controlled capital budgets. Now, the Green Building Council is making it easier for property managers and operators to make a difference. So HVAC and energy management, solar and wind turbine power, and expensive recycling systems are no longer the only way to be LEED certified as a property. Leave the low VOC (volatile organic compounds) wall coverings, carpets, and adhesives to the design group, and worry about what you, the hotel engineer, can affect. Water flow control valves and waterless toilets, environmentally friendly and bulk cleaning products, paper key cards are all things you can do. You don't have to find driftwood,

dead standing pines, and virgin forest. Just buy recycled paper products.

The NIST (National Institute of Standards and Technology) has created a Windows® based computer program named BEES (Building for Environmental and Economic Sustainability), that analyzes various data and aspects of product usage, such as life cycle, initial cost, replacement cost, and environmental merits to determine the "really" most ef-



ficient products. BEES lets one evaluate the carbon footprint and cost from cradle to grave. This is important because often indigenous materials, once you factor in labor and disposal, do not stack up to the environmental impact associated, say with substitute based petroleum products, or products outside the 50 or 500 mile LEED scoring system. While primarily used by Architects and Designers, this could be a good tool for anyone in control of budget planning for a renovation or new construction project. The program can be obtained in the form of a free download from the NIST @ [brfl.nist.gov/oac/bees.html](http://brfl.nist.gov/oac/bees.html).

Also watch for information coming from the ASTM (American Standards for Testing and Materials) who has now formed a "Green Building Committee" and is coming out with updated ASTM standards. The second edition of ASTM International Standards on Sustainability in Buildings (not specific for hotels) is now available on CD-ROM. The compilation, which includes 111 standards, addresses

environmental problems and challenges related to the design, construction, and operation of environmentally sound and resource-efficient sustainable buildings. The standards identify compliance with federal mandates that call for environmentally preferable products, energy efficiency, and sustainable buildings. The text covers building materials, performance of wetlands, and general principles for life cycle assessment as well as sustain-

able design, construction, and operation of buildings. A complete list of the standards can be accessed by visiting [www.astm.org/](http://www.astm.org/) and entering GREEN05 at the site search. ASTM has recently received approval of its residential / multi-family housing "Green" standard. This standard was developed in cooperation with the NAHB (National Association of Home Builders) and has provisions affecting R-1 mixed-use occupancies (hotels). You should also watch for ANSI (American National Standards Institute) and ISO (International Organization for Standardization) programs.

There was a time, and may still be, when the operational reluctance was fear of a negative guest reaction to (perceived) less services, or "different" services and amenities. Well, the world has shifted its focus and what would have hurt business before will now help. Educating employees and guests is extremely important. The more educated they are the more they will support the efforts. Identify what you do, and why, in your printed literature. Put a loop on the guest / meeting information system in the lobby, and the television when it hits the information channel. Include it in your advertisements. Have employee meetings to identify the programs and their value. Wear it proudly. Because soon, very soon, you will be standing at the station watching the train pull away (with your guests on board).

In 1983 at the Hyatt Regency Phoenix we had a new Rooms Exec, Chief Engineer, and General Manager, all within 3 months. We were looking to make a difference. Our new "Chief" put three kicking halogen lights on a lower flat roof that illuminated the 27 story tower so you could see it from the airport, 7 miles away, and beyond. Our building stood out beyond all others in the downtown area. The GM beamed with pride. We were the talk of the town! And we would be the talk of the town today, but in a much more negative way. It made sense then. It was good then. But now we have to look for more environmentally friendly ways to stand out.



- Supports the use of alternate energy sources (wireless room energy management systems, fluorescent light bulbs, and fluorescent fixtures are easy).
- Participates in energy conservation programs.
- Compact Fluorescent Lighting (back of the house and some public area lighting can easily and affordably be changed).
- Uses Energy Star appliances.
- Uses Green Key Card (change out plastic for paper)
- Uses bulk soap and toiletries (as opposed to individually wrapped)
- Xeriscaped or Native Plant Gardens (saves water and maintenance man-hours)
- Fresh-Air Exchange (windows that open)
- Is A State Certified Green Property (look for information within your state)

#### Websites:

Green Travel Hub - Rezhub.com

GreenSeal.com

Green Hotel Association, Texas - Green-hotels.com

Green Building Council - USGBC.org

*“We should all embrace ‘going green’ to help save the earth, cut costs, and benefit from it as a public relations opportunity.”*

As you can see, there is an abundance of “standards” materials, actually an overwhelming amount. Don’t know where to start? Look up the privately run “Green Seal” program, established in 1995. They have a checklist of what to do to get your seal. Find the LEED EB: OM requirements through the local chapter of the Green Building Council, or investigate the Energy Star program run by the EPA. Check with your state to see if they have a program. In Texas there is the “Green Hotels Association”. In California and Florida it is the “Green Lodging Program”. Find the sources in your state, and do what you can. It’s good for everyone.

The Green Travel Hub website ranks these categories; this may be a good starting place:

- Sheets and towel reuse program (remember to train and check)

- Recycles: newspapers, disposables, service items, in-room recycling
- Educates staff and/or guest about greenness, and/or participates in green programs
- Composts waste food
- Offers organic food
- Uses non-toxic Earth Friendly cleaning agents (citrus based is good and works).
- Uses re-usable service items (no disposable cups, plates, silverware, etc.)
- Gives to non-profits
- Conserves water
- Low-flow showers/toilets (this can be a simple valve replacement, and a brick)

(LEED & LEED EB:OM)

NIST.gov (BEES)

ANSI.org

ISO.org

ASTM.org

Run by the State of California: Integrated Waste Management Board

Green Lodging Program, California – [ci-wbm.ca.gov/epp/greenlodging/](http://ci-wbm.ca.gov/epp/greenlodging/)

Run by the State of Florida EPA

Green Lodging Program, Florida – [dep.state.FL.US/greenlodging/](http://dep.state.FL.US/greenlodging/)

#### Publications:

Green Hotelier

Green Lodging News

Soon, very soon.

# MOISTURE: STONE ENEMY NUMBER ONE

Moisture can be the underlying cause of many problems showing up on marble and other natural stone. Fred Hueston, internationally recognized stone forensic expert, tells you how to identify these problems and what can be done about them.

As a stone and tile forensic consultant, I am frequently called upon by hotel engineers regarding problems they are experiencing with their marble or other natural stone or tile. Many of these problems—yellowing of certain types of marble, discoloration, flaking and spalling to name a few—all have one thing in common: they are all problems as a result of moisture or water intrusion.

Water can enter a stone installation from flooding, broken pipes as well as natural disasters such as hurricanes, strong winds, etc. Moisture problems can also result from excessive water used in maintaining the floor.

Water is an essential ingredient for the setting, cleaning and restoration of stone but it can also be its number one enemy. The following is a description of the most common of these problems, their prevention and remedies.

## A WHITE POWDERY SUBSTANCE ON THE STONE SURFACE

Efflorescence appears as a white powdery residue on the surface of the stone.



It is a common condition on new stone installations or when the stone has been exposed to a large amount of water, such as from flooding. This powder is actually a mineral salt from the setting bed.

The solution: To remove efflorescence do not use water. Buff the stone with a clean polishing pad or #0000 steel wool pad. The stone will continue to effloresce until it is completely dry. This drying process can take several days to as long as one year.

## SPALLING (PITS IN THE SURFACE OF THE STONE)

In the efflorescence condition above, the salts are deposited on the surface of the stone. When the mineral salts migrate and do not make it all the way to the surface, a condition called subflorescence occurs. In subflorescence the salts crystallize just below the surface, causing stress within the pores of the stone. This manifests as a condition known as spalling which appears as pits in the surface of the stone. Subflorescence is very common on green marbles and very common on almost all stone surfaces where de-icing salts are used.

Subflorescence is difficult to repair but not impossible. First an assessment must be made to determine the extent of the damage. If it is found that the damage is not too extreme, the stone may be able to be filled with an epoxy. A stone expert should be called in to evaluate and perform testing and discuss possible remedies.

## YELLOWISH / BROWN STAINING ON THE STONE

Many light colored stones contain natu-

rally occurring deposits of iron. Iron is a mineral found in stone and can occur randomly throughout the stone. If iron is present, it will begin to oxidize when exposed to water or other oxidizers such as acids and household bleach. Stone can remain for years without yellowing, then over time may slowly turn yellow and in severe causes may turn completely brown. This oxidation process is accelerated when the stone is saturated with water. This process of oxidation is similar to the rusting of metal. If you expose a brand new nail to water and air it will turn brown and rust. The same process is occurring with the iron in the stone. If water and/or air is eliminated the iron will not oxidize. This is the reason certain white marble suddenly turns yellow. The process is difficult to reverse. It is advisable to contact a stone restoration contractor to try to remove the staining. However, in many cases even the best techniques may not work and replacement of the stone may be necessary.

Before assuming the marble is yellowed due to iron, be sure to attempt cleaning and stripping with a good alkaline based stripper.

The yellowing of stone is a common problem. New installations should be sealed with a good quality penetrating sealer (impregnator) which will help prevent oxidation of the iron by keeping moisture out.

## EROSION

Erosion is a condition found when stone is exposed to constant amounts of water. This is especially true with marble that is used in water fountains. While marble is a very decorative material, it is one of the

worst materials to use in or around water. Marble is composed of calcium carbonate. Calcium carbonate is a water soluble mineral. Quite simply this means it will dissolve in water. If you want proof, visit the Grand Canyon.

Erosion can be recognized by a slow deterioration of the stone surface. With polished stone the polish will be worn off. In older installations, the stone may become very soft, brittle and in extreme conditions, it will powder.

(To the architects or designers reading this article I beg you not to use marble for water fountains. If you do, plan on very high maintenance costs and plan on replacement in about five to ten years if not sooner.)

### Stabilizing Erosion

If you are faced with trying to stabilize a marble fountain that is already deteriorated there are some treatments that can be applied that will extend the life of the marble. These treatments are generally called consolidants and serve to replace the natural binders that are lost through erosion. Consolidants can be tricky and quite often will cause discoloration of the surface. It is strongly advised to contact a qualified stone restoration contractor to provide this service for you.

### WHITE CRUST-LIKE FORMATION ON STONE SURFACE

You may find a white crust-like formation on your stone surfaces, often on outdoor stone stairs, water fountains and other areas where the stone is exposed to water. This is probably from mineral crusts or lime putty originating from the soil, setting

bed or from the water itself. The crusts are a deposit of hard mineral salts consisting of calcium and magnesium. These salts are similar to efflorescence in that they are a mineral. They differ in that they form a hard crust which can be difficult to remove.

### Crust Removal

There are only two ways to remove these mineral crusts: by abrasion and with the use of chemicals. The mineral salts should be removed with an abrasive. I have found that a stiff non-ferrous wire brush can work well. Brushes can also be purchased that attach to an electric drill. Be careful not to get too aggressive and damage the stone surface.

Quite often abrasion alone will not remove all salt deposited. Strong acidic chemicals will be required. These chemicals can be purchased from most chemical companies that supply stone cleaning products. Be careful when using these products around calcium based stone since the acid can also damage the stone itself. Because of the potential pitfalls with resolving this problem, this is another problem that may be better left to a qualified stone restoration contractor.

### Prevention

The best prevention from mineral salts is to prevent moisture from entering the stone. On steps and fountains make sure all grout joints are caulked with a waterproof material. When installing steps outdoors make sure a waterproofing barrier is used. It is also a good idea to use a good stone impregnator on all surfaces to impede water from entering the stone.

Important Note: Stone impregnators will not waterproof stone. Do not use them where hydrostatic pressure is a concern. Impregnators are not water-proofers and are not recommended for outside installations.

### HOW TO REMOVE MOISTURE FROM STONE

The first thing that needs to be done is to remove as much standing water as possible. Use a wet-vac to get all water off the surface. Next place some air movers or fans on the floor to circulate the air and accelerate evaporation. If the area is small enough you may want to rent some dehumidifiers. The stone can take several days to several weeks or even months to dry out. Many of the problems described earlier may not show up right away. Once the floor is dry, you may need to have a qualified stone consultant perform some testing and evaluations.

As you can see moisture can be the cause of many stone and tile problems. Proper care must be exercised to make sure new installations are installed properly and that existing installations are monitored and maintained to avoid costly and often irreversible damage. It is not surprising that a majority of the inspections and issues I deal with as a Stone Forensics professional are caused by moisture intrusion.

To learn more about these and other stone and tile related issues, visit the case studies pages at [www.stoneforensics.com](http://www.stoneforensics.com). To submit any questions you may have, visit the Resource Center at [www.stoneandtilepros.com](http://www.stoneandtilepros.com).

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# UPDATE

## Fire Alarm System Inspection and Testing Requirements

John F. Devlin, P.E.

Schirmer Engineering Corporation

<http://www.schirmereng.com>

The proper operation of a building's fire alarm system is essential to ensure occupant life safety and continuity of operations. Fire alarm systems technology has become more advanced than ever before. Technology has yielded more intelligent and sophisticated fire detection sensors and notification appliances making possible the integration of fire alarm systems with other building systems. These advances combined with way finding and mass-notification technologies have created a myriad of different inspection and testing requirements specific to fire alarm systems.

To remain current with these technical advances the codes and standards governing fire alarm systems testing and maintenance are changing. It can be challenging to a building owner and facilities engineer knowing when the codes and standards change, their applicability, and the specific requirements.

In general, the inspection, testing and maintenance requirement for fire protection and life safety systems is governed by the fire code. In virtually all jurisdictions throughout the United States and Canada, the National Fire Protection Association (NFPA) Standard 72, National Fire Alarm Code, is the standard referenced by the fire code and defines the scope of system's inspection, testing and records documentation.

### Inspection and Testing

NFPA 72 – 2007 edition, the most current adopted edition, contains some significant changes from previous editions that apply to systems inspection and testing. The most significant change is the requirement for "an inspection, testing and maintenance program" to be implement-

ed to ensure the integrity of the fire alarm system. This requirement is intended to identify the type of system installed and devices utilized within the system, the method by which each device is to be tested and required frequency of testing, and documentation required to confirm proper testing. Detailed records of systems testing records are required to be maintained that includes information such as test frequency, persons performing the testing, and functional test of detectors. (See Section 10.6.2.3 of NFPA 72 2007 edition for complete list)

Table 1 summarizes the primary fire alarm system components and testing frequencies prescribed by NFPA 72-2007. NFPA 72-2007 Table 10.4.2.2 outlines the acceptable testing methods of fire alarm systems and devices and has been updated to include the testing methods for recent technology such as multi-sensor or multi-criteria detectors, exit marking audible notification appliances, and fire safety functions including fan control, smoke damper operation, elevator recall, etc. The inclusion of these items and the identification of their testing methods increases the knowledge base required for persons performing system testing.

Another important change to NFPA 72 – 2007 edition is the minimum qualifications for persons performing system inspection, testing and maintenance of fire alarm systems. Qualified personnel shall include, but not be limited to, one or more of the following:

- (1)\*Personnel who are factory trained and certified for fire alarm system service of the specific type and brand of system
- (2)\*Personnel who are certified by a nationally recognized fire alarm certification organization acceptable to the authority

having jurisdiction

(3)\*Personnel who are registered, licensed, or certified by a state or local authority

(4) Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of fire alarm systems

Under subparagraph (1) it is possible for building engineering staff to perform the required periodic inspection and testing and possibly even routine maintenance if they are factory trained and certified on that specific equipment to perform these functions.

### Contract Agreements

Inspection, testing and maintenance of fire alarm systems are often left to the responsibility of an independent contractor as part of an annual service and maintenance agreement. The contract agreement language prepared by the independent contractor defining the scope of systems testing, frequency of tests, and record documentation format is sometimes vague. To assure the systems' inspection and testing are satisfactorily performed in accordance with the local fire code, confirm that the contract agreement includes language that clearly states the scope, frequency, and methods of all inspections and tests will comply with NFPA 72, current edition, and all local and state fire codes and ordinances. Require the contractor to include as an appendix or attachment to the contract agreement:

A matrix or table of the systems components to be visually inspected and the specified frequency of inspection. (Reference NFPA 72-2007 Table 10.3.1)

A summary of the testing methods pro-

TABLE 1: SUMMARY OF FIRE ALARM SYSTEM COMPONENT AND TESTING FREQUENCIES

REFERENCE – NFPA 72-2007 TABLE 10.4.4

COMPONENT	INITIAL / REACCEPTANCE	MONTHLY	QUARTERLY	SEMI-ANNUALLY	ANNUALY
Control Equipment - Building Systems Connected to Supervising Station	X				X
Control Equipment - Building Systems Not Connected to a Supervising Station	X		X	X	X
Engine Driven Generator	X Weekly				
Batteries - Fire Alarm System	X			X	X
Power Supply	X		X	X	X
Fiber-optic Cable Power	X				X
Control Unit Trouble Signals	X				X
Emergency Voice / Alarm Communications Equipment	X				X
Remote Annunciators	X				X
Initiating Devices	X			X	X
Alarm Notification Appliances	X				X
Supervising Station Fire Alarm Systems Transmitters	X				X

posed for each type of device specific to your system. (Reference NFPA 72-2007 Table 10.4.2.2)

A sample inspection and testing report with the contract agreement proposal. (Reference NFPA 72-2007 Figure 10.2.6.3)

In each case, compare the proposed scope to the inspection and testing requirements of NFPA 72.

As fire alarm system and device manufacturers continue to provide new and innovative products, the codes and standards that regulate the testing and maintenance

of these products will change accordingly to ensure system availability and anticipated performance reliability is properly maintained. Performing all inspections, testing and maintenance in accordance with the most recent edition of NFPA 72 is a reasonably sure way to meet compliance with your property's applicable fire codes and standards.

John F. Devlin, P.E., is Vice President with Aon Global / Schirmer Engineering Corporation, international fire protection and

risk engineering consultants. Mr. Devlin has over 25 years experience in the fire protection engineering consulting industry, is a registered fire protection engineer in numerous states, and serves on several NFPA Technical Committees.

**Editor's note: See NAHLE's new membership service for records documentation. ([www.nahle.org](http://www.nahle.org))**

## Plumbing Is Hotel Engineering and a Whole Lot More

By Todd Isbell

Director of Engineering, Hilton Clearwater Beach Resort

One of the many aspects of hotel engineering is plumbing... the pipes and fixtures that we all take for granted bringing hot and cold running water to us every day. Sometimes trouble free, other times not. In some older structures, there are leaks, blockages, dampness, mildew... all associated with old or dilapidated pipes, possibly condensation.

As an engineer responsible for plumbing projects, you first need to know what and where your leaks are and where they could possibly show up. This means poking your



heads into access panels, noticing damp ceiling tiles or drywall, buckled wood flooring, wet or damp carpet and knowing the difference between a leak and condensation.

Condensation occurs when warm moist air comes in contact with cooler air on a condensing surface such as metal pipes that are a cooler temperature than the moist air itself. Air contains varying, but certain amounts of water vapor. Warmer air holds more moisture than cooler air so its capacity or humidity is directly affected by temperature. When warm



**Todd Isbell, Director of Engineering, Hilton Clearwater Beach Resort, Florida**

*Todd was brought up on hard work and dedication to family and friends, and understands the meaning of being hospitable and making others comfortable around him. He is a graduate of Lanier Technical Institute, and has 17+ years in the hospitality engineering field. Learning and understanding the "how and why" things work have always intrigued Todd. Taking something that has a problem, taking it apart and making it work, or figuring out better ways for something to be more efficient have led him to where he is today. Attitude and a willingness to succeed drive him to be the best he can be. Todd is proud to be the Director of Engineering at a property of one of the largest hotel chains in the world.*



moist air comes into contact with either colder air or a colder surface, such as your plumbing pipes or AC evaporator drain lines, the air releases the moisture onto the surrounding cooler surface and forms condensation. This condensation or newly formed water droplets can then run down your pipes onto the surface of your ceiling or walls causing some to think they have a leak. Controlling condensation is not always simple, especially in humid climates, however, insulation is key to keeping those droplets at bay. Pipe insulation that wraps around the pipes, even heat tape is a way to go to warm the surface. Blocking off outside air temperature variances will also help stop the condensation problems.

Condensate drain lines that come from AC units on roof tops, or ice machine drains up on the floors sometimes drain into cast iron pipes that run down the risers of your buildings. The cold water causing condensation on the outside of the pipe which forms spots on ceilings or walls can be taken care of by adding more PVC lines on the roof to make a longer run to the drain, and painted black to warm the water with solar heat before it goes into the drain. Also insulating the pipes will help.

For leaks we cut holes in sheetrock and moist air comes into contact with either colder air or a colder surface, such as your plumbing pipes or AC evaporator drain lines, the air releases the moisture onto the surrounding cooler surface and forms condensation. This condensation or newly formed water droplets can then run down your pipes onto the surface of your ceiling or walls causing some to think they have a leak. Controlling condensation is not always simple, especially in humid climates, however, insulation is key to keeping those droplets at bay. Pipe insulation that wraps around the pipes, even heat tape is a way to go to warm the surface. Blocking off outside air temperature variances will also help stop the condensation problems.

Condensate drain lines that come from AC units on roof tops, or ice machine drains up on the floors sometimes drain into cast iron pipes that run down the risers of your buildings. The cold water causing condensation on the outside of the pipe which forms spots on ceilings

water must be shut off to the building for an undetermined amount of time inconveniencing everyone including our paying guests, to changing from copper pipe to PVC or (CPVC if it is hot water), or cutting and replacing the old pipe with a new section and soldering or gluing it into place.

No matter how you look at it, leaking pipes are not what we signed up for. To repair an old leaking building, we must first put a plan into place which requires a daily walk through looking for wet, damp or dark spots on walls and ceilings, maybe even buckled up wood flooring, all the while making a list of worse locations and eye sores. Also, we sometimes see calcium build up on pipes, but no leak as of yet. This can be interpreted as a good thing, because we now can get a step ahead of a leak, plan when we are going to repair it with the least inconvenience to our guests and staff, and move forward with the “drying out” of our structure; being proactive, rather than being re-active.

a section and then moving forward, inspecting everywhere, not only the water pipes, but where drain lines are **ran** as well. Make it easy on yourself by installing access panels where the risers are situated, and where problem areas may occur. Daily walk-throughs of our properties, looking for leaks and repairing them before they become nuisances not only keeps added work such as having to replace wet drywall or ceiling tiles at bay, but saves an exorbitant amount of money per year as well, not to mention dissatisfied guests. All this said, make your list, decide which section to start and stick to the list. Moving forward even with small steps is still moving forward.

Remember one drop of water per second dripped unintentionally produces roughly 32 liters a day. This is around 981 liters of water per month wasted. This is just one drip per second; add say 100 rooms with leaking toilet flappers or dripping sinks or faucets, and maybe a kitchen sink or two dripping, and you've got a water bill that most don't ever want to see, and owners asking why.

---

*“It is always easier to be in control when you make repairs, versus having to make emergency repairs in the middle of the night.”*

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or walls can be taken care of by adding more PVC lines on the roof to make a longer run to the drain, and painted black to warm the water with solar heat before it goes into the drain. Also insulating the pipes will help.

For leaks, we cut holes in sheetrock and delve in only to find either condensation from summertime humid-invasive outside air or a true leak showing calcium and lime build up on pipe joints, wet insulation, mildew, or other signs. Small pin holes have been witnessed spraying onto a rafter, running down and dripping some 20 feet away. The ambient temperatures in the crawl space in some instances is enough to evaporate some of the run off before reaching its final destination, which is your ceiling or wall; meaning the leak has been there a while. This as you know wreaks havoc in trying to locate the source of the leak. So we make yet another hole and get to work. There are several ways to make repairs; from total renovation of plumbing, which is costly and usually means

Once the leak is repaired, there is still the task of drying the surrounding area and repairing any ceilings, walls or flooring that may have been damaged by the intrusion. Dry up as much as possible with wet vacs and then graduate to cloth or sponges, making sure the surface areas have not been compromised. Remember, the area should be opened up so as to dry completely and allow for good air flow. Also, use dehumidifiers and fans whenever possible. Drywall will usually need to be replaced unless you can get it thoroughly dried with no abnormalities on the surface. Uneven surface areas or waves will indicate the material will need to be replaced, otherwise you risk mold or mildew encroachment, and the work will become much more costly and time consuming. Remember it is always better to do the job right the first time.

Don't feel overwhelmed with a larger building; take it one step at a time. Budget for repairs a little each month, and then prioritize and utilize the list you've created, beginning with choosing

Help with this problem is in your hands. Keep an eye on your water bill; if the cost begins to rise, look for the obvious reasons such as occupancy levels, outside ambient temperatures, etc. as well as hidden factors. Make sure your housekeepers are listening when they clean a room for toilets that begin filling without being flushed. Tubs or sinks with water droplets around the drain, but **it** has been a while since used. You can set up incentives for the most reported leaks every month. Use your imagination, to not only save water, but have fun doing it.

Your local water utility service can help you save water with low flow spray nozzles for your kitchen sinks and dish machines. There are as well water saving showerheads and faucet aerators and low flow toilets that also reduce the use of water. Remain vigilant in your walk throughs and make timely repairs to help save one of the earth's most valuable resources as well as your building and budget.

## THE WRONG EXTENSION CORD CAN DAMAGE YOUR POWER TOOLS

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Every year, motors in thousands of power tools burn out for one simple reason: the tool was plugged into an extension cord not suited for the job. To help you keep your power tools running properly, here's some information from the Leviton Institute about choosing extension cords.

Whether you're using a very long outdoor extension cord to run an electric lawn mower, or a short cord to power up a tool for an in-house project, the wrong extension cord can damage, and eventually ruin the motor in your tools. The reason is simple: If the extension cord isn't delivering enough power to the motor, the motor will begin to overheat. In the worst case, the motor will completely burn out from the excessive heat.

Think of that extension cord as though it were a garden hose carrying water. A large diameter hose can carry more water than a smaller diameter hose. The same is true with extension cords. Larger diameter wires can carry more power than wires with smaller diameters. And the bigger the motor in your power tool, the more power it needs.

How do you determine the size of the wire in an extension cord? The easiest way is to check the markings on the outer jacket of the extension cord. You'll be looking for a number followed by the letters AWG printed right on the cord. The typical outdoor extension cords you'll find in a hard-

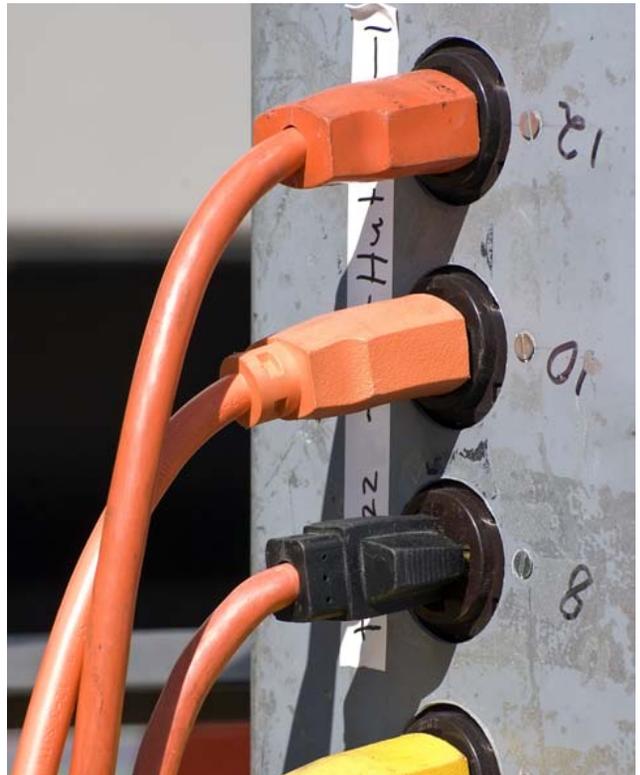
ware store or home center are 16 AWG, 14 AWG, or 12 AWG.

But there's a twist to wire numbers: The smaller the number, the bigger the wire size. The 12 AWG wire can carry much more power than a 16 AWG wire. That's why you would use a 12 AWG extension cord to run the big motor on a table saw, for example.

A second factor in your choice of an extension cord is its length, because this too affects the amount of power getting to the tool. Here's why. As electricity travels down the extension cord and farther from the outlet, its energy diminishes. So if you need to use a long extension cord for garden chores, choose one that has larger-diameter wires, such as 14 AWG. It's also a good idea to uncoil a long extension cord before you use it to prevent heat from building up in the cord itself.

Manufacturers of power tools and electric garden tools also specify the proper type of extension cord to use with their equipment. This information is typically included in the equipment's owner's manual.

While choosing the right size extension cord will protect your tools, the Leviton Institute also recommends using an extension cord with a built-in GFCI (Ground



See How to Match Extension Cords to  
Electrical Tools Reference Chart on page 12

Fault Circuit Interrupter) receptacle to protect yourself from potential electric shock.

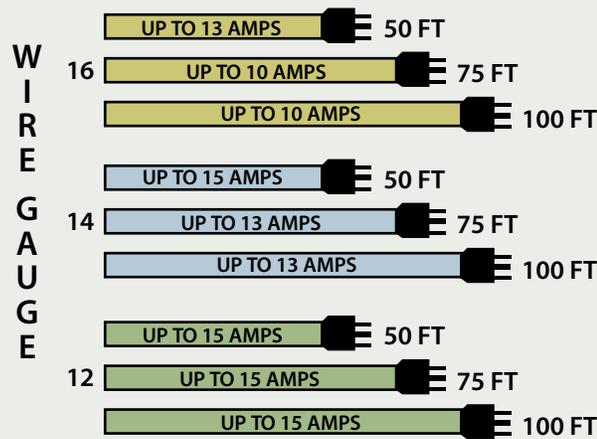
These inexpensive GFCI-protected extension cords have been on the market for about 10 years and are available at home centers and hardware stores. They have very short cord lengths and are meant to be plugged into an electrical outlet. Then the longer extension cord is plugged into the GFCI-protected cord. 

## How to Match Extension Cords to Electrical Tools:

Step 1. Find out the amperage rating of the tool which you'll find on the tool and in the owner's manual. Here are the most common motor ratings for some typical outdoor electric tools.

Lawn Mower	Leaf Blower	Hedge Trimmer
6-12 Amps	6-12 Amps	2-3 Amps
Weed Trimmer	Circular Saw	Drill
2-4 Amps	12-15 Amps	3-7 Amps

Step 2. Use the table below to match the tool to the proper gauge and length cord having 2 current carrying conductors and using a standard plug rated 15 Amps (two flat blades plus ground pin).\*



\* Using the same extension cord to power two tools at the same time is not recommended.



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# Are You Drowning Trying To Keep Your Pool Or Water Features Clean?

By Frederick M. Hueston, PhD



Over the years I have evaluated numerous stone and tile failures on pools, spas, fountains and other water features. Failures such as tiles coming loose, grout missing, discoloration and build up of mineral deposits etc. In most cases all of these failures can be contributed to improper maintenance such as using the wrong chemicals for cleaning to unbalanced water chemistry. The following is a simple guide of what to do and what not to do when it comes to cleaning your pool or water feature.

## Getting rid of the crud

One of the most common problems with swimming pools and water features is a buildup of mineral deposits. These deposits often appear as a white film deposited on the surface of the tile. These deposits can often develop into heavy crusts. Most of the time the only way to clean these deposits off is to break out the muriatic acid and go out with a scrub brush. The problem with most acids is that will attack the grout as well as the tile. I have seen cases where there was so much acid used in a pool that all the grout turned to powder and was washed away. If there is any marble in the fountain the acid will etch and dull the marble. Most of these failures are the result of misuse of muriatic acid. So what is the proper way to clean these deposits off the fountain? The following is the proper procedure:

## Procedure for cleaning mineral deposits off tile

Step 1. Preparation. Before using any acid make sure to wear the proper protective equipment. For muriatic acid this includes chemical resistant gloves, respira-

tory mask and goggles.

Step 2. Protect all adjacent surfaces that might be affected by the splash.

Step 3. Mix one part muriatic acid to two parts water. Make sure to pour the acid into the water. DO NOT Pour the acid in first and than the water. This could cause the acid to splash up. Do not pour the acid into the water from any height, a few inches is appropriate.

Step 4. Apply the acid solution with a sponge or rag. Do not use spray or pour it

on. Agitate with a nylon scrub brush until all the deposits are removed.

Step 5. Rinse the tile with a solution of water with one cup of odorless ammonia added to one gallon of water. One cup of baking soda to one gallon of water will also work. This step is important since it will neutralize the acid.

Step 6. Rinse entire surface down with clean water.

The above procedure should reduce the amount of damage done. There are al-



In most cases, failures can be contributed to improper maintenance such as using the wrong chemicals for cleaning to unbalanced water chemistry.

ternative non-acid cleaning methods using bead blasting, but this is not a do it yourself technique and will require a professional contractor.

## Proper Water Chemistry

Another major problem with pools and water features is improperly balanced water chemistry. The most common mistakes made are as follows:

- Not monitoring water chemistry frequently. You should be checking the ph, total hardness, bromine and chlorine at least twice per week. By monitoring these levels more often only minor adjustments will be necessary.
- Do not allow the pH to get above 8.0. When the pH increases, the activity of chlorine is dependent on the ph levels. For example, when the pH is 8.5 the chlorine is only about 10 % active but at 7.5 the chlorine is about 50-60% active. Keeping the ph in check will prevent you from over chlorinating the water and will also save you money on chlorine.
- Total Dissolved Hardness (TDS) and calcium hardness are also important for water balance and can affect the precipitation of mineral deposits. These should be checked at least once per

***“A properly maintained pool or water feature can go years without a major overhaul or restoration”***

month. If the TDS is above 1500 ppm (parts per million) the water will need to be drained and replaced. This cannot be corrected with chemicals. This is a major cause of mineral deposits and staining on tile and stone in pools and water features.

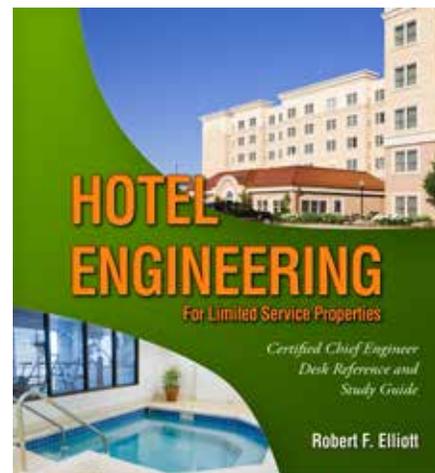
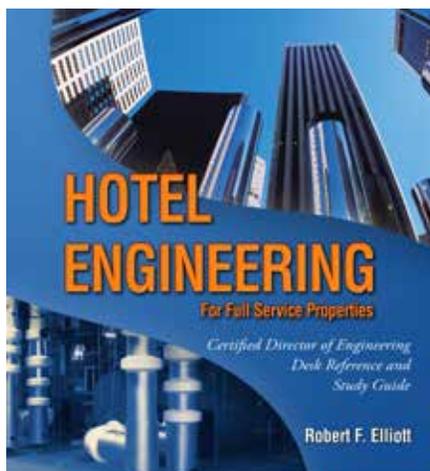
- Alkalinity should be 80 to 140 ppm. Lower or higher alkalinity will affect the effectiveness of chlorine or bromine levels. This should be monitored monthly as well.
- If you have a salt-water pool the cells should be cleaned often. Corroded or calcified cells will reduce the amount of chlorine generated.
- If you pool's filter system is a sand or DE (diatomaceous earth) filter try to avoid backwashing too often. Most systems will only require backwashing when the gauge rises from 8-10 psi from clean.
- Clean the filter baskets often. If these are clogged this reduces the amount of water flow and can cause not only poor

circulation but build up of deposits, scum algae etc.

- If you use liquid chlorine add it in the evening, not during the day.
- Brush the walls and tile both above and below the surface with a soft nylon brush. This will keep the deposits, algae and scum from adhering.
- Check for damaged tile and pipes. You should be checking the pool on monthly bases for cracked tile and grout, broken pipes, etc. These should be repaired immediately.

## A properly maintained pool is inviting to your guests

A properly maintained pool or water feature can go years without a major overhaul or restoration. Of course, you must start with the proper water balance and a sound water-tight system. If you run into problems or issues that are causing failures make sure to consult an expert to prevent further deterioration. ■



# A Call in the Midnight Hour

By Tim Arwood, CEO

Director of Engineering, Sonesta Hotel Downtown Orlando

Managed by Gemstone Resorts



If you are a Chief Engineer, then you have experienced that sound of the phone in the middle of the night. Oh, it could be a fire in a kitchen exhaust vent, a broken water main, the

third shift front-desk clerk saw a drop of condensation fall from an air duct, or your third shift guy can't find his paintbrush. Over the years these calls will run the gambit and the most important thing is making sure that you make the right call. We all have our war stories about those early AM runs to the property and how we were calling plumbers, electricians, or locksmith on the way to the event. Yes, there are those times we go in and find that we really weren't needed to resolve a problem and there are those times that you wish you were three people. Know whether it is a situation that warrants you coming in the middle of the night or is it something that someone on duty can handle with a little instruction. This decision is critical and there's no way you can sugar coat this, but keep in mind your future with the property could be determined by your choice.

My advice to you is always error on the side of caution. First, have an emergency list of your vendors at home, by the front desk, and posted on the wall of your shop. You probably have this emergency contact list in your cell phone and if you do,

have your info on your Sim Card backed up. Make sure on your hard copy of those emergency contacts you make a column to explain what each vendor would respond to in the event of an emergency. And, have a back-up emergency vendor for each category, because many times their nighttime on-call technician may not answer the phone or try to get out of coming out. It is not bad idea if it is a company that you deal with on a regular basis to become familiar with higher-ranking supervisors or company officials. You would be surprised how quickly an on-call tech, who tells you that he can't get equipment or parts until his shop opens in the morning will change his tune when you tell him you have the owners cell phone number and you will give him a call and ask him to meet the tech to open the shop. Nine times out of ten he is already grabbing his keys by then.

As for the war stories I mentioned, we all have them or know of them. And, of course, there are stories behind the stories. We all have a personal life and caring for families may sometimes put a strain or an occasional restriction on our being able to respond, so try to have a well trained designated person on-call at all times, when those times arise that you are totally indisposed. In all honesty, you know what is expected of you and you did sign on for this job and know the responsibilities that it entails. One Chief out west got the 1:30 AM call in the night that there was water in the lower level of the parking garage. Well, that always happens when they have an occasional rain and

the sump pumps will clear out that two or three inches of water in a short time. Also, that night the Chief's spouse, who was tired of everyone crying wolf at night for trivial things, insisted that he need to get his rest and can't it just wait until morning. How did it go? The food and beverage director was called after the chief didn't show up to deal with the four feet of sewage in the garage. Oh, by the way, the corporate CFO had parked his \$75k car down there before flying to Europe for business. The next week the new chief engineer walked the area with the F & B Director and was briefed on the sewer pipe that had burst that night. Remember sometimes even if we put on the cape and fly to the emergency we can't always resolve things that the city, county, or utility company may ultimately have to correct, but responding and knowing what to do, and who to call is all it takes to fulfill your obligations as the "Chief Engineer."

I would like at this time to say that a Chief's best friend is knowledge and education. There are many beneficial certifications and designations out there that will aid you in having the tools you need to be successful. A HVAC certification is a must! Do you have your CPO (Certified Pool Operator)? Have ever attended a seminar on laundry or kitchen equipment repairs? In the months to come Lodging Engineer and NAHLE will be helping to put you in contact with those who can help you prosper and grow along your career path. ☞

# The Hidden Risks of Green Buildings: Why Building Problems Are Likely

By

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Liberty Building Forensics Group, LLC

The great irony of building green is that the very concepts intended to enhance a building's performance over its entire lifetime are many of the same things that make a building highly susceptible to moisture and mold problems during its first few years of operation.

While green buildings have many positive benefits, there is also strong evidence to suggest a direct correlation between new products, innovative design, and building failures.



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*“Simply put, departing from the “tried and true” often means increasing the risk of building failure.”*

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Two strong characteristics of most green buildings are: 1) the use of innovative, locally-produced products and 2) the implementation of new design, construction, and operation approaches that are intended to reduce energy usage and be environmentally sound.

**The Hidden Risks of Green Buildings**  
continued

*Green Buildings vs. Lower Risk Buildings*



David Odom

The preceding graphic summarizes some of the differences between green buildings and the concepts the authors have found in lower risk buildings. For example, lower risk buildings do not exceed industry guidelines on mechanically introduced outside air; but emphasize humidity control (especially in hot, humid climates). Green buildings, on the other hand, reward the introduction of more outside air than current industry standards, which can lead to indoor humidity problems and mold growth.

Green building environmental goals are typically organized around a set of nationally accepted benchmark guidelines such as those of LEED® (Leadership in Energy and Environmental Design), which is the guideline established by the United States Green Building Council (USGBC). LEED® certification is a checklist and point system of recommended practices where achieving various point levels can certify the building as having achieved silver, gold, or platinum status. These practices involve such issues as efficient water and energy use, the reuse of waste materials, and the use of renewable and regionally produced products.<sup>1</sup>

The overall goal of these new materials and procedures is to achieve a structure with reduced negative environmental impact—both during construction and throughout the building’s life. The intent of building green is unquestionably noble and good, and should be aggressively pursued. However, because of the dramatic change that this will present to the design and construction industry, its implementation will present new risks that are likely to be both technical and legal in nature. Some of the legal risks are fairly obvious, such as the risk of not meeting a building owner’s expectation of achieving a certain level of LEED® certification (i.e., implied or even written warranties). Other risks are more obscure, such as:

- The failure of new products to meet their promoted performance levels, which is more likely with new materials compared

Green Buildings	Lower Risk Buildings
<b>Adds additional outside air (&gt;ASHRAE by 30+ %)</b>	<b>Minimizes outside air (Does not exceed ASHRAE guidelines)</b>
<b>Emphasize energy conservation</b>	<b>Emphasize dehumidification</b>
<b>Stress VOC reduction</b> — Emphasizes exhaust (>5 Paschals) — Building flush out	<b>Minimizes VOC concern</b> — Very tight control of exhaust — Rejects building flush out
<b>Stress new, innovative materials</b>	<b>Stress proven materials</b>
<b>Stresses carbohydrate based materials</b>	<b>Stresses hydrocarbon based materials</b>
<b>Stresses extra envelope thermal insulation</b>	<b>Stresses drying potential of envelope (walls and roof)</b>

to proven materials found in traditional buildings.

- Accepting the higher standard of care that a green building might present—what is currently considered “best practices” may now become the new expected “standard of care.”
- Failing to recognize (or prepare for) the unknowns in cost and schedule impacts that a green building might present.

introduction of new materials and methods has not always proven to be successful, and sometimes has resulted in notable building failures, especially those related to moisture intrusion and mold contamination. Many of the time tested materials found in lower risk buildings are hydrocarbon based. The long term efficacies and performance levels are unproven for some of the new carbohydrate based materials being promoted for green buildings.

*Green building environmental goals are typically organized around a set of nationally accepted benchmark guidelines such as those of LEED® (Leadership in Energy and Environmental Design)*

It is even unclear if a LEED® certified building can be built under a design/build method without the construction team assuming huge amounts of unknown risks because of the vague definition of what is considered “green.”

The building industry has been historically conservative, relying on time-proven construction materials and methods. The

The proliferation of new products and innovative building approaches related to green development is challenging the design and construction community in a dramatic fashion. These changes virtually guarantee an increase in building failures and lawsuits. Past experience indicates that many of these failures will be predictable, and some are likely to be catastrophic.<sup>2</sup>

### EXAMPLES OF TECHNICAL RISKS FOR CONTRACTORS & DESIGNERS

Moisture intrusion, whether bulk water intrusion through the building envelope or a relative humidity increase due to the heating, ventilating, and air conditioning (HVAC) system, results in a large percentage of construction claims in the U.S. Moisture intrusion not only results in building deterioration, but has been linked to occupant comfort and health issues, especially in those buildings that become contaminated with mold.<sup>3</sup> Sustainable building practices, some of which are part of the LEED® accreditation process, can increase the potential for moisture intrusion if not carefully considered and implemented. Examples include:

- Vegetative roofs, which are more risky than conventional roofs (due to the constantly wet conditions) must be carefully designed, constructed, and monitored after construction.
- Improved energy performance through increased insulation and the use of new materials, which may change the dew point location in walls, resulting in damaging condensation and a reduced drying potential for wall assemblies. Lower risk buildings emphasize the drying potential of the envelope over increased insulation. While it is desirable to increase insulation for energy savings, the designer must also evaluate moisture impacts.
- Reuse of existing buildings or recycled components, which may not provide optimum water-shedding performance in new configurations or may not be readily integrated to the adjacent new materials.
- Use of new green construction materials that have not been field-tested over time. The designer needs to assess new materials and their risks compared to traditional materials found in lower risk buildings.
- Increased ventilation to meet indoor air quality (IAQ) goals that may unintentionally result in increased interior humidity levels in hot, humid climates. The designer must consider the increased energy load (and cost) and HVAC equipment sizing required to properly dehumidify a building when exceeding the minimum outside air requirements recommended by the American Society of Heating, Refrigerating, and Air-conditioning, Engineers (ASHRAE).
- Building startup procedures, such as “building flush out,” could result in in-

creased humidity levels and mold growth. Lower risk buildings rely almost exclusively on source control (which is also a green building goal) rather than relying on “flush-out” and increased building exhaust. Building “flush out” along with building “bake-out” were concepts developed in the late 1980’s by the indoor air quality industry, which often caused more problems than they solved.

New green construction materials are entering the market at a staggering rate. Because many of these products help to achieve multiple LEED® credits, designers working on green buildings are eager to specify these materials. The risk to contractors is that many of these new items are not time-tested, and designers often do

tal quality credits has increased the incentive to add more outdoor air to a building through its HVAC system (a minimum of 30% more outside air above ASHRAE recommended minimums is required to obtain a LEED® credit for ventilation).<sup>1</sup>

Increased ventilation is especially risky in the southeast U.S. where outdoor relative humidity levels are elevated for a good part of the year. Experience in the southeast, as well as other areas of the country with humid summers, has shown a direct correlation between the number of moisture problems and increased ventilation rates.

To effectively minimize the risk of moisture problems while increasing ventilation, designers may need to increase the complexity and capacity of the HVAC compo-

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*The intent of building green is unquestionably noble and good, however its implementation will present new risks that are likely to be both technical and legal in nature.*

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not have the time to fully research their efficacy. If the new product fails, it may be difficult to determine if it is a design error, an installation error, or a product defect. Additionally, general contractors must rely on subcontractors to install new materials that they are often inexperienced in installing.

Some of the expandable foam insulation products are examples of green materials that pose increased risks. The water absorption properties of these insulation materials can be quite different than what designers expect with traditional insulation. Additionally, some of the carbohydrate based foam insulation materials may retain more water than traditional hydrocarbon based foam insulation. Increased absorption of water into the insulation could negatively affect the wall performance. This is not to say that such materials should not be used; however, their properties need to be recognized and accommodated in the design.

The amount of ventilation (outdoor air) necessary for occupant health and comfort has been debated for decades. Although there are sound arguments on both sides of the debate, the emphasis on increasing ventilation to achieve LEED® environmen-

ments and control systems to achieve proper dehumidification. This adds to contractor risk, since complex systems historically fail more often than simple systems. Additionally, the complexity of the system operation can result in unintended pressurization relationships where local depressurization causes humid outdoor air to be drawn into interstitial building cavities, causing condensation and mold growth.<sup>4</sup>

Building owners, designers and contractors all assume more risk when they deal with complex, and possibly untried, technologies not generally found in traditional buildings. Pinpointing whether the problem is design- or construction-related may be very difficult after problems have already occurred.<sup>5</sup>

Building startup procedures to meet LEED® credits include a credit flush-out of indoor containments using increased outdoor air either at the end of construction or during the initial occupancy period. The intent is to remove pollutants from off gassing of volatile organic compounds (VOCs) from new materials. The amount of air needed to meet the flush-out requirements places a building at increased risk because of the amount of moisture

*“The amount of air needed to meet the flush-out requirements places a building at increased risk because of the amount of moisture introduced with the increased outdoor air.”*

introduced with the increased outdoor air. LEED® requirements are that a minimum of 14,000 cubic feet per square foot of floor area is required for flush out. This presents multiple problems: most HVAC systems are not designed to dehumidify that amount of outdoor air which, in a 100,000 square foot building, is 1,400,000 cubic feet of outside air. Depending on outside conditions at the time of the flush-out as much as 240,000 gallons of water can be added to a 100,000 square foot building. This added moisture will be absorbed into building materials, finishes, and furnishings, increasing the risk of mold growth.<sup>6</sup>



**There's one sure way to kill an idea:  
Sue it to death.  
Quote from ENR, July 2008**

Most specifications put the general contractor in charge of the flush-out, including controlling relative humidity levels during flush-out. If the system is not designed to handle such loads, the contractor is faced with a difficult challenge that may require the addition of a temporary, and extremely costly, dehumidification system. Lower risk buildings tend to avoid flush-out.

## CONCLUSIONS

What is the greatest risk to the green building movement? It's likely not the in-

creased costs associated with green buildings—it's more likely green buildings that don't perform up to expectations and, in some cases, may experience significant failures. The increased costs of litigation and insurance that could result from underperforming green buildings will be absorbed by designers (in a highly competitive marketplace), but in most cases will be passed onto building owners. These increased costs, along with the negative publicity on failed green buildings, could dramatically influence building owners NOT to build green. Only recently has the marketplace begun to recognize the various contractual, legal, and technical risks that are inherent to green buildings. A growing number of experts have suggested that the first two steps to improved green building risk management are to: 1) recognize the unique risks for green buildings. 2) Develop a set of guidelines that merge the unique regional challenges with green building guidelines, recognizing the lessons learned in lower risk buildings. The design and construction community must not assume that if one builds green, then one will be building regionally correct or even lower risk buildings. Until the gaps between lower risk buildings and green buildings are addressed, the design community would be advised to prioritize the lessons of lower risk buildings already learned from the waterproofing, humidity control, and building forensics community. Without these priorities, poorly functioning green buildings are the likely result, and this could be the ultimate killer for the green building movement, especially in demanding climates. In our opinion the solution to good performing, lower risk green buildings are at least three-fold:

- Development of a set of Climate Design Criteria that integrates (and prioritizes) climate-specific criteria with current green building practices. Best practices for moisture control must take priority over green building practices.

- Development of a detailed Green Building Risk Management Plan that provides guidelines for the design and construction team from concept through the 1-year warranty period. These guidelines would incorporate the best ideas of green building specialists, moisture control specialists, construction attorneys, and insurance companies.

- Apply the lessons learned from past building successes and failures and make green building concepts subservient to these past lessons.

*Liberty Building Forensics Group, LLC (www.liberty-building.com) is a firm that specializes in forensic building investigations and expert witness/litigation support. Its staff has led the correction and cost recovery for some of the largest building failures in the country, including the \$60 million defect claims at Hilton Hawaiian Village in Honolulu and the \$20 million Martin County Courthouse problems. Its staff has performed green building-related services on over \$3 billion in new construction since the late 1990's and has authored three manuals and over 100 technical publications.*

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# The Andaluz Hotel: A Historic Property goes GREEN

By Art Attaway



I recently had the privilege to participate with Robert Elliott of NAHLE on a project to write a chapter of a textbook for a Professor at Michigan State University in

conjunction with the EI (Educational Institute) of the AH&LA. The book, a project of Professor Arjun Singh, is on sustainable hotel development and our contribution was on sustainable hotel operations. During the process we had the chance to work with industry leaders across the country and learn what they are doing to go GREEN. We did a series of "case studies" on properties that were involved in energy efficiency efforts while operating a facility. The property age range was between 2 years old and 71 years old. One of the most interesting was a property named the Andaluz, located in Albuquerque, New Mexico.

In 1939 Conrad Hilton built this property designed by Anton F. Korn, and touted as being the first building in New Mexico with air conditioning, and was in fact the tallest building in the state at that time. The property operated as a Hilton until 1969, and has changed hands a number of times since then. In 1984 the Andaluz (then operating under a different name), was placed on the National Register of Historical Placed. The new owner, Gary Goodman, committed 30 million dollars to restoring the 104 room property, with 5.2 million being dedicated to green energy solutions. The property just reopened in Q4 2009, and little actual comparative figures are available. As well, the capital investment would have been significant to restore this project to a fully functioning operating hotel, regardless the technology selected.

The name Andaluz retraces Korn's design concepts to its origin in a region of Spain named Adnaluz, and famous for its original and striking architectural designs. This region is also famous for the Andalusian, one of the most spectacular breeds of



horses in the world.

The restoration project goal, driven by Goodman, and in addition to operating a fully committed sustainable property, is to achieve a Gold level LEED certification. The property was shutdown to complete the full restoration that included the green energy measures.

Some of their efforts include:

- Energy Savings and Initiatives:
- Solar Panels for hot water – 60% of consumption.
- Energy efficient HVAC system including chillers and towers.
- Energy efficient windows
- (BAS) Building Automation System

Unfortunately, the property is not old enough operationally to provide the ROI information. They also do not have an estimated savings number. We were provided a comparison of the hotel's utility numbers. These numbers compare Andaluz from its opening (Oct 2009 to Jun 2010) to the hotel before therenovation (averaging Oct to June for 3 years). However, some explanation is required in order to understand these numbers. See below

## ELECTIRCAL USAGE

The electrical usage for Andaluz is higher than the former hotel. Although all the equipment in the hotel has been upgraded with more efficient equipment, there is greater demand in Andaluz. For example – 10 rooftop AC units were replaced along with the former chiller. These equaled approximately 200 tons of refrigeration. Replacing these are 2 chillers totaling 240 tons of refrigeration. The former chiller did not run during the winter. The 2 new chillers are operational all year long. The former hotel had traditional fans and pumps. All fans and pumps at Andaluz are Variable Frequency Drives (VFD's); however, there are presently more fans and pumps than in the former hotel. Approximately 1000 amps of power have been added to the new hotel. Previously 3 guestrooms ran off of one 20 amp circuit, now each guestroom runs off of three 20 amp circuits. In addition, numerous kitchen and housekeeping equipment have been added to Andaluz, as well as additional lighting.

Electricity kWh former hotel 9 mo aver  
Oct - Jun  
monthly average = 106,953

Electricity kWh Andaluz 9 mo aver  
Oct - Jun  
monthly average = 125,016

Electricity costs former hotel 9 mo aver  
Oct - Jun  
monthly average = \$8,281.26  
Electricity costs Andaluz 9 mo aver  
Oct - Jun  
monthly average = \$10,705.36

### GAS USAGE

The average gas usage is lower at Andaluz than at the former hotel. This is significant because at Andaluz we installed 2 domestic high-efficient water boilers and 3 high-efficient heating boilers, a 600,000 BTU ironer, and a solar thermal system that is designed to heat approximately 60% of our domestic hot water annually.

Gas therms former hotel 9 mo aver  
Oct - Jun  
monthly average therms = 6,334  
Gas therms Andaluz 9 mo aver  
Oct - Jun  
monthly average therms = 6,003  
Gas therms former hotel 9 mo aver  
We do not have this amount)  
Gas therms Andaluz 9 mo aver  
Oct - Jun  
monthly average therms = \$4,508.03

### WATER USAGE

The comparison on the water usage shows a huge decrease in water consumption. The former hotel had 3 gallon per flush toilets. Andaluz has dual-flush .08 gallon and 1.6 gallons per flush toilets. Andaluz has low flow shower heads. But it is also significant to note that the old hotel did not have the cooling tower running during the winter months. Andaluz' cooling tower is operational all year.

Water gallons former hotel 8 mo aver  
Oct - Jun  
monthly average gallons = 871,482  
Water gallons Andaluz 8 mo aver  
Oct - Jun  
monthly average gallons = 261,052  
Water costs former hotel 8 mo aver  
Oct - Jun  
monthly average gallons = \$3,687.94  
Water costs Andaluz 8 mo aver  
Oct - Jun  
monthly average gallons = \$1,772.95

- The property expects a 21% overall annual savings in power consumption. The 21.8% present savings is based on ASHRAE 90.1-2004. This

equals an \$18,067 savings annually. (Note: The comparisons above are not based on ASHRAE standards. They are a comparison between the former hotel's performance and present Hotel Andaluz.)

Hotel Andaluz installed a central control room management system,

Building Automation System (BAS), at a cost of \$391,460. It is a centralized plant that delivers chilled water and heating water through out the hotel including guest rooms. It is controlled locally at each space/location/room by the BAS.

Energy efficient windows were installed at a cost of \$237,088 (removal, disposal, windows, installation) We do not have a ROI or estimate savings number, but the cost of these compared with more traditional windows was marginal and should produce

For example, if a typical reconstruction project would have cost 4.7 million to purchase and install more traditional systems, the additional expense would have been 1.5 million. You could then analyze the reduced energy consumption cost in dollars, and derive an ROI.

Some of the operating policies and procedures and renovation decisions focused on the environment include:

### Operation

- Comprehensive recycling program that includes cardboard, paper, plastics, glass, metals and composting of all the food waste
- Recycled paper for hotel stationary and office use
- Locally grown fruits, vegetables, and

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*The property claims it will achieve a 70% overall energy savings by completing the project with the equipment and materials selected.*

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a cost savings. The only additional cost, since new windows had to be installed regardless, was the cost difference between the possible window choices...

The property claims it will achieve a 70% overall energy savings by completing the project with the equipment and materials selected. The 70% renewable energy is in reference to the Green Power that is purchased. It is estimated based on annual energy usage and then the purchase of 70% of this amount from a company that sells Renewable Energy Credits (RECs). The RECs are from a range of renewable energy producers including biomass, small-scale hydro, geothermal and wind.

It is difficult to extract hard facts from the project numbers due to incomplete data, but at 5.2 million the initiatives represent approximately 17% of the total project budget of 30 million. To draw a comparison, it would be relevant to determine what it would have cost to introduce more traditional systems into the reconstruction and compare the difference, then compare the energy consumption reduction savings by the use of the more efficient equipment.

meats used in hotel kitchens

- Mounted amenity soap dispensers in lieu of small bottles
- Rubberwood toiletry amenity holders
- Green features and practices education and training for hotel staff
- Cork tabletops in restaurant
- Filtered water stations to cut down bottled water
- Occupancy light sensors for public restrooms, storage closets
- Light timers for public spaces
- Restaurant wait staff will ask before pouring a glass of water

### Indoor Environmental Quality

- Increased air quality by using low emitting adhesives, sealants, paints, stains, carpets, and carpet padding
- High level of lighting control for employee and guest comfort
- High level of temperature control for employee and guest comfort



Solar Panels Produce 60% of Hotel's Domestic Hot Water Needs

**Water Conservation**

- 45% reduction in water usage with dual flush toilets, oxygen assisted shower heads and low flow fixtures
- 50% reduction in water consumption for landscape - utilizing water efficient landscaping fixtures
- Zero potable water use for landscape irrigation - utilizing captured rainwater

**Energy Efficiency**

- 21% less energy usage than similar traditional buildings
- Integrated building energy management system with occupancy sensors in each guestroom that place room in energy setback mode when unoccupied
- Solar heated hot water production on-

site producing 60% of hotel's domestic hot water needs

- High performance windows increase building's insulation properties
- High efficiency quick-recovery boilers and chillers reduce energy needed to keep occupants comfortable
- Environmentally accepted refrigerant used in chillers
- Fluorescent and LED lighting throughout building minimize energy load
- 70% of hotel's power has been offset with renewable energy

**Materials and Resources**

- Extensive construction and demolition waste management plan diverted 75.6% of debris from the landfill during

renovation process

- Extensive hotel recycling plan
- Reuse of salvaged building materials – public restroom vanities, various wood trim, meeting room ceiling tile, guestroom bed frames, glass panels, various doors and hardware, brick sidewalk
- Bamboo furniture in guestrooms
- Recycled content in many of the building materials
- Recycled content and rapidly renewable materials in carpets and padding
- FSC wood floors – library and penthouse suite
- Local artisans provided the majority of art in the hotel

**Site**

- Located in downtown with pedestrian access to a large number of basic services
- Brownfield site cleanup and redevelopment
- Convenient access to City's public transportation hub
- On site bike racks and available showers, lockers and changing facilities
- Preferred parking for low-emitting and fuel-efficient vehicles
- Storm water runoff reduction to help limit disruption of natural hydrology
- High reflective hardscape and roofing materials to minimize heat island effect

We applaud their efforts and wish them the greatest success with this magnificent property. Rangers Lead the Way! ■

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## Department of Energy Phases Out Incandescent Lighting



Since lighting accounts for about 22% of all electricity consumed in the U.S., a switch to more energy efficient lighting will help reduce both the amount of greenhouse gases resulting from the production of electricity and our nation's dependency on petroleum. In an effort to conserve the nation's energy resources, the U.S. Government has passed multiple legislative acts that will affect the use of electrical lighting in hotels, commercial buildings and residences, benefiting both the economy and the environment. The Department of Energy is responsible for interpreting Congress' legislation into enforceable energy efficiency standards. These new standards have the force of law and become effective July 14, 2012 beginning with phasing out the manufacture of energy inefficient incandescent bulbs and some halogen and linear fluorescent lamps.

### What do DOE's energy efficiency standards say and how will it affect you?

Between 2012 and 2014, standard A-line 40- and 100-watt incandescent light bulbs

*These new standards have the force of law and become effective July 14, 2012...*

must use 30% less energy, but produce the same light output as the incandescent bulbs most of us use today.

**What does this mean for you?** While you won't be required to throw out your existing bulbs, you may be surprised when trying to find the same replacements at the store. Af-

ter 2012, you'll find that these bulbs will have to be replaced with energy-efficient options, such as Halogen, CFL and LED light bulbs.

**How much energy can energy-efficient lighting really save?** The most common alternative to incandescents used today is the CFL. While the upfront investment is more for these bulbs, the cost is more than offset in money savings and product longevity.

### Incandescent A19 Lighting Legislation

The standard A19 incandescent bulb can no longer be manufactured for sale in the U.S. based on the following schedule\*:

§ January 1, 2012: 100-watt

§ January 1, 2013: 75-watt

§ January 1, 2014: 60-watt, 40-watt

Retailers and distributors may still sell these bulbs until their inventory is exhausted. Lamp manufacturers may also sell off their existing inventory. Consumers may continue to use existing incandescent bulbs. Most specialty and decorative lighting sources are not regulated and will continue to be sold. Note: The State of California will begin their phase out schedule one year earlier.

### Reflector Legislation

In addition, all incandescent R20, R30, R40, BR30, BR40, and BPAR reflector bulbs must meet halogen efficiency levels except:

§ Lamps rated at 50 watts or less that are ER30, BR30, BR40, or ER40

§ Lamps rated at 65 watts that are BR30, BR40 or ER40

§ R20 incandescent reflector lamps rated 45 watts or less

### Linear Fluorescent and Halogen Legislation

The Department of Energy announced new efficiency standards for linear and U-shaped fluorescent lamps and halogen PAR lamps. The new standard will become effective on July 14, 2012 and will implement lumens per watt (LPW) regulations

for linear fluorescent and halogen PAR lamps. The new regulations will affect the following fluorescent and halogen bulbs\*:

§ All standard 4-foot T12 bulbs eliminated

§ Most 8-foot T12 bulbs eliminated

§ Some 4-foot T8 bulbs eliminated

§ All standard halogen PAR38, PAR30, PAR20 bulbs within the 40 watt – 205 watt standard eliminated

§ No changes for T5 bulbs

There are exclusions to each of these regulations. The regulation dates are when the products can no longer be manufactured. Inventory built prior to the cut-off date can still be sold. Information is subject to change.

### Legislative Background

The Energy Policy and Conservation Act of 1975 (EPCA) established an energy conservation program for many consumer appliances. The Energy Policy Act of 1992 (EPACT) amended the EPCA by setting minimum lamp efficiency standards for some general service fluorescent lamps and incandescent reflector lamps. The Act also gave the Department of Energy (DOE) authority to write new standards or amend existing standards if they were warranted. On December 19, 2007, the Energy Independence and Security Act of 2007 (EISA) was signed into law. The Energy Independence and Security Act of 2007 is an energy policy law that consists mainly of provisions designed to increase energy efficiency and the availability of renewable energy. Among its many provisions, EISA implements new efficiency standards for certain incandescent lamps and directs the Department of Energy (DOE) to undertake new energy conservation standards rule-making for incandescent reflector lamps and general service fluorescent lamps.

### Notice of Proposed Rulemaking (NOPR)

The original NOPR by the Department of Energy's Office of Energy Efficiency & Renewable Energy was published in the Federal Register April 13, 2009. To view the NOPR;

See: [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/pdfs/fl\\_incandescent\\_stds.nopr.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/fl_incandescent_stds.nopr.pdf). ■

# How to Evaluate and Explain ROI for HVAC Equipment

By Marc Rouse

Distributor Development Manager  
Capstone Turbine Corporation



HVAC (heating, ventilation, and air conditioning) systems have a greater impact on guest comfort than any other building system. While guests won't tolerate a stuffy room, lodging managers can't afford

unsatisfied customers and unruly costs derived from inefficient energy generation. Taking action to upgrade HVAC systems in today's hotels and lodging facilities can help cut energy costs and improve guest comfort—thus increase profit.

HVAC upgrades provide several benefits for hotel operations, including enhanced guest comfort, decreased energy consumption, higher reliability, longer equipment life, and overall cost reduction. Additionally, HVAC systems provide many options for increasing energy efficiency – programmable thermostats, room occupancy sensors, variable speed blowers, low pressure-drop air filters, and high efficiency chillers and boilers. The most energy efficient systems are combined heat and power (CHP) and combined cooling, heating, and power (CCHP) systems that combine an electric generator with a heating or heating and cooling system that uses the generator's exhaust heat to provide extremely high fuel efficiencies, thus

er property upgrades and improvements.

The effective and simple ROI model for HVAC upgrades shared in this article will help decision makers better understand and trust ROI information commonly provided by equipment suppliers.

## Evaluating ROI for HVAC Equipment Using Payback Model

ROI is a performance measurement that evaluates the profitability of an investment. It is calculated by dividing the money returned on an investment (savings or profit) by the cost of the initial investment. ROI is calculated and expressed in many ways; different investment types use differ-

nificant up-front capital costs (equipment and installation) and value of the capital equipment depreciates over time (equipment life). A payback model compares the total cost of an installation against the predicted cost savings, calculating how many years it will take the installation to pay for itself. For example, an HVAC system with a "payback of 4.5 years" means the system will have saved enough in energy or maintenance costs over 4.5 years to cover the initial cost of the install. Most likely, the life of the HVAC system will exceed its payback period, so from the breakeven point forward, the installation continues to generate savings. At this point, savings can be viewed as profit in the form of decreased

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*“Most likely, the life of the HVAC system will exceed its payback period, so from the breakeven point forward, the installation continues to generate savings.”*

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*“More efficient HVAC systems can reduce enough costs to completely pay for the upgrade, and then continue to provide significant annual savings over time.”*

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opportunities to reduce energy costs for building climate control.

While most HVAC upgrades can be justified by improved reliability and promised guest comfort advantages alone, in many cases, return on investment (ROI) of HVAC system upgrades actually outperforms oth-

er models, and calculations can become more complicated when more variables are considered, including tax rates and risk.

For simple investments, such as a savings account, the ROI represents the percentage yield on the savings account. Using a simple percentage ROI allows decision makers to compare multiple investment alternatives to determine what option is most suitable for their application.

This article will explain the simplified model for the purpose of understanding how to evaluate ROI of an HVAC investment to compare it to other investment options.

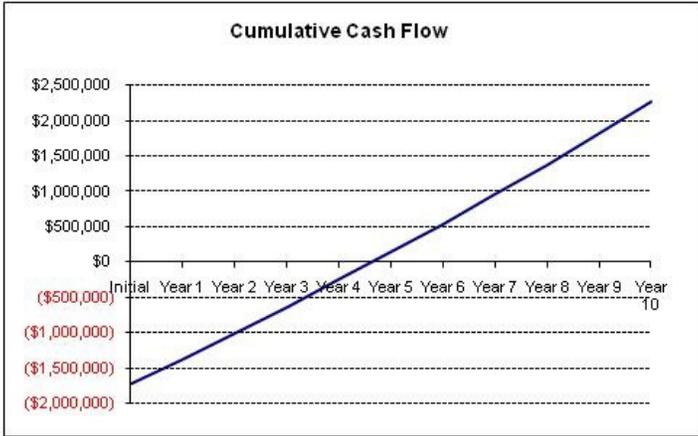
The payback model is most commonly used to express ROI of an HVAC system because these systems typically have sig-

operating expenses.

Payback ROI also can be expressed as a percentage yield on the capital investment, which is very useful for situations where an investor has the option of placing this money in an alternate investment (property purchase, advertising campaign, savings, etc.), as it allows various investment types to be compared.

HVAC upgrades often are required for more than just financial reasons. The payback model is the easiest tool to calculate other upgrade advantages – taking credit for extended equipment life, reduced costs from increased efficiency, and reduced operating and maintenance costs. For example, the payback model can justify the purchase of more expensive HVAC systems by proving how higher upfront cost provide a faster payback or better economics in the long run. For a limited facility upgrade budget, the projects with the fastest payback should be captured first.

**How to Estimate the ROI of Your HVAC**  
Regardless of the sophistication of the



tures. These variables are highly dependent on equipment location and local programs.

The calculator produces a project payback and a ten year IRR (internal rate of return). IRR is a very useful metric when considering the best way to allocate discretionary investment dollars by allowing various investment types to be compared side-by-side as simple expected investment yields.

Using the provided tools to evaluate the ROI of HVAC equipment, it is realized that upgraded HVAC and energy saving systems often provide the highest ROI. Using these steps to evaluate investment options, the lodging and building management industry should better understand how upgrading HVAC systems is a worthy means to reduce energy consumption and costs, and make guests more comfortable. ■

HVAC technology used, the ROI calculation follows the same philosophy.

Variable speed blowers, which provide quiet and efficient operation, are a simple HVAC upgrade with energy savings that exceed initial cost. A simple calculation to determine the payback period on a variable speed blower upgrade would consider:

- variable speed blower upgrade cost
- energy cost
- hours of use per day

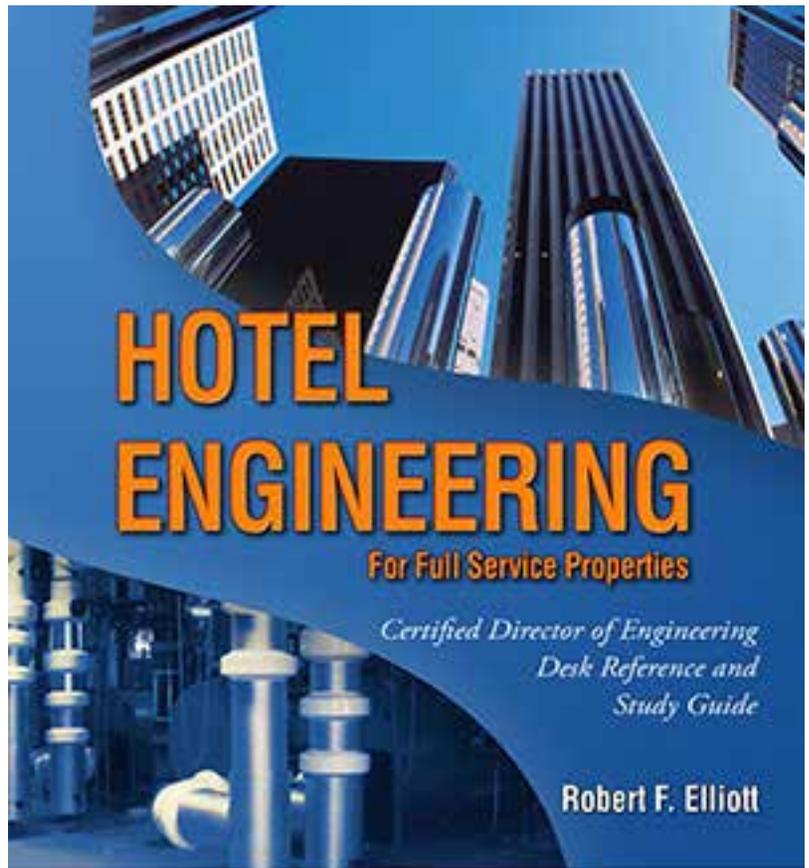
Assuming the variable speed blower uses 80 percent of the energy that the older blower used, energy savings of about \$7,300 a year for a 17,000-square-foot facility would be expected. To calculate the simple payback period, divide the installed system cost by the yearly-expected savings, which provides the number of years it would take for the investment to pay for itself. The additional years of the product life multiplied by the yearly savings are increased profits on the facility's bottom line in the form of reduced expenses.

**Economic Calculators to Evaluate ROI**

Many HVAC equipment manufacturers have developed sophisticated ROI calculators. These calculators generally are very accurate and trustworthy if the customer is aware of the assumptions used in the calculations and agrees they are reasonable. It is necessary for decision makers to review and agree with the assumptions used in payback and ROI calculations to ensure the expected cost savings will be realized.

Capstone Turbine Corporation's proprietary Economic Calculator models fuel cost; costs and savings as total installed cost; operation and maintenance cost; energy and heat savings due to onsite generation; and value added for reliability.

Additionally, this calculator can incorporate investment tax credits, emissions credits, depreciation tax benefits, and various electric rate tariff struc-



# Trigeneration for Hotels and Casinos

By Jim Crouse

Executive Vice President Sales & Marketing  
Capstone Turbine Corporation  
[www.capstoneturbine.com](http://www.capstoneturbine.com)



Heating enormous amounts of space and water, keeping thousands of lights radiant, and air conditioning can compose nearly 75 percent of a hotel's overall energy use. These four consuming power

applications are the reason the hospitality industry pays outrageous costs—nearly \$4 billion per year—for energy.

While a baseload electric generator produces electricity, its exhaust heat byproduct is captured and recycled—rather than wasted—to create heating and cooling. It's caught in a heat recovery module and diverted to an absorption chiller to produce cooling, such as air conditioning. Depending on the facility's fluctuating power needs, heating and cooling output can operate concurrently or interchange to deliver variations of hot water, hot air, steam, and space cooling.

Economic, technical, and environmental benefits exist for using a single fuel to generate three primary energy requirements.

When compared to traditional power sources (gensets and boiler heating) microturbines are low cost, more reliable, require less maintenance and associated downtime, have low noise and space footprints, and are highly efficient.

In fact, microturbines can achieve energy efficiencies as high as 90 percent compared to 35 percent from conventional systems that produce power and heat separately. Less fuel is required to produce a given amount of energy because conversion and transmission losses are avoided, which boosts microturbines' ability to produce near-perfect efficient scores.

A microturbine's heat output can be used

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***“This isn't a future engineering dream; it's a reality for smart hotel and lodging engineers.”***

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Imagine the industry's three primary energy needs—electricity, heating, and cooling—integrated into one onsite system that accomplishes it all cleanly, reliably, efficiently, and at a lower cost than traditional energy sources. A system with a longer, healthier equipment life that can improve guest comfort and significantly enhance corporate image.

This isn't a future engineering dream; it's a reality for smart hotel and lodging engineers who have deployed combined, cooling, heating, and power (CCHP or trigeneration) systems to save money, energy, and the environment.

## **CCHP: CHP's Cooler Counterpart**

Already acquainted with combined heat and power (CHP or cogeneration) from Lodging Engineer's Fall issue (click here for full story), you understand cogeneration is the simultaneous production of onsite electricity and thermal power from a single fuel. Now it's time to meet CHP's cooler counterpart, CCHP (or trigeneration), which can achieve higher efficiencies per fuel unit than cogeneration and traditional power plants.

A one-stop-shop for all onsite power needs, CCHP systems generate electrical, heating, and cooling from a single fuel.

First, the electricity, heating, and cooling produced onsite by a CCHP system eliminates the need to purchase electricity and fuel for boilers. Additionally, CCHP systems that use certain onsite energy delivery systems require minimal maintenance and help lower a property's environmental impact through reduced fuel consumption and—depending on the energy source—greenhouse gas emissions.

According to the U.S. Environmental Protection Agency (EPA), hotels and casinos are opportune—yet underutilized—markets for CHP and CCHP. Of the nearly 48,000 hotels in the United States, about 10,000 have the energy characteristics suitable for current CHP technology

CCHP is destined to help hotels cope with swelling energy costs of onsite recreation operations, entertainment, dining, and even laundry facilities.

## **Microturbine-Powered CCHP**

Microturbines—small, clean-and-green alternative power systems—are ideal for CHP and CCHP applications because they are compact, flexible in connection methods, can array in parallel to serve large loads, provide reliable energy, and emit ultra-low emissions.

Is CHP/CCHP a good fit for your hotel?

Source: [http://www.epa.gov/chp/markets/hotel\\_fs.html](http://www.epa.gov/chp/markets/hotel_fs.html)

- More than 100 rooms?
- Pay more than 7 cents per kilo watt-hour for electricity?
- Already implemented other energy efficiency measures?
- Concerned about rising utility costs?
- Guests complain of insufficient hot water?
- Hotel experienced a utility outage?
- Hotel has a central chilled water system?
- Planning to add new boilers or replace existing boilers?

If you answered “yes” to three or more questions, your hotel is likely a good candidate for CHP or CCHP.

to heat and air condition a facility through absorption cooling. Clean microturbine exhaust is ducted to an absorption chiller that uses the heat energy to produce chilled wa-

ter for air conditioning or process cooling.

Most absorption chillers burn natural gas to create heat that drives the cooling process, which means facility engineers need to purchase natural gas for two energy-related sources. Microturbines eliminate this inefficient step. When using a microturbine with an absorption chiller, the generator's waste heat is recycled to drive the process, instead of natural gas.

Microturbines have the advanced ability to automatically switch between cooling and heating mode, making them ideal for hotels with fluctuating seasonal needs.



*CCHP system at The Ritz-Carlton, San Francisco*

### Five-Star Power

Microturbine CCHP applications are not new to the hospitality industry. Hotels and casinos across the country are reaping award-winning benefits from these highly efficient systems, including a West Coast luxury hotel and a renowned Mid-Atlantic five-star property.

Located in upscale Nob Hill, The Ritz-Carlton, San Francisco's track record as the epitome of elite hospitality is matched by its progressive environmental stewardship.

The trend-setting luxury hotel was the first in the world to install the Capstone MicroTurbine®-based UTC Power Compa-

Two federal bills passed that include provisions supporting CHP/CCHP applications:

1. Energy Improvement and Extension Act of 2008 (EIEA) significantly expanded federal energy tax incentives and introduced the CHP investment tax credit.
2. American Recovery and Reinvestment Act of 2009 (ARRA) expands and revises tax incentives for CHP and provides billions of dollars in funding opportunities for CHP and waste energy recovery

ny PureComfort™ combined cooling, heating, and power (CCHP) system to conserve energy and protect the environment.

At the core of the CCHP system, four Capstone C60 Microturbines generate electricity and heat to provide base-load power and air conditioning that support much of the hotel's captivating 440,000-square-foot grounds.

Using natural gas, the CCHP system provides the exquisite 336-room hotel with 240kW of electricity and 120 refrigeration tons (RT) of cooling year-round at 80 percent efficiency, which is near maximum overall efficiency for this type of system.

According to Director of Engineering at The Ritz-Carlton, San Francisco, purchasing the CCHP system resulted from an ongoing plan to lower the hotel's energy consumption and reduce energy expenses. The hotel's parent organization strongly wanted to deploy the highly efficient CCHP system to offset energy loads.

With a 1MW peak electricity demand and significant chilling requirements that approach 300 RTs, The Ritz-Carlton, San Francisco needed a cleaner, more efficient power system to align with its industry-leading corporate standards for conservation.

The hotel's original inefficient 300 RT electric chiller ran 24/7 year-round, even though the hotel's chilling needs often were well below the chiller's capacity.

Today's newer microturbine-based CCHP configuration meets 70 percent of the hotel's cooling demand and is designed to satisfy base-load chiller demand for the whole year. This allows the facility to shut off the inefficient 300 RT chiller for eight months each year. The big payback is the tremen-

dous amount of heat that comes from the four microturbines.

Exhaust heat from the four microturbines is captured by a Carrier Corporation 120 RT double-effect absorption chiller, which can be manually configured to operate as either a chiller or heater. When in cooling mode, the chiller recycles the microturbines' exhaust heat to achieve a COP of approximately 1.3.

Since the rooftop CCHP system was commissioned in 2005, the hotel has reduced its energy consumption 20 percent and saved an estimated US\$120,000 each year in energy costs. With financial support from California's Self Generation Incentive Program and the U.S. Department of Energy, the hotel's return on investment took less than four years.

According to the Pacific Region CHP Application Center, the Capstone microturbine system at The Ritz-Carlton, San Francisco saves enough electricity annually to power 200 average American homes.

With such tremendous energy savings, greenhouse gas emission reduction is inevitable. The clean-and-green Capstone system emits 40 percent less CO<sub>2</sub> a year than conventional systems – a benefit equal to planting 150 acres of pine and fir forest. In fact, the CCHP system reduces 800 tons of CO<sub>2</sub> each year when compared with traditional onsite energy systems.

Additionally, with NO<sub>x</sub> emissions less than nine parts per million (ppm) at 15 percent exhaust oxygen, the Capstone system emits 90 percent less NO<sub>x</sub> a year than conventional systems, which is equivalent to removing 250 cars from the road.

It's clear: the hospitality industry is rapidly turning to microturbines for reliable, efficient, clean-and-green CCHP power.



# THE MYTHS OF PTAC UNITS

**David Odom**  
**Liberty Building Forensics Group**  
**Norm Nelson**  
**CH2M Hill**

The low cost and simplicity of packaged terminal air conditioning (PTAC) units are two of its most appealing features. You design and install these simple systems and then let the guests decide what temperature they want the room to be. If good temperature control and low initial cost were the sole expectations for PTAC units then they are the perfect solution for economy and mid-priced hotels. When everything goes right PTAC units provide a seemingly elegant solution to an important business question in the hotel industry: “How do you make a hotel guest room comfortable for the least cost?”

In reality, low cost and good temperature control are not the sole expectations for PTAC units. The problems arise because PTAC units are also expected to accomplish three other very important, albeit more subtle, functions for the guest rooms:

- 1) Proper dehumidification,
- 2) Proper outside air ventilation, and
- 3) Proper pressurization for the guest rooms versus outdoors (at least in warm, humid climates).

It’s these three important functions where the “myth” part becomes important and is the cause of many PTAC-related moisture and mold problems over the past 20 years. Whether or not hotels achieve these three criteria using PTAC’s is not just a matter of meeting building codes or industry good practices—these factors are unknown to guests as long as they are comfortable. What’s much more important is that these myths are often the cause of increased mold problems, objectionable odors in the guest rooms, and elevated moisture conditions that can

jeopardize the integrity of the facility and can be the source of guest complaints.

Surprisingly, with tens of thousands of hotels using guestroom PTAC’s the evidence that this equipment is properly ventilating, pressurizing, and dehumidifying guestrooms is almost non-existent. Hoteliers, designers, and contractors don’t ask for proof that the equipment achieves these criteria, consequently no one is forced to document that the equipment actually achieves these goals. Most of the evidence that designers, contractors and owners rely on comes from statements in the manufacturer’s literature and on their technical instinct. The other evidence that does exist is not a sound body of data, but is primarily the absence of guest complaints and the lack of significant problems in many hotels. Thus, the myths are perpetuated.

Despite the widespread use of these apparently simple systems, the margin of difference between a problem hotel and a well-functioning hotel is often very thin. What a number of building experts know is that when you accurately measure ventilation, pressurization, and dehumidification of hotels with PTAC’s many of them do not meet minimum requirements necessary to meet building codes, prevent problems, or avoid guest complaints. The factors that tip the scales between a problem and a well performing hotel are numerous and often interrelated. Even more important is that these “tipping point” factors are largely unknown in the hotel industry—again mostly because the myths supersede the absence of technically sound cause-and-effect information.

*NAHLE conducted a cursory Internet search looking for information or ‘evidence’ supporting testing or other background information regarding the selection, production and/or installation of PTAC units in hotels. Various building codes and nationally promulgated standards as well as individual corporate ‘brand’ standards also impact PTAC selection and usage in hotels. NAHLE does not support any specific brand or the views of any specific information provided in the adjoining article or videos.*



## Operating In the Dark



*Area-wide power outages pose special challenges for hotel operations*

By Thomas G. Daly, MSc. CSP  
Principal

The Hospitality Security Consulting Group, LLC



Within the last fifteen years several U.S. cities including Los Angeles, New York and New Orleans have experienced emergencies involving long duration electrical power outages

impacting hotel operations, among others. Such events posed serious lifesafety challenges for affected hotels' staff and guests alike.

The 1994 Northridge earthquake in Los Angeles, the 2003 Northeast Power Failure impacting New York City in particular and 2005's Hurricane Katrina in New Orleans resulted in 24 hour plus duration power outages in those cities. New Orleans' power failure lasted for weeks.

### Why area-wide power outages are different

The standard response for significant emergencies including localized power failures affecting large hotels is to organize a traditional evacuation followed by a relocation of patrons and non-essential staff to adjacent facilities unaffected by the event.

Where such emergencies involve loss of power area-wide however, hotels become 'areas of refuge' given their ability to house hundreds, if not thousands, of patrons. That conclusion proved true in all of the events in the cities and events cited above. A substantial building with food, water, shelter and limited electrical power provides a safe haven for such occupants in the short term.

Code requirements as to time of operation vary for different emergency systems during power interruptions. The NFPA's Lifesafety Code requires emergency lighting to last only for 1.5 hours. Building code requirements for fire pump operation during power outages typically vary from 4-8 hours duration.

Such code requirements reflect a philosophy of dealing with such outages as short term events where traditional building evacuations are possible. Since the late 70's building codes have required newly constructed high-rise hotels to have emergency power, typically diesel fueled generators, to supply emergency systems. Many older large high-rise hotels have been voluntarily retrofitted with emergency power. Those emergency systems include fire alarm and communication systems, which also have limited battery power; special extinguishing systems; fire pumps; limited emergency lighting (stairways, corridors and public assembly areas); a minimum of one elevator; telephone systems which often have their own dedicated battery bank and the emergency command center. Where spare emergency power capacity exists, hotels have added critical operating systems such as property management systems and key encoding equipment.

Hotel emergency plans for power failures typically include further safeguards to include flashlights, glow sticks and lanterns for staff and guest use

All of the above have their limitations. Diesel powered emergency generators have a limited supply of fuel and portable lighting has a very limited operational life span. Natural gas-fired emergency generators typically have an unlimited duration of fuel available but they are rare in the hotel industry. 'Emergency' generators are also challenged as they are not intended to operate for long durations.

'Continuous duty' rated generators for longer duration operations are available, but again, are rare in the hotel industry in the United States.

### Planning for the worst case

The 'lessons learned' from these historical events is to have an emergency plan that anticipates such contingencies and prepares to re-supply the hotel with needed critical supplies.

Depending on public safety organizations, including local police, fire and the National Guard to assist you is a trust misplaced. The dysfunctional city and state governments in Louisiana during Hurricane Katrina are a telling example. Hotel emergency plans for such catastrophic events should reflect a singular reality. You are on your own.



*New Orleans' power failure lasted for weeks.*

The re-supply of water, food, ice, batteries, fuel and portable lighting equipment needs to be well planned for in advance, initiated immediately and should not depend on traditional local suppliers. Those local resources will be taxed to supply public needs including those of police, fire, National Guard, nursing homes and hospitals. During the 2003 Northeast Power Failure some hotels in New York City were re-supplied from as far away as Washington, DC.

Spare parts including fuel, air and oil filters for emergency generators need to be

stocked on site and the engineering talent of the hotel needs to be trained to handle simple on-going maintenance and minor repairs of same. Emptying the emergency generator's fuel tank, cleaning same and re-fueling it should be done at least every 3 years as a routine maintenance task. Contaminated fuel will clog a generator's fuel filter and stop its operation as a large hotel in New Orleans found out during Hurricane Katrina. Some spare fuel should be stockpiled in quantities allowed by local fire codes, preferably stored outdoors. Hand trucks or other equipment to move 55 gallon drums of fuel should be on site. Remember – a 55 gallon drum of diesel fuel weighs in excess of 400 lbs. Hand operated pumps to transfer such fuel should also be standard equipment in your engineering department.

A regular load-testing schedule for emergency generators, not simply running the generator weekly, should be a required policy. Knowing the generator's fuel consumption calculation vis-à-vis available fuel for a fully loaded emergency generator is key to decision making.

Before running a test of your emergency generator, ask your staff what equipment they 'think' is powered by the generator and then have them catalog what actually was powered when the normal power is pulled and the generator activated. You will be surprised at the outcome as many learned in the run up to Y2K.

Verify that the battery charger for your hotel's phone system is itself connected to the emergency generator. The same advice holds true for each uninterruptible power supply (UPS) that provides back up power for other critical equipment like front office reservation, property management systems, radio system repeaters and key encoding equipment.

### Communications

When disaster strikes, the ability to communicate within a hotel and between a hotel and its corporate headquarters is paramount to ensuring the safety of all occupants and for requesting assistance. Internally, the hotel's fire alarm and voice communication system is a critical component to provide frequent updates to occupants. Make sure several members of management are familiar with this system's operation and have 'canned' pre-

approved messages for their use to communicate frequently (at least hourly) with all guests.

Many hotels have in this decade changed to cell phones with a talk around capability in place of more traditional two-way radios for staff use. Word of advice – don't. And

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***“Satellite phones should be standard equipment in hotels in high risk areas including those historically prone to power system failures, earthquakes, hurricanes and tornados.”***

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if you already have, reverse that decision.

Cell phone systems failed miserably on 9/11 and in the 2003 Northeast Power Failure as few, if any, had back-up power themselves and simply stopped operating when normal power to them failed. Even where such systems have backup power they will fail nonetheless as the result of the overwhelming demand in capacity they were never intended to supply. More than 1,600 cell phone towers were destroyed in Hurricane Katrina and remained so for weeks. Traditional land line phone systems in New Orleans were rendered ineffective as telephony network switching stations were inundated with the resulting floods and connectivity was lost for days.

For internal operations two-way radio systems are much more reliable. You own them, maintain them and have your own FCC Radio Station License and frequencies. A well designed system will have back up power including a UPS for the base station and one or more repeaters. Portable radio units should have spare batteries and spare radios should be available for management staff not normally equipped with same. Power for battery rechargers need to be supplied by the emergency generator. Verify the circuitry.

Two-way radios however typically only provide for communications within the hotel but area-wide systems can be designed by adding directional antennas and high-output repeaters as was done with one major hotel chain post-Katrina in New Orleans. Nonetheless, such systems are rare.

During Hurricane Katrina one hotel in New Orleans was supplied with satellite phones just prior to the event. With no

other owner communications available including cell phones, landline phones, email or the internet, that unique technology allowed for communication with its corporate headquarters and the planning and successful evacuation in a fleet of 55 chartered buses in the early morning

hours of September 1st for some 1,200 guests and staff, all without death or injury to any involved. All of that extraordinary operation was planned and accomplished by the private sector in less than 24 hours by a small corporate team outside of the area but in communication with the local hotel with its satellite phone.

Satellite phones should be standard equipment in hotels in high risk areas including those historically prone to power system failures, earthquakes, hurricanes and tornados. While satellite phones require a direct line or sight to the sky, antennas can be set up thru selected phone sets within the hotel to avoid the need to go outside. Such systems were installed in several major hotels of one chain in New Orleans as the result of Hurricane Katrina.

### Summary

When considering emergency planning for the worst case think resource redundancy, a dedicated private sector outside-of-the-area source of help and a well trained staff. The CEO or COO needs to put someone in charge with an unlimited budget and tell them their decisions including financial expenditures will not be questioned after the event.

When the time comes, act--don't procrastinate. Lives are at stake.

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# *“Maintenance Creed”*

By Stan Hannibal, CEOE, CFM, FMA  
White Lodging Hotels

Ever wonder to yourself, why do we have maintenance in our hotels? The easy answer is to do preventive maintenance, for life safety issues, to keep the hotel looking good. All right, but there is more to it than that, and they will be discussed here. When concluded, everyone will be able to recite the 11 reasons we have hotel maintenance.

**Reason 1- “S” Safety.** Safety is the number one concern for guests and associates alike. Accidents can deplete profits in an instance. Be on the lookout for safety hazards and correct them, or report them to leadership right away.

**Reason 2- “H” Hospitality.** A guest in a hotel will on average only talk to one person and that is the person who checks them in. Let them have a maintenance problem and no one around and a stay can go from bad to worse. Maintenance personnel are tasked with doing many things and being in front of the customer is one of them. A friendly, well groomed maintenance person can make or break a guest stay.

**Reason 3- “I” Innovation.** Maintenance personnel are always looking at ways to make things better. Many of the systems in hotels now are the way they are because of input from hotel maintenance personnel. A good maintenance person is always trying to find a way to get things done, with what they have and minimal cost.

**Reason 4- “T” Troubleshooting.** A service call to an outsider service provider can range between \$50-\$125.00 an hour depending on equipment type and location. Having maintenance check it out (troubleshoot) before calling can reduce these calls to a minimum and save money.

**Reason 5- “H” HVAC.** No building can function without a proper working Heating, Ventilation, and Air Conditioning system. Filters need to be changed quarterly (depending on filter efficiency rating) and one of the top guest issues is heating and cooling of the guest rooms. Maintenance should be done on guestroom HVAC units at least quarterly (check for proper operation, replace or clean filters, verify drains are working properly). Think back 34 years to the American Legion Convention in Philadelphia where deaths resulted from a disease contributed to the HVAC system. Part of preventive maintenance on HVAC is to make sure this never happens again in any hotel by cleaning and treating the drain pans.

**Reason 6- “A” Alarms.** Fire alarms are vital to notification to everyone in a building in an emergency situation. There needs to be someone in charge during an emergency and also in charge of training. This job routinely falls on maintenance. By law, systems must be tested and documented annually and most brands require this more often.

**Reason 7- “P” Profit.** A good looking hotel and a good working hotel means “Mo Money, Mo Money, Mo Money.”

**Reason 8- “P” Preventive.** Preventive Maintenance was mentioned earlier as an absolute reason for having maintenance in the hotel. Our bodies require periodic preventive maintenance because it is a machine, as do the working machines in the hotel. Failure to perform preventive maintenance in a timely manner costs money. For instance, not cleaning HVAC coils will increase energy consumption anywhere from 20 to 50% and even more should they go longer without preventive maintenance. Simple math says if your hotel is budgeted to make \$1,000 a day in room revenue at an average rate of \$100 you need to sell 10 rooms a day. However do not clean the coils (50% lost) and you now need to sell 15 rooms to make the money.

**Reason 9- “E” Environment.** Regulatory compliance is very much a concern by the Government and many customers today. We can no longer dump chemicals, oils, and paints down the drain. Without someone monitoring these activities and taking readings on equipment, a hotel can violate the law very easily and cost ownership large amounts of money.

**Reason 10- “N” Numbers.** Failure to do preventive maintenance or make timely repairs can really hurt profit. It is proven that proactive maintenance can keep equipment running far longer than reactive maintenance, and predictive maintenance (replacing components on a schedule whether they have failed or not) even longer. There is really nothing worse for profit than the failed room AC on a sold out night resulting in walking guests.

**Reason 11- “S” Standards.** In order to drive rate and bring more money to the bottom line, high standards need to be maintained in every hotel. Arrival at the hotel and dead flowers, unpainted curbs, trash outside, are first and lasting impressions and indicative of a lack of maintenance. Maintenance should be held to high standards through inspections and accountability weekly. Good maintenance means higher profits.

In conclusion these 11 reasons are the top reasons for having maintenance in hotels. They are not the only reasons by any means, but touch on all areas of maintenance. In the end each letter adds up to the main reason we have maintenance in hotels:

***SHIT HAPPENS***



# IMPLEMENTING A WATER CONSERVATION PROGRAM AT YOUR HOTEL

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*Thirty years ago gasoline was so cheap that a car's gas mileage wasn't the decisive factor when purchasing a new car. In the last 30 years, water and sewer rates have increased faster than the cost of oil. What was once thought of as a virtually 'free product' with little regard to usage or waste is now a serious discussion among energy conservation managers as water management is rapidly becoming synonymous with fossil fuels and other utilities. This means that the cost of water and sewage services are and will continue to increase the hotel operator's bottom line. What was once an abundant ubiquity is now a precious and sustainable resource. This is the first in a series of articles on how hotels can get a grip on these rising costs while at the same time taking some positive steps toward becoming more environmentally responsible and seeking sustainable operations in today's world of "green hotels."*

**INTRODUCTION**

As water and wastewater costs are continuing to rise, today's hotel managers and engineers are challenged with reducing the property's usage and curbing rising utility bills while still providing guests an uncompromised level of quality water usage and benefit. This first article addresses ways that facility managers and hotel engineers can get control of these rising costs. In this installment, we will look at:

- The rising cost of water bills
- Water use benchmarks for hotels
- Getting started, and

- An introduction to national codes and standards and rating systems that will impact hotel operations.

Future articles will drill down into actual ways to reduce water use, techniques to calculate payback, and ways to make water efficiency work for them.

**RISING COSTS**

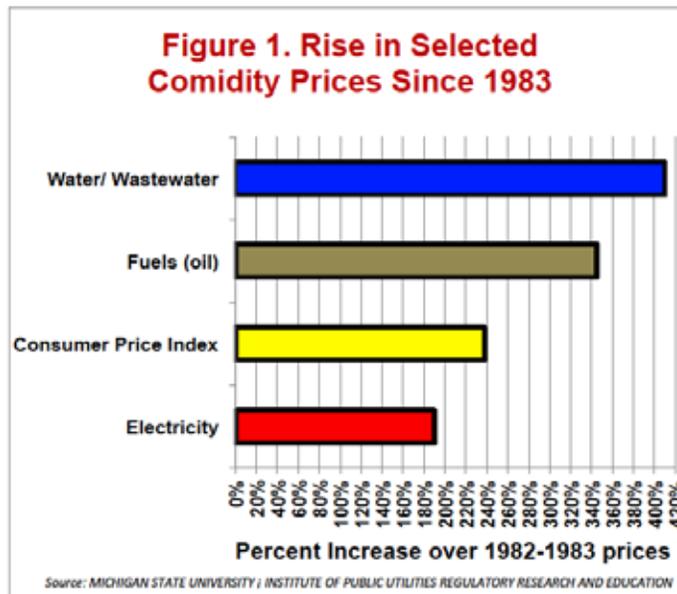
Silently, almost without notice, water and wastewater costs have been skyrocketing. As the following graph shows, water and wastewater rates nationally have risen even faster than oil over the last thirty years and, based on recent trends, this increase is not slowing down. Many hotel managers are finding that becoming more water efficient is a very effective way to improve their bottom line.

According to the Earth Policy Institute, between 2002 and 2007, municipal water rates increased an average of 27 percent in the United States, 32 percent in the United Kingdom, 45 percent in Australia, 50 percent in South Africa, and 58 percent in Canada. This is a worldwide trend.

The Institute of Public Utilities at Michigan State University found that water and wastewater rates have increased faster than any other utility or service commonly purchased by facilities. Figure 1, as shown below, summarizes the increase of the consumer price index and selected commodities in the United States since 1982.

Hotel managers can expect costs for water and wastewater to continue to rise further impacting the bottom line of the facility's balance sheet. In addition to the cost water and wastewater, costs associated with the use of water need to be considered. Dishwashing and laundry operation involve the use of chemicals and detergents, and there are equipment costs and other considerations. National water and sewer rates average about \$7.50 per thousand gallons (\$5.60 per hundred cubic feet -CCF).

But, this is not the whole picture. The most commonly encountered additional cost is that of water



heating. Heating water uses energy. According to the US Department of Energy, energy costs for commercial users such as hotels average \$8.17 per thousand cubic feet (MCF), (\$0.817 per therm) for natural gas and 10.17 cents a kilowatt hour for electricity. The net impact is that heating water by gas costs about \$6 to \$8 per thousand gallons of water, while heating by electricity costs more than double, \$16 to \$20 per thousand gallons of water heated. This means that regular tap water in a hotel costs about \$0.75 cents a gallon, less than a penny a gallon, while hot water heated by electricity can cost over 2.7 cents a gallon!

It is hard to get your head around costs in thousands of gallons or a MCF of natural gas, but if you visualize the cost for common uses, then the picture becomes much clearer. Let's look at the cost to use a toilet, take a shower and operate one irrigation zone.

- **Toilet** - At a cost of \$7.50 per thousand gallons, a five-gallon per flush toilet costs about 4 cents to flush. If a 1.28 gallons per flush toilet is used, then each flush costs only about 1 penny, or a 3 cents per flush savings... *How many toilets in your facility require more than 1.28 gallons per flush and how many times are they flushed each day?*
- **Shower** - A shower head that flows

at 2.5 gallons a minute for a ten minute shower will use 25 gallons, of which approximately 15 to 20 gallons will be hot water (bathers typically like water temperatures between 102 and 110 F). If you consider only the water cost for the shower then this will cost the hotel about 19 cents. However, if 75 percent of that shower's water is hot water heated with electricity at the national average of 10.17 cents per kilowatt hour (2.0 cents per gallon), then that shower will cost 55 cents. Are you looking for a way to conserve water and energy consumption at your property and save at least a nickel every time one of your guests takes a shower? If a new EPA recommended shower head using only 2.0 gallons per minute is used instead of the 2.5 gallon head, the cost for that same 10 minute shower will be reduced to 44 cents, an 11 cents savings!

- **Sprinkler** - The typical pop-up sprinkler head that sprays a 360 degree pattern, has a flow rate of 4.0 gallons per minute. This equals 3 cents a minute or about 45 cents (\$0.45) for a typical 15 minute run time on the sprinkler system. Each zone will have ten to 15 heads. This means that one irrigation event with only one zone would cost between \$4.50 and \$6.75 per watering event.

How many zones do you have? Installing weather-based controllers, new rotator heads, and other irrigation improvements can often cut these costs by 25% to 50%.

**HOTEL WATER USE METRICS**

Across the nation, the hospitality industry is beginning to look at water costs seriously. To do this, some statistics from the US Environmental Protection Agency may help. Figure 2, below, shows typical water use in hotels across the nation based on EPA's Water Sense program and Figure 3 is taken from Energy Star's Portfolio Manager program.

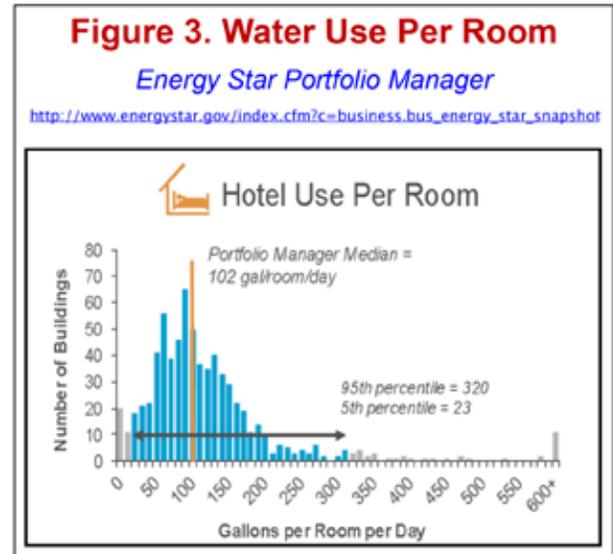
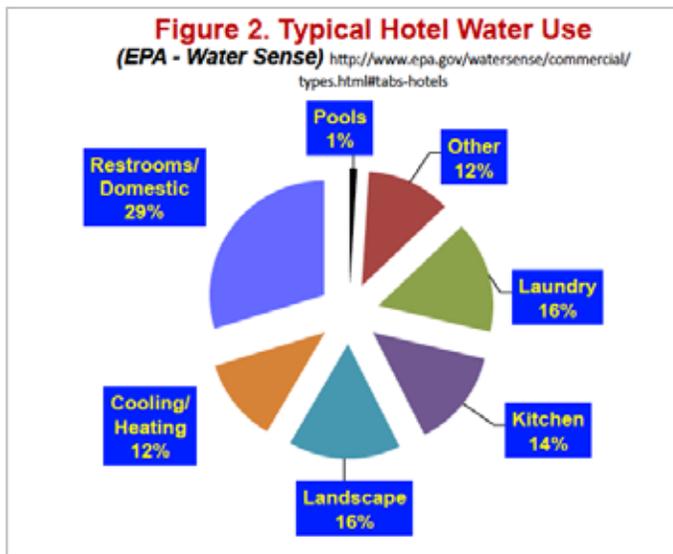
*So where does your property stand and what can the Hotel Manager and Engineer do?*

**GETTING STARTED**

Remember that the title of this section is getting started - things you can do first. Implementing a program will be discussed in future articles, but you have to find out where you are before you can logically determine where to go.

There are three tenants of beginning a program.

1. You have to understand the purpose and need for each water use at your facility,
2. Your employees are your ears and eyes - they must be part of the process, and



3. If you don't measure it, you can't manage it.

### 1. The purpose and need for each use:

You already know where water is used. Some uses are obviously needed and vital to your operation. Therefore, this step may appear to be unnecessary, but it can help focus where future operational improvements can be made. Also, by walking the facility and talking to the employees about the ways they use water is often eye opening. It is also a good way to discover uses, leaks, malfunctions, and other things, that even though you keep a keen eye on things, just slip under the radar. As a guide, write down all uses in your facility after your walk-through and answer these seven basic questions:

1. Where is it being used?
2. When is it being used?
3. How is it being used?
4. Who is using it?
5. Why is the water use necessary?
6. Can the amount of water being used be reduced by simple change in procedure?
7. Is there a way to accomplish the same thing without using water?

Most facility managers and engineers find that they will have some revelations as they attempt to answer these seven simple questions for each use.

**2. Involving your employees:** Employees are your eyes and ears, the ones who actually use the equipment that uses water, and are often an excellent source of information on better and more cost effective ways to reduce all utility costs not just water. Providing them with the incentive to look for better ways and even providing them with summaries of utility costs will help empower them to become part of the solution.

**3. Measurement:** A few years ago, a facility with a rather large cooling tower had the overflow pipe for the tower basin literally come loose and fall over on the bottom of the tower. The tower did not have a conductivity meter or a makeup meter. Because of that, the float valve for

the tower ran wide open at about 15 gallons a minute. Based on that city's water and sewer rates, this amounted to over a \$5,500 dollar a month water and wastewater bill, not to mention the wasted cooling tower chemicals. By the time the bill arrived and accounting flagged a "possible" problem, almost two months had gone by.

The facility engineer called in experts to figure out why the water and wastewater bills were so high. The only water meter on the property was the one from the utility. This meant that finding this "unexplained increase in water use" would be difficult. Luckily, the cooling tower was one of the first places examined. By the time it was found and fixed for under \$100, the facility had paid \$8,000 in additional water and wastewater bills.

## *If you don't measure it, you can't manage it.*

The point of this is that if you don't measure it, you can't manage it. If just a makeup meter was in place or if a conductivity controller was installed, the problem area could have been quickly identified. Much has been written about energy management systems, energy "dashboards" and the like. Monitoring water use is also critical to good control. If your facility already has water meters that are electronically connected to their central information system or the property management system, you have a system that will let you know if there is a problem. Smaller hotels may not be able to afford a "dashboard" type system, but having employees read the water meter on a regular basis and plotting the use on a daily basis will establish use patterns that will let the facility manager or engineer know there is a problem. Submeters - meters that are located within the property for use by the property owners as opposed to the utility meters that are the basis for billing - can help manage water costs and identify costly problems

in the property's various water using systems.

### CODES, STANDARDS, REGULATIONS, AND RATING SYSTEMS

No discussion of water conservation in commercial and lodging facilities would be complete without the mention of the significant changes that are occurring across the nation. Both major plumbing code bodies, the International Association of Plumbing and Mechanical Officials (IAPMO) and the International Code Council (ICC), have issued new green code supplements, as of 2012, that will significantly impact both new construction and selection of water using equipment from guestroom toilets to kitchen appliances. Several organizations, such as the Association Society of Heating, Refrigerant, and Air Conditioning Engineers are developing standards for water



*South facing green roof in Atlanta*

use similar to those previously developed for energy. Many States are promulgating legislation regarding water efficiency and new rating systems such as the soon to be released LEED 2013, all contain major new water efficiency related sections.

Keeping up with the rapidly changing codes and regulatory environment is a herculean task for hotel engineers and managers. The past decades were about energy efficiency, but both energy and water will be on the radar screens of all who manage facilities wisely in the future.

# THE ABC'S OF HOTEL BATTERIES

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An average 200 room property running at 60% occupancy will spend as much as \$5000-\$6000 a year on batteries for door locks, remotes and smoke detectors. Batteries are available nearly everywhere from the convenience store to major distribution companies. Some folks will send a staffer down to the corner store and pay retail pricing without a thought. Others buy from equipment manufacturers, and still others from distributors and spend far less. Buying from your local retailer will cost you plenty. You can pay up to \$5.99 for a 2 pack of name brand 9v cells, (\$3.00 each!) when a distributor can sell you a non-branded cell that will perform just as well for less than \$1.00! Likewise, you can pay up to \$1.50 each for AA cells, while you could be buying the same performance for around \$.25. Fact is, if you could save thousands by simply buying from a distributor and erasing the brand name, wouldn't you want to?

**Small batteries** in all common sizes; AA, AAA, C, D, & 9V come in a variety of chemistry choices these days. Believe it or not, there are still many uses that are served by the old standby Carbon Zinc batteries of old. These are now known as Heavy Duty or Super Heavy Duty. In uses that are not high drain and long life is not an issue, Carbon Zinc batteries are cheap, light, and very reliable. We have a client that builds an air freshener unit in which the replaceable fragrance unit contains the battery power, and the Alkaline cells they were using lasted far longer than the fragrance did, clients were not happy. Switching to the Carbon Zinc, saved 50% on their battery cost, and the cells now

expire at the same time as the fragrance. The clients are now quite content. Plus, this chemistry is completely biodegradable.

**Alkaline cells** have evolved to a very high state of performance. These batteries will last longer than the older carbon zinc by 5 times or more. This makes them the perfect choice for most of our common devices and they are by far the most widely used batteries on earth. These too are completely biodegradable and can be disposed of in normal landfill bound trash. The alkali materials used to create the chemical reaction are all naturally occurring and safely breakdown in a surprisingly short time. They no longer contain any mercury or cadmium. The FDA supports this and does not classify these as hazardous for transport or disposal. All alkalines are not created equal, however. Small changes in chemistry blend can create very different performance in batteries.

One major brand advertises their brand by always showing it in flashlights or night vision goggles, but they never show you their batteries in toys or high drain devices. While the other major brand always shows you their batteries in high drain toys and the like. Ever wonder why? It is because their specific chemistry is



*Small batteries come in common sizes with a variety of chemistry choices.*

designed to perform well in that application. That same cell will do poorly in an application it was not designed for. Electronic door locks use alkaline cells almost 100% of the time. Only in areas of extreme temperature exposure or almost constant use are other chemistries indicated. **Only one company** has ever developed a battery chemistry specifically for the electronic door lock.

**In rechargeable cells**, the old Nickel-Cadmium (NiCD) cells have been replaced almost totally by Nickel Metal Hydride (NiMH). The newer NiMH cells no longer have the charge memory problems that plagued early users of NiCD. Basically, if you charged your NiCD cells up only halfway to capacity, the battery would remember the half charge and that would become the new full charge. Eventually, they would not hold a useable charge at all. NiMH cells, however, are more receptive to the way we actually use rechargeable battery devices. Ask anyone who uses a radio. While it should sit in the charger all night, it might be left in for half an hour, then you need it, drop it back in for 10 minutes, and go again. They are suitable for lower drain devices only. NiMH has no problem with this, and will take a full charge any time you can give it one. Both these and their older counterparts must be recycled.

**Lithium batteries**, from the button cells in your watch to the massive units that power today's electric vehicles, are still relatively new. Early on, these cells proved very dangerous indeed. Laptops bursting into flames, folks being burned by their cell phones, even airplanes crashing who were transporting them, are only a few of the known reports of failures. As a result of these early problems, most lithium compositions now feature some level of protection built into the battery to prevent overcurrent and heat failures. It continues to expand ever day as new blends, Lithium Ion, Lithium Polymer, Lithium Manganese and more, surface in the market. In Lithium cells, the activator is lithium, just as alkali chemicals are in alkaline cells. The difference here is that lithium is a much more powerful activator, and is far less stable. It is also a rare element, so costs are high. A Lithium AA cell will cost up to 10 times more than its alkaline counterpart, however it will not last 10 times longer. In fact, in most applications, it may only last twice as long. So at up to 10 times the price for only 2 x the service life, it is still not a good value proposition for most applications in hospitality. Plus, it costs more to ship due to International Air Transport Association (IATA) regulations, and must be disposed of via a recycler.

**Door Locks** - Most engineers with experience in electronic door locks place the maintenance of these locks on a PM schedule. The batteries or battery packs should be replaced every 6 months under normal to heavy use. A quality pack could easily last a year, but being proactive is always the best plan when it comes to direct guest services. The card reader in the lock should be cleaned out every month with a quality door-lock cleaning card. The actual reader head is very small and cards are constantly handled by guests and pick up skin oils, makeup, pocket lint, suntan oil, you name it; and it all gets deposited on the reader head. If the reader head cannot read the code, the door will not open. And, who is going to get that call? The newer systems have



*Most folks will be happy to change the TV remote's batteries.*

monitoring systems that allow a master computer at the front desk to collect data on the room use, access times, and even battery life in some cases. If your property has this resource, put it to use as a regular part of your PM programs.

**TV Remotes** - Most of today's replacement TV remotes use AAA alkaline cells. I say replacement remotes, because an astounding 25% of all TV remotes are stolen out of guest rooms every month, so you are always buying replacements. Even with a screw through the battery door, many guests find it irresistible and simply have to snatch the batteries out of the TV remote and either replace them with their dead ones, or leave it empty. So buying expensive cells is a real waste of resources here, since either the batteries or the remote itself is going to disappear long before those batteries run out. You can expect a year of service from a high quality non-branded cell. This task of replacing stolen or worn out batteries is really best suited to housekeeping. It only takes a minute to find the remote and pop open the battery door. If the batteries are not yours, have a supply on the housekeeper's service gurney so the housekeeper can change them immediately. I know of

several engineers who actually place a 2 pack of AAA cells in the desk drawer of each room. It really helps deter theft from the remote, plus when a guest calls the front desk complaining of a non-functioning remote, batteries are already in the room. Most folks will be happy to change them. Outside of these measures, change the remote batteries when you visit for the door lock battery change.

**Inventory** - Batteries are little and everyone uses them. Fact is they have legs. Sad to say, but these are best kept locked up in a cage. Batteries are a commodity with a 5-year shelf-life. Buying in quantity saves money and assures you have product on hand. We recommend a min/max inventory system with a 'first-in first-out' method of usage. A good rule of thumb for door lock batteries is to keep on hand 25% of your room count in door lock packs. These are custom made, by hand, so if you wait until you are out, you roll the dice. You simply have to have them when you need them, nothing else can substitute, and you cannot run over to the hardware store and pick some up.

**Recycling** - Recycling is a good thing, no questions about. But it does have a real cost. Recycling has become a big business. Think about it, you must pay a recycler to come and pick up your old batteries. Then, the recycler sells the materials and gets paid again. Nice work if you can get it. You most certainly want to do this with any and all hazardous materials and the obvious things at your property, but you might be surprised to find out what the recyclers simply throw away. Carbon Zinc, Alkaline, even some Lithium cells containing very small amounts of the compound are not considered hazardous waste and can literally be considered "green." These can simply go with your normal trash removal and will decompose nicely in a landfill. For more information on what your state stipulates, visit your state government website or contact your local hotel/motel association for location specific requirements. As a last resort, visit the EPA website and be prepared for a deep search and another pot of coffee!



## KEEPING a L.I.D. on HOTEL WATER COSTS

**Russ Horner, President  
Water Management, Inc.**

[www.watermgt.com](http://www.watermgt.com)

Do you know that fees for water, wastewater, and stormwater are increasing as fast if not faster than any other product or commodity in the U.S.? The majority of local jurisdictions in the U.S. now charge stormwater fees. Before the recent assessment changes, these fees were included in a hotel's tax bill, but increasingly these fees are being transitioned to your water and/or wastewater charge. This trend in new fee structuring is based upon charging a fee for stormwater run-off that is commensurate with a property's overflow of water and the municipality's removal of that water. Hotels and lodging facilities will increasingly find themselves subject to new fees and rising utility costs based upon the impervious nature of roofing and parking lot materials. In other words, the more roof and parking lot area (square feet) you have, the more stormwater runoff you will require the municipality to remove. Hotels and motels under new fee structures will be subject to unanticipated rising costs and scrambling to reduce excess runoff.

Most municipalities combine storm and sewer systems. However, many communities are strapped with collection systems dating over 100 years old. And, these systems are often in need of repair and upgrade. One legacy of 19th century municipal engineering is the Combined Sewer Overflow system that was designed to collect both sewage wastewater and storm runoff in the same pipes. These systems are mostly found in older cities along the east coast like New York City, Washington, DC, and Philadelphia, but are in fact found scattered throughout the



*Clean water through Low Impact Development (LID).*

U.S. Fortunately less than four percent of the U.S.'s 20,000 some municipalities have these antiquated combined sewer systems. Newer 20th century cities like Phoenix and Columbus are typically designed with separate sewage and stormwater systems.

ing storm water service fees as part of a storm water utility.

A stormwater utility is simply a funding mechanism dedicated to recover the costs of stormwater infrastructure regulatory compliance, planning, maintenance,

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***The new paradigm seeks to shift stormwater tax fees to a utility fee thereby including all contributors, both taxpaying properties and tax exempt properties, based on property area.***

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New EPA regulatory requirements, flood concerns, water quality issues and population growth all contribute to rising system costs of both maintaining and upgrading a storm sewer system. So how are municipalities responding to these new costs? They are doing so by adopt-

capital improvements, and repair and replacement. The new paradigm seeks to shift stormwater tax fees to a utility fee thereby including all contributors, both taxpaying properties and tax exempt properties, based on property area. Approaching the problem from a stormwater

utility perspective addresses the inadequacy of funding stormwater management by property taxes or water/sanitary service fees and moves directly away from Combined Sewer Overflow Systems (CSO) and focuses on separate stormwater and sewer systems for communities.

In theory a sanitary sewer system collects sewage and other wastewater and transports it to a facility for proper treatment and disposal. Even the best systems are subject to occasional blockages or failures due to structural, mechanical, or electrical problems. Sanitary sewer overflows can occur when any untreated sewage is discharged from the collection system. This excess discharge is often associated with pipe blockages, pipe breaks, infiltration and inflow from leaky pipes, equipment failures, or the population has out grown the system's capacity. During periods of heavy rainfall or snowmelt the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. Combined sewer systems are designed to overflow occasionally and when they do, they typically discharge excess wastewater directly to nearby streams, rivers, lakes, or estuaries.

Excess wastewater discharge may be dangerous to the public carrying with it harmful substances. The Environmental

Protection Agency (EPA) is mandating in over 750 cities a reduction in Combined Sewer Overflow (CSO) events. In December 2010, the EPA set limits on the amount of nitrogen, phosphorus, and sediment from sources necessary to attain adopted water quality standards. EPA established the mandatory regulatory requirement of a total maximum daily load (TMDL) requirement only after years of mostly ineffectual voluntary and required efforts of the various jurisdictions to reduce pollutants. The cost of compliance has not been fully realized and will likely cost our nation billions of dollars. Faced with tougher water quality standards and rising disposal costs numerous environmentalists are approaching the problem from differing perspectives. One leading expert, David Eckert, suggests clean water through Low Impact Development (LID). This approach addresses five essentials principals:

- Conserve sensitive lands
- Minimize pavement and building footprints
- Disconnect stormwater flow from current system and use water for other uses
- Infiltrate rainwater into groundwater through bio-retention basins
- Educate, maintain and enforce

As a water conservationist, I recommend

starting with simple steps that can be easily adopted to reduce run-off such as:

- Rainwater harvesting systems
- Bio-retention basins and
- Green roofs.

As some jurisdictions such as Philadelphia and Richmond are already discounting stormwater fees for businesses that are taking efforts to alleviate the run-off from their properties, others municipalities, such as our nation's capital are implementing innovative stormwater credit trading programs. With minimal planning and effort, hotel owners can reap the benefits of implementing LID and sustainable practices and help reduce the hidden costs of impervious roofs and parking lots.



*Combined sewer systems overflow to nearby streams*



# TOP 5 MOST CREATIVE IDEAS TO REDUCE EXPENSES IN YOUR ENGINEERING OPERATION

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If you are like me, you love a great “Best Of” list. You know what I mean...the top 10 richest supermodels ...the top 5 winning NASCAR drivers...and if you are a Letterman fan, the *Top 10 list of Top 10 Lists*. There is just something innately entertaining about the “best of” concept that keeps us just intrigued enough to read, listen or watch until the end hoping for vindication of our opinions or waiting to do battle with the author on theirs. Either way, if you are as easily entertained as I am, then here’s my take on the *Top 5 Most Creative Ideas You Can Implement to Reduce Expenses in your Engineering Operation*. Admittedly, it’s a topic not nearly as sexy as supermodels. But hey, neither is Letterman.

## 1) ATTIC STOCK...IT’S NOT JUST FOR THE ATTIC

Atop my list is the capital budget. Most properties have at least a modest reserve for replacement fund...monies for everything from room renovations to a new chiller. If you are lucky, you will have a say in what makes it on the capital list. But even if you don’t, make sure to take advantage of whatever capital funding you have by using it help mitigate foreseeable operating expenses that will invariably hit the engineering budget. As long as you follow accounting rules, this can be a highly effective operating cost reduction strategy.

Everyone knows to ask for extra carpet and wallpaper when they renovate. Not so much to save money, but because try-

ing to find matching materials years after a renovation can be next to impossible. But the idea of attic stock works well for other kinds of capital purchases. For instance, let’s say you are buying a new dish machine. Have the supplier include a stock of high-dollar replacement parts, like pump motors, bearings, spray arms, and heater elements. You’ll save a small fortune in the cost of repair parts over the life of the machine, and save time in sourcing and buying parts later on.

You can use this same tactic with less traditional projects, like refrigeration and lighting. If you are replacing a chiller, PTAC unit, or walk-in freezer, consider including an attic stock of refrigerant. Minor leaks over the life of even well maintained refrigeration equipment are inevitable, and the cost of most refrigerants, even modern ones, adds up fast. Next, if you are like me you may be looking at the next generation of lighting retrofit projects. Replacing incandescent and even fluorescent lighting with super energy efficient LED ‘s makes a lot of sense when you calculate the life cycle cost of the bulbs. But you will still need to have some bulbs in inventory for replacements, and your controller’s memory will be short when you try to explain why the

bulbs you used to pay \$.50 a piece for now cost upwards of \$15 apiece. So be sure to include a healthy stock of extra bulbs in the retrofit project...bulbs which may also be eligible for the same rebate as those being installed on day one.

## 2) BE YOUR OWN CONTRACTOR

For years, engineers have often been asked to judge the merits of outsourcing a portion of their work. Does it make sense to farm out air handler maintenance, kitchen equipment repairs, lawn care, etc.? Sometimes it does, sometimes not, but regardless of the answer deciding whether or not to keep work in-house is not the only consideration. Sometimes, it makes sense to bring work in-house, especially when that work does not require specialty skills or equipment. Case in point...*window washing*.

To be clear, I am not talking about the windows on your guest room tower. We’ll leave that acrobatic feat up to the professionals. I am referring to work done on the ground...all the glass that needs routine cleaning but is literally beyond the reach of your housekeepers or lobby porters. This work is often sub contracted, but can be brought in-house for a fraction of the cost using cost ef-

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*For the cost of a glass cleaning crew working one day a month, I was able to add a FTE to my staff who is capable of doing the same work in one week, leaving three weeks a month for virtually anything else.*

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fective, part time labor. Or better still, it may be feasible to add a full-time staff member for equal cost...creating an extra pair of hands for all those projects that can be done between window cleanings. In my case, tens of thousands of square feet of glass are within 15' of the ground (remember to count both sides). For the cost of a glass cleaning crew working one day a month, I was able to add a FTE to my staff who is capable of doing the same work in one week, leaving three weeks a month for virtually anything else. Need someone to help power washing...no problem. Want to relamp the ballroom? We've got just the guy to help. The opportunities are seemingly endless. So while you will probably still want to contract your chiller and elevator maintenance, take a hard look at some of your maintenance agreements that don't require such a high skill set. You might be pleasantly surprised.

### 3) ROSES ARE RED....

While we're outside, let's look at the landscaping. Many properties, even in urban settings, incur a significant expense every spring and fall, if not more often, for costs associated with their seasonal color rotation...fancy language for all those flowers you put in the ground that end up dying a few months later. These flowers are, to a great extent, a necessary consumable. Second only to a Bellagio caliber water feature, one could argue that nothing adds as much flare, excitement, and a warm sense of arrival then a well designed and vivid landscape rich in colorful flowers. But those little petunia pots add up fast, with costs shooting into the thousands or even tens of thousands for many properties. For this reason, consider perennials; the long term alternative to costly annual flowers. The obvious benefit of perennials versus annuals is longevity. Annuals last a season and get replaced over and over again, while properly installed and maintained perennials can last indefinitely, generating a much lower life cycle cost.

So why doesn't everyone plant perennials? I suspect the most common reason is ignorance of available selection and

aesthetics. When we hear "perennials", we picture plants and shrubs in umpteen shades of green... materials that provide the back drop in out of the way flower beds rather than plants that are worthy of taking center stage. But when properly selected and cultivated, the right perennials can allow you to have your crocus and eat it too. And the best part...drum roll please...since perennials are a *permanent installation*, their cost can often be capitalized, so the expense does not have to come out of your operating budget. Need more convincing? Here are some of my recommendations for flowering and/or colorful perennials that add lots of beauty, texture, and visual interest to even the most budget conscious properties.

#### **Flowering perennials offer colorful, cost effective alternatives to annual flowers.**

*From top left, black eyed susans provide striking visual contrast. Day lilies come in a variety of colors, and can bloom as much as three times a year depending on your climate zone. Daffodil bulbs bloom early, creating a splash of color within days of mild spring weather. Most bulbs are available in early and late season varieties, so you can mix and match to maximize your bloom window. Ornamental grasses, such as this Japanese blood grass, provide bold color and depth...this isn't your father's tall fescue!*



### 4) MULCH MADNESS

Since we are already standing in the flower beds, let's dig a little deeper into this frustrated horticulturist's idea bag. Pull back the flower pedals and take a closer look at what lies underneath...that overwhelming but agriculturally responsible pile of shredded trees known as *mulch*.

Well maintained mulch beds provide lots of benefits. Not only do they look nice and create a rich, dark background to help make your flowers and shrubs pop, but they also keep weeds down and the soil moist helping to bolster growth. Problem is...it doesn't last! Seemingly weeks after it goes in, traditional mulch transforms into an uninviting blanket of

matted, weathered grey blandness that does anything but generate visual excitement. But have no fear, dyed mulch is here! If you haven't tried it, prepare to become a believer. Dyed mulch holds its color all season, negating the need for an expensive top dressing of fall mulch. This will make the extra \$10/yd or so you will pay in spring well worth the \$50/yd you will save in fall. Or better yet...use the money to buy some perennials!

### 5) LOSE THE WEIGHT... AND GET PAID FOR IT.

After we've cleaned the windows and spruced up the landscaping, eventually we will have to get around to taking out the trash. For a hotel, this often

means having the compactor pulled, promptly followed by an invoice from your trash hauler detailing the weight of the compactor's contents...the basis for the hauler's charges. Since most markets charge for waste by the ton, the lighter your trash is, the less you pay. So what's the heaviest item in a hotel's compactor? The liquids are of course...an inevitable byproduct of our food-service operations. Fluids from F&B activities or even rainwater can saturate the contents of the compactor making it heavier and therefore costlier to dispose of. Closing your restaurants is one option to lighten the load, but there is an easier way to get the liquids out and reduce your hauling expense.

Take a close look at the front end of your compactor...the end with the operable door. Look for a pipe nipple or plug sticking out near the bottom. This orifice is designed for connection to a drain line that allows your compactor to squeeze out excess liquid every time the "compact" button is pressed...saving real money with every squeeze. If there's no orifice there, you can install one. Admittedly, you could start a composting program or feed your food waste to the local pig farmer, two of the many "greener" ways of keeping wet food waste out of your compactor. But, what this idea lacks in earth-appeal it more than makes up for in its simplicity. Once installed, employees have to do nothing...no extra work, no special bins and no concerns over the comingling of food and non-food waste. Just press it and forget it, and watch your trash bills shrink. (Note: the liquid byproduct from your compactor should be directed to a *sanitary* waste line... not the storm sewer. Consult your local

building codes before pursuing such an installation).

Hopefully, you will find a few of these ideas apply to your operations, or otherwise help to spawn an idea or two of your own. But for those of you who have stayed until the end looking for closure, I offer you this:

Kathy Ireland probably does not share our enthusiasm for the financial benefit of LED retrofits...at #1 she is reportedly worth over \$350 million. Equally impressive is Richard Petty, with over 200 Nascar wins, one can only wonder how prolific he would have been racing a compactor truck. As for the greatest Letterman Top 10 list of all time, there seems to be no shortage of opinions. From Y2K to Obamacare, the home-office in Sioux City, Iowa has apparently never been busier. But consensus seems to favor this winner . . .

The Top 10 Things Never Said Before on "The Sopranos", presented by the cast members themselves. Hmm, maybe I should re-think my idea about those daises.

*(A note from NAHLE's editor; this article was written prior to the unfortunate passing of James Gandolfini, may he RIP)*



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# DIAGNOSING THE WARNING SIGNS OF HOTEL INDOOR POOL PROBLEMS

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The hotel/motel industry is rife with problematic indoor pools.

Unfortunately many hotel chains unknowingly accept chlorine odors in non-pool areas, surface mold growth, condensation on windows, corroded metals and other dysfunctional signs. These problems are not acceptable and many times can be remedied with knowledgeable investigative troubleshooting by hotel engineers.



Natoriums, *building(s) that contain a swimming pool*, have many unique design challenges that are not always obvious to anyone unfamiliar with their state-of-the-art requirements. The dehumidifier, which is an indoor pool's key mechanical HVAC equipment, is unduly blamed. However, the majority of indoor pool problems are not related to the dehumidifier, but caused by the facility's original design and construction faults such as building pressurization imbalances, improper vapor barrier specification and installation, or dysfunctional ventilation design. They can also be due to poor water chemistry and maintenance. Regardless, most dehumidifier manufacturer's factory techni-

cians are good natatorium troubleshooters because they're typically the first responders to problems and see dysfunctional indoor pools firsthand.

## CHLORINE ODORS IN COMMON AREAS

Chlorine odors are noticeable in many hotel and motel common areas after only stepping into the lobby. Any hint of chlorine odors outside of the indoor pool area typically signifies a building pressurization problem.

Indoor pools are purposely designed with a slight negative building pressure under the guidelines of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards for natatoriums.

Negative pressure (exhaust air) is critical, because it ensures there is always some portion of natatorium air, presumably containing some pool chemicals, being exhausted and replaced with fresh outdoor air. Design engineers ensure negative pressure by specifying one or more exhaust fans in the ventilation system. A continuous dilution of the airborne chemicals helps ensure the best possible indoor air quality (IAQ).

The exhaust fan, which might be packaged with the dehumidifier or mounted separately, should be checked first. A positive building pressure in the pool area might signify the exhaust fan is no longer working properly or its original cfm configuration has been changed. All it takes is one person fiddling with the exhaust fan or outside air dampers and an imbalance of exhaust or outside air creates IAQ problems.

A facility with a long history of pool area chlorine odors, might have had someone decide that more outdoor air was needed for dilution. Thus, they may have opened the outdoor air damper and unbalanced the entire system by creating a positive pressure environment. Thus, the IAQ problem remains unresolved and new complaints inevitably arise about pool odors residing in the facility's outlying rooms. Thus, it's highly recommended that hotel engineers develop a solid understanding of the pool's overall ventilation system air pattern.

Burning eyes and respiratory irritations *within* the pool area might signify a chloramine problem. Chloramines are chlorine atoms that attach to ammonia, perspiration and other byproducts of human body functions. The result is a toxic, heavier-than-air chloramine gas that hovers just above the water surface in the human breathing zone. Typically, this problem is associated with water chemistry. All hotel engineers should understand pool water balance and have the test kits and training to test water even if outside swimming pool service companies are contracted to maintain pool water.

Persistent chloramine problems might better be solved with water side alternatives such as ultraviolet irradiation, sorghum moss, or a deck-level air capture exhaust system.

### CONDENSATION ISN'T ACCEPTABLE

A pool's dehumidifier is also many times blamed for excessive pool area condensation on windows, walls and ceilings, since its key function is to maintain a 40 to 60-percent relative humidity (RH).

Window condensation is never acceptable and can still occur even though the dehumidifier is providing low 30 to 40-percent RH levels. Instead of a dehumidifier malfunction, window condensation typically signifies an air distribution problem.



*Window surfaces colder than the ambient dew point temperature will experience condensation*

Window surfaces colder than the ambient dew point temperature will experience condensation, much like a cold can of soda on a summer day. The low insulating R-values of windows and skylights make them notorious for condensation when their surface temperature drops below the dew point temperature, which can be very high in natatoriums. For example, an 82°F space temperature plus 50-percent RH will produce a 62°F dew point temperature.

If proper airflow is distributed across window surfaces, thus warming every square inch of the window and/or skylight above

the dew point temperature, condensation can be eliminated. Another possible reason for airflow problems is ductwork installation errors. For example, sheet metal duct elbows installed too close to the dehumidifier's supply air discharge could cause airflow resistance or turbulence that might affect air distribution throw distances in the natatorium.

Overhead or under-deck ventilation ductwork should span the entire width of windows. A common architectural mistake is the specification of windows with mullions that jut out on the interior rather than the exterior. Interior mullions block air flow across the entire window surface. Hotel engineers can reroute ductwork or replace inadequate or poorly positioned diffusers to distribute even airflow across window surfaces.

While window condensation signifies air distribution challenges, wall condensation indicates the wall's insulation is insufficient or the R-value is too low. Wall condensation is the more serious issue of the two, as any amount of it must be addressed immediately to avoid serious building structure deterioration.

### VAPOR BARRIERS

Another problem related to walls and ceilings is the absence or breach of a vapor barrier, which is a ubiquitous plastic sheeting that basically envelopes the entire pool room.

Indoor pools are warm environments with 40 to 60-percent relative humidity (RH). This environment has a high vapor pressure relative to the outdoors during cold weather. The vapor barrier is akin to a balloon keeping moisture contained in the environment. A vapor barrier that isn't tight due to a tear allows moisture to migrate through walls and roofs toward the low vapor pressure of the outdoors. Just a small seam that wasn't properly sealed by the installing contractor or a tear during construction can allow moisture into areas where it will eventually damage the building envelope or even its infrastructure.

Condensation migration in subfreezing climates could produce ice on a natatorium's exterior wall or roof, which is a serious issue that should be addressed immediately.

### DEHUMIDIFIER OPERATION AND MAINTENANCE

Dehumidifiers don't require much routine maintenance other than regular air filter change-outs. Older dehumidifiers with belt-driven blowers may need routine fan belt tension checks and lubrication. More modern units with direct-drive fans typically don't need lubrication, however an on-site engineer should always keep his eyes and ears open for any unusual sights and sounds.

Outdoor exhaust dampers need regular cleaning. Generally, outdoor air dampers remain open 24/7 unless the pool area is subject to an occupied/unoccupied schedule that automatically closes them at night.

Like all refrigeration circuits, any visible bubbles or an unusual color in the liquid line sight glass, if there is one, can denote a problem with the system and a service technician should be called immediately. Some manufacturers have sight glasses on receivers for refrigerant level troubleshooting and the appearance of bubbles there doesn't necessarily denote a problem.

Relative humidity (RH) level performance by the dehumidifier can be checked with a hygrometer. Newer dehumidifier models have on-board microprocessor controllers with readouts for RH as well as space and water temperatures, refrigeration circuit operating pressures and other vital signs. High RH typically points to two problems: 1) the facility is being run at conditions for which it wasn't designed; or 2) the dehumidifier isn't operating optimally.

There are many instances where a facility unknowingly deviates or evolves away from its original space and water temperature design. For example, if water slides, water cannons and other water toys were added to the original design, it may raise the evaporation load to a level that surpasses the dehumidifier's capacity.

In another example, the pool's 82°F space and 80°F water temperatures, a two-degree differential recommendation that most experienced consulting engineers typically comply with, might have been skewed and the system is inefficiently wasting energy. Maintaining space temperatures above water temperatures minimizes pool water evaporation. If the room temperature is set below the water temperature due to complaints from fully-clothed occupants such as child chaperones or cleaning employees, for example, the evaporation rate will increase, RH will surpass acceptable levels and the dehumidifier's energy usage will increase exponentially.

Both of these examples illustrate the need for hotel engineers to find the system's design operating parameters and what type of dehumidifier/ventilation unit the facility has so operation expectations will be realistic.

A traditional compressor-based dehumidifier, which is used in a majority of natatoriums, should maintain 60-percent or lower RH and a year-round stable space temperature. A minority of pools operate ventilation-only style systems without compressors and a refrigeration cycle. They have the capacity of maintaining similar RH levels and space temperature with good controls during cooler weather by utilizing drier, outdoor air. However, as outdoor temperatures get warmer, the ventilation-only system can only provide temperatures that are available outdoors, thus humidity levels will generally surpass 60-percent in summer months.

## DEHUMIDIFIER REPLACEMENT

Technology advancements the last 10 years combined with the EPA's phase out of R-22 refrigerants make dehumidifier replacement more feasible than ever before.

Since all refrigeration coils leak sometime during their lifecycle, replacing R-22 (HCFC) machines with dehumidifiers that use less expensive, environmentally-friendly HFC refrigerants will pay dividends as R-22 refrigerant costs continue to skyrocket during the phase-out. Larger dehumidifiers, such as those used for resort indoor water parks, might also find more economy in a modern dehumidifier replacement that uses glycol heat rejection loops to reduce refrigerant charges by up to 85-percent and limit the cost and environmental liabilities of refrigerant leaks.

Many of today's dehumidifiers offer Web-based monitor and control where the factory technicians can set-up alarms and review dozens of operating parameters via the machine's Ethernet connection. This highlights efficiency and performance problems and expedites repairs immediately instead of waiting for months of inefficiency to discover the problem during annual service check-ups.

Furthermore, recent technological improvements such as exhaust air heat recovery and direct drive fans have such huge impacts on energy savings versus dehumidifiers from 10 or more years ago, that replacement costs are many times offset by quick paybacks.

Since the 1980's, a very common feature among dehumidifiers is energy recovery from compressor waste heat to provide free pool water heating. Frequently, dehumidifier manufacturers find this option not hooked up on-site. Instead the back-up conventional pool water heaters, that rely on gas or electric, are providing pool water heating. Or the auxiliary pumps associated with the free pool water heating are not installed or working properly. Free pool water heating from heat recovery can save thousands of dollars annually per location in energy costs.

*Seresco recently produced a free Professional Development Hour (PDH) video available at [www.serescodehumidifiers.com](http://www.serescodehumidifiers.com). (NAHLE will be requesting a copy of this video to make available on our new website) The video targets the continuing education requirements for consulting engineers, but also serves as an invaluable primer of indoor pool design and operation basics for hotel engineers and their maintenance staffs. The bottom line for the hotel engineer is to know the basics of natatorium design and the system operation, so that any problems can be recognized sooner and the real cause is quickly identified and rectified. The end result will be a more comfortable environment for patrons and a long-lasting facility with the lowest possible operating costs. ■*



# THE 2013 GRAINGER SHOW

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**Orlando, FL.** NAHLE, had the pleasure of attending the Grainger Show this spring with thousands of building and facility maintenance engineers from across the country. Since many of our members have asked about the event we wanted to share our experience and what we learned about this amazing organization.

**The Grainger Show** was designed for building engineers to find solutions that improve their facility's bottom-line performance and help operate their properties efficiently, economically, and safely.



Attendees gain valuable knowledge by connecting directly with industry-leading suppliers, business-issue experts, Grainger representatives and their peers.



Guests attend educational sessions and networking discussions for specific groups including hospitality, safety, sustainability, inventory management, property management and emergency preparedness to name a few.

**Grainger Town.** Engineers can browse through Grainger Town to learn about specialized areas. Attendees can visit the General Store for Inventory Management Solutions and the Grainger Branch to learn about customer services, sourcing and tech support. They can visit the



Travel Agency to speak with the International team or check in to the Library to speak with industry experts on how to reduce costs or visit New Construction



to learn about implementing the newest solutions in sustainability for business. The Police and Fire Station helps attendees integrate the latest in safety and emergency preparedness. That's a lot of information in one place.

Walking the floor and mingling with attendees and a vast array of manufacturers and suppliers is a wonderful way to view the latest innovations, tools, technologies, and solutions. As with everything Grainger does, the floor is organized into supplier categories so you can make the



most of your time finding products and learning about the latest solutions from highly qualified industry representatives loaded with information and resources



*Jim Ryan, Grainger's Leader and CEO*

from the world's leading manufacturers. It is great fun and truly an educational experience in itself.

### **GRAINGER HISTORY**

Grainger was founded eighty-five years ago by William W. (Bill) Grainger as a wholesale electric motor sales and distribution business in Chicago in 1927. He established the company to provide a consistent supply of motors. Sales in the early days were generated primarily through mail order via post cards and a catalog. The MotorBook, as the catalog was originally called, was the basis for today's Grainger catalog. To improve customer service, Bill Grainger opened a branch in Philadelphia in 1933, and then three additional branches the following year. By 1936, there were 15 branches in operation.

In 1967, Grainger became a public company and today there are more than 700 Grainger branches making the company North America's leading broad-line supplier of maintenance, repair and operating products, with expanding global operations.

### **A CONVERSATION WITH GRAINGER'S LEADER, CEO, JIM RYAN.**

"Cost are going up significantly and companies are looking for cost savings," explained Ryan, "this not only means managing the cost of products, but providing information to maintain equip-

ment, help companies with compliance and support work safety to reduce the cost of lost time from accidents. We are serious about environmental friendly cost management. Company's that tie sustainability to cost savings helps all of us. Think about the new lighting products that drive down costs and improve energy conservation. Grainger now offers 10,000 energy efficient products. Even our headquarters is LEED certified."

Ryan, who started his career in the warehouse, said Grainger is growing rapidly, "Grainger has launched a five-year plan to become the leading product supplier in the world. As a service provider, we will deliver products the most efficient way possible, from our warehouse, directly from the manufacturer or if it is an emergency we have last minute delivery from a local branch. Whatever it takes, Grainger will deliver what our customers need."

But that's not all, Grainger is also proactive in education. "As consultants we help our customers find opportunities to do their job better. Our sales people will walk your facility and make recommendations on things you can do differently. We are hiring a sales force with experience in every segment, working with trade associations to share information and adding products in specific verticals," said Ryan.

### **HOSPITALITY NETWORKING SESSION & REGULATORY AFFAIRS.**

After our meeting with Jim Ryan, Bob Elliott, CEO of NAHLE, spoke at the Hospitality Networking Session, hosted by Robert Bahl, Vice President, Engineering, Marriott International and

attended by hotel engineers from across the country including Bob Jones of Marriott and Randy Gaines of Hilton to name a few. Bob Elliott updated the group on regulatory affairs in the hotel industry and led an informative discussions on CO detectors and storm water management, concluding with a lively discussion on electric vehicle charging stations.

Meeting with Jim Ryan, one immediately senses he is a highly energized and focused leader whose goal is to deliver the highest quality products fast and efficiently. According to Jim, "our mission is to be a very organized supply chain for our 20 million customers. With 400,000 products in stock and over 700,000 products on Grainger.com our customers can see if the product is in stock and determine how long it will take to receive their items. If we don't have it, we will find it and deliver it. Customers can call or visit our 700 Grainger branches for personal service or you can search products on the go with Grainger's new mobile app.



*Jim Ryan and Robert Elliott*



# CRITICAL ISSUES IN HOTEL ELECTRIC VEHICLE CHARGING STATIONS

**John Kalb**  
**EV Charging Pros**

<http://www.evchargingpros.com>

After years of preparation, the electric vehicle industry is gathering real momentum. From multiple vehicle models for consumers to choose from to the growth of publically available charging stations, it is clear that the electric vehicle market is at the beginning of a significant growth curve. The Electric Vehicle Drive Association reports that over 69,000 plug in vehicles (both hybrids and all electric) have been sold in the United States in 2013, up from 52,000 for the entire 2012 model year. Since 2008 over 150,000 highway-capable plug-in electric cars have been sold in the US through October 2013.

## Infrastructure Standards Are Available

With a worldwide plug standard (SAE J1772) now in place for both charging devices and cars, EVSE (the industry term for a “charging station”) is now being deployed commercially around the world. EVSE stands for Electric Vehicle Supply Equipment.

A major industry organization, Pike Research, projects that by 2015 close to 200,000 charging stations will be installed on commercial properties and in public spaces across the country—a more than tenfold increase from today. The Department of Energy states that as December 1, 2013 there are 19,413 electric fueling stations in the US.

Hotels have been installing electric fueling stations at an accelerated pace. By the end of 2012,

more than 50 Marriott properties offered EV Charging Stations with that number continuing to grow in 2013. Marriott now lists the properties with dedicated electric vehicle charging stations section on their website.

## The Decision Process

Hotels are becoming aware of the competitive advantage they receive when they install and operate an EVSE in a competitive marketplace. The idea of adding a charging station to differentiate your property can be attractive if it attracts guests. It seems simple, install a charging station and guests will search out your property and stay at your hotel for an overnight charge. If you strike now, you set yourself apart from the competition, maximizing the benefits to your company both today and over time.

Yet the challenge in deploying EVSE infrastructure is not as simple as selecting a vendor, purchasing equipment and letting guests charge as necessary. Questions you will have to answer in the beginning are how many stations, where do you place them, do you charge guests for the service, which type of chargers to purchase or lease, and which promotional networks to join. You will also have to consider questions regarding installation, marking and promoting the stations, managing the availability of the stations, valet charging, capturing user experiences, codes and regulations, interfacing with PMS (Property Manage-



*“Fairmont Hotel Electric Vehicle Charging Station”*

ment System) and determining if outsourcing the entire program is the best way to go.

The decision about why and how to install charging stations is always organization and site specific. Any decision requires an understanding of a complex set of information required to effectively deploy and operate EV charging stations. This is a decision that is at once both strategic and tactical. The strategic aspects should be well considered by the CEO, senior

marketing executives, and/or director of sustainability. In too many companies, however, EVSE is seen as a short-term tactical decision, and so determined largely by facilities and operations managers, with a focus on price and technology issues rather than overall strategy. Once a company realizes that no one is addressing the bigger strategic questions, this can lead to stalled projects.

Businesses must first choose from three major competing charging and operational models, each touted by its proponents as “The Way”:

- In the owner-operator model, a business (the hotel) runs the EVSE, offering free charging services to tenants or customers and accruing profits through higher occupancy, increased foot traffic, and/or customer loyalty.
- In the networked service model, a business (the hotel) determines what to charge end users, splitting the income with an EVSE vendor that operates the networked-based transactional back-end.
- In the leasing model, the company outsources all EVSE installation and operations to an outside contractor, which leases the space for a set fee. The contractor handles everything from deployment and maintenance to pricing and advertising.

Other information is just as critical in the decision making process. Pursuing the EVSE opportunity means assembling a team of decision makers from across the company. Together, such a cross-functional team can research and evaluate multiple vendors and business models and then craft a comprehensive deployment plan.



*Car receiving electrical charge*



*Parking lot with multiple charging stations*

### **Major issues for consideration:**

Are we installing a single charger or scalable infrastructure for multiple chargers over time? This goes to the heart of the existing power availability of a property, as the industry standard Level 2 charger requires a single dedicated 240v circuit and a 40a breaker for each charging station. Scalable infrastructure may require additional transformers and power panels. Power availability and load calculations are critical because the National Electric Code (NEC) Article 625 states that charging stations are continuous devices, meaning that for permitting considerations the stations are always drawing load.

Where to locate the charging stations? Frequently the “best” location is visible to the public and adds to a property’s curb appeal though often a long distance from the power room. The cost of installing a charging station is directly related to the length of the run of conduit and trenching, concrete and landscaping requirements.

### **Why ADA Compliant?**

There is also the issue of accessibility to be considered. While charging stations are technically considered “alternative fueling stations” and are not covered by current ADA regulations, most cities require that the first station deployed be “accessible” to the ADA specification.

### **Three Levels of Charging Stations.**

Modern charging equipment consists of the vehicle’s standard connector and receptacle based on the standard developed by the Society of Automotive Engineers (SAE J1772) International. Any vehicle with this plug receptacle should be able to use any J1772-compliant Level 1 or Level 2 EVSE. All major vehicle and charging system manufacturers support this standard in the U.S. This standard also eliminates drivers’ concerns about whether their vehicle is compatible with our nation’s infrastructure.

**Level 1** or AC Level 1 EVSE provides charging through a 120 volt AC plug and requires electrical installation per the National Electrical Code. Most Level 1, if not all, will come with an AC Level 1 EVSE cord set so that no additional charging equipment is required. On one end of the cord is a standard, three-prong household plug (NEMA 5-15 connector). On the other end is a J1772 standard connector (see the Connectors and Plugs section below) which plugs into the vehicle.

AC Level 1 is typically used for charging when there is only a 120 V outlet available or when the vehicles are going to be parked for a stretch of time, such as overnight parking at airports and hotels. Based on the charging capabilities of most vehicles today, AC Level 1 charging adds about 5 miles of range per hour of charging time.

**Level 2** equipment uses the same connector on the vehicle that Level 1 equipment uses and seems to be the preferred choice of many drivers who use public charging stations.

Level 2 charging uses 240 V or 208 V electrical service for commercial and residential applica-

tions. Level 2 EVSE requires installation of a dedicated circuit of 20 to 80 amps, depending on the EVSE requirements. Level 2 charging is offered by almost all equipment vendors and frequently is integrated with charging network software, which allows site hosts to set access policies, transaction or session fees as well as collect and reconcile payment by drivers. A discussion of network features will be in the next article. Based on the charging capabilities of most vehicles today Level 2 charging adds about 20 miles of range per hour of charging time. Link to more info at:

[www.afdc.energy.gov/electrical\\_charging](http://www.afdc.energy.gov/electrical_charging)

**DC Fast Charging** (DCFC) equipment, typically requires typically 480 V AC input. These chargers enable rapid charging along heavy traffic corridors and at public stations. There is a lot of focus in the industry at creating a network of DCFC along highways to service the needs of drives requiring a fast charge for a fee. Not all vehicles can use DCFC due to the requirement to have a completely different plug than the J1772. In the future resolving plug compatibility will be a key to the evolution of the EV industry.



*The standard J1772 receptacle can receive charge from Level 1 or Level 2 equipment.*



*An electric car charging station for underground garage.*

## Charging Time

How long does it take to charge a vehicle? Each car using a charging station will require a different time to charge. Charging a vehicle is actually dependent on three intersecting concerns,

1. How much power is the charging station receiving (110v/15a or 240v/40a),
2. What is the capability of the on-board vehicle charger to draw that energy and convert it to use by the battery (usually 3.3 kWh or 6.6 kWh) and ,
3. What is the size and state of charge of the battery (15kWh up to 30 kWh 10% to 100% required). A good rule of thumb is that a vehicle using a standard Level II charging station will be able to put up to 20 miles of range in the battery in an hour.

### Charging Times per Level

(from completely empty to completely full):

1. Level 1: Standard charge time: 12-16 hours
2. Level 2: Standard charge time 4-8 hours
3. Level 3: Standard charge is less than 30 minutes (also known as fast-charge)

Hotels have a unique opportunity to differentiate their property both for short-term uses (such as meetings and events) and with increasing daily occupancy rates for overnight guests. Planning, designing and deploying charging EVSE infrastructure may seem complex but, it is no more complex than any other capital improvement project. And, unlike other amenities a property might invest in, offering electric vehicle charging can create a clear marketing benefit to an attractive demographic looking for locations to visit on a regular basis.

## A Growing Market

The electric vehicle movement is rapidly becoming a reality. Canada now has a “Green Highway” of charging stations conveniently located across the country enabling EV owners to drive from the Atlantic to the Pacific Ocean without “range anxiety”. In the U.S., states are taking the initiative; North Carolina is developing their own “Green Highways” with charging stations at rest areas and exits along its highways, New York’s Governor Cuomo announced Charge NY, a new \$50 million initiative to promote EVs by installing 3,000 public charging stations by 2018 to service 40,000 EVs which is expected to grow to one million by 2025 and Illinois is offering a 50% rebate to hotels to encourage installation of EVSE in 2013. (<http://www.afdc.energy.gov>)

As the demand for EVSE grows, hotels are busy investigating how to link the EVSE to room reservations and yes, charge an additional fee. This ensures the EV guest is guaranteed a space and charger for their stay and the EVSE becomes a profit center. The increase in EV’s is leading hotels, communities and rental car agencies into partnerships to ensure the EV driver has access to a charging station during their stay.

These and many other considerations will be addressed in future issues of *Lodging Engineer* magazine. Visit our website Resource Center for more information at <http://www.nahle.org>.

*John Kalb of EV Charging Pros guides commercial property owners and managers through the EV charging process—from strategy to tactical deployment and operation. His team has deployed over 300 charging stations since 2010. John Kalb can be reached at [johnk@evcharging-pros.com](mailto:johnk@evcharging-pros.com) or (415) 209-6585.*



## HIDDEN DANGERS DETECTED WITH INFRARED SCAN

**Tom Belger, CDOE**

Licensed Electrician, Practicing Hotel Engineer

Wear and tear is an accepted fact in all mechanical equipment but do we look at the electrical circuits that deliver power to this equipment in the same way? In a lot of cases building equipment problems give themselves away through visual and audible signs. It is almost as if the equipment is telling us “hey problem over here!” Like a 60-amp 10-HP motor driving a worn out belt or that same motor with bearings that are about to go, these specific noises will give themselves away every time to the experienced engineer. But the dangers that lay silent and out of sight can be the most threatening, costly, and just plain dangerous to personnel safety.

In commercial buildings there are dangers that lay hidden. Loose electrical connections, overloads, loads that are unbalanced, and changes made here and there to the building (added loads) in the past, can wreak havoc on electrical switch-gear, panels and branch circuits.



*Dust and Dirt Can Accumulate Causing A Potential Fire Hazard*

There are companies that offer services using infrared scanning technology equipment offering different tiers of services. Depending on your buildings specifics, the skill level of your engineering department, and local and federal codes and regulations

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*“An infrared scan gives you the confidence of knowing where potential electrical hazards hide and puts you in control of addressing them based on the recommended severity.”*

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All electrical circuits under a load generate heat and heat always gives off light. However, this light is not detected by wavelengths seen by human eyes. If you would, imagine electrons moving through wires, creating friction and that friction is turned into heat (this is a good way to think of amps). This is the heat that is only detected in the infrared portion of the electromagnetic spectrum. The more friction the higher the temperature but sometimes the temperature is higher than what the equipment and wires are rated for. This is when electrical hazards occur.

you can determine what tier of service is best for your property.

As one of the two electricians at a very popular Westin Hotel (*due to liability concerns we are not identifying Tom’s property*) I can say with confidence that we are dedicated to safety of personnel and property.

I personally accompanied Jeff Craig technician from Edward G. Sawyer Co., Inc. on our building



*LockOut-TagOut Safety Procedures*

survey. As a MA state licensed electrician I was able to take part in the scan by removing panel covers and switch-gear covers. Adorned in my Personal Protective Equipment (PPE) I was able to fix the easily remedied hazards making sure not to slow the scanning project down knowing full well the importance of a complete building scan. From bottom up we checked all switch-gear, electrical panels, transformers, troughs, and anything with wires going into and out.

All buildings, including hotels, have potential electrical hazards, it's just a fact. An infrared scan gives you the confidence of knowing where they hide and puts you in control of addressing them based on the recommended severity.

The benefits of an infrared scan speak for themselves;

- pinpoints hot spots in electrical systems,
- reduces unscheduled outages and losses,
- reduces electrical energy costs by increasing energy efficiency, and
- avoids unscheduled maintenance along with creating an electrical maintenance programs based on your findings.

Equipment damage and preventing catastrophic failures is a big part of any engineer's responsibility in any building. Arming yourself and your crew with the knowledge of these potential dangers is a key component. Establishing repair priorities and being proactive in the fight against electrical hazards is a 'no brainer.' We can stay on top and ahead of the dangers a lot more easily by implementing a yearly infrared scan.

If your building does not have an electrician, the scanning technician will be accompanied with one. A complete equipment problems report will be presented a day or so later with all of the findings in an easily understood paper binder and pdf file. The report will have pictures taken with the infrared scanner by the technician of all your building electrical equipment indicating locations, breaker numbers, panel schedule, etc. The infrared pictures indicating the hazards will have references to indicate recommended levels of severity and action items.

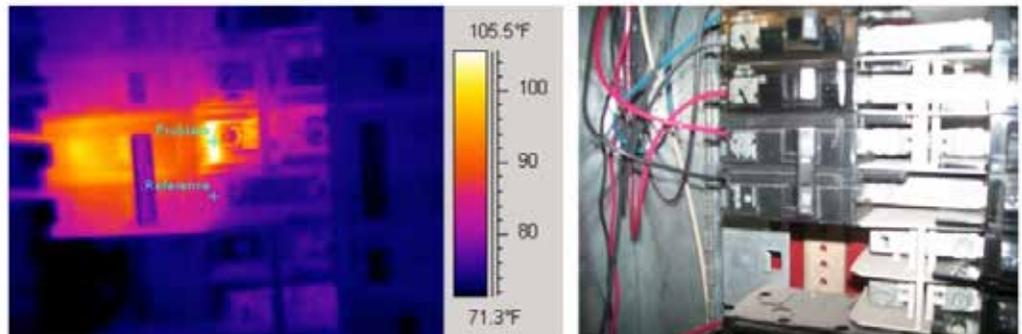
Working in hospitality you develop an uncanny sense of service you just don't see anywhere else. The engineering department's attitude



*Electricians: Bob Baker & Tom Belger in Personal Protective Equipment*

towards this service is no different than any other department in the hotel. It is just that we may serve our clients and guests in a little different way, by providing a safe and efficient environment. It is true we stay out of common areas as much as possible for the reason if you see us, then something must be wrong and we are on our way to fix it. Most of our work is behind the scenes such as keeping environmental air flowing, keeping motors turning and lights shining and making sure that our back up emergency systems are going to work flawlessly in the event of a disaster.

<b>Problem Description</b>		<input type="checkbox"/> Immediate Hazard	<input type="checkbox"/> Customer Notified Immediately
Circuit #15 line side connection to the bus on has a temperature increase compared to circuit#17 and millivolt measurements confirm poor connection.			
<b>Recommendations For Repair</b>		<input type="checkbox"/> Repair Equipment	<input checked="" type="checkbox"/> Replace Equipment
De-energize circuit, remove breaker and inspect contact surface and replace with a new 2 pole 20 amp type BQ breaker.			
<input type="checkbox"/> Problem Corrected	<input checked="" type="checkbox"/> Tightened/Torqued Connection	<input type="checkbox"/> Corroded/Discolored	
<input type="checkbox"/> Overloaded Circuit	<input type="checkbox"/> Excessive Current Harmonics	<input type="checkbox"/> Stripped/Cross-threaded Hardware	



*Infrared Scan Report*

Scheduling infrared scanning company Edward G. Sawyer Inc. was part of our proactive, predictive approach to building safety. Neutralizing the uncovered potential hazards and dangers that would have otherwise gone unnoticed gives you a great sense of pride that you are doing everything possible to keep your building running safely.



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# Integrated Pest Management: Encouraging Pests to Find Shelter Elsewhere This Summer



**Ron Harrison, Ph.D.,**  
 Director of Technical Services  
 Orkin, LLC

August has arrived, which means hoteliers around the country have geared up for the peak travel season of the year. Millions of Americans, not to mention countless travelers from all around the world, are booking transportation and lodging for their vacations, searching for a comfortable hotel where they can relax. And vacationers are not the only ones seeking out hotels for a break from the heat – pests are following suit.

When temperatures rise, pest activity increases as well. To manage pest activity on your property, it is imperative to establish a robust Integrated Pest Management (IPM) program. IPM goes above and beyond traditional pest management; instead of relying solely on chemicals to reactively repel or kill pests, IPM focuses on non-chemical techniques such as exclusion, sanitation and facility maintenance to help keep pests away proactively. An effective IPM plan also requires a higher standard of scientific expertise, including knowledge of pest biology, pest behavior and best practices in pest control technology. This knowledge helps to better understand why pests do what they do and in turn better prevent them.

To ensure your IPM plan is as strong as possible, be certain it includes the following:

- **Pest Management Partner:** Your relationship with your pest management provider should surpass typical vendor status. Your pest management provider should be a partner who takes the time to design an IPM program especially for your property, adjusting the plan over time as pest pressure and your pest control needs evolve.
- **Staff Empowerment:** Work with your pest management provider to host an IPM training for your staff, as they are your eyes and ears and are often the first to see pest problems around the property. By hosting an IPM training, your staff will gain an understanding of your IPM program and their role in preventing and controlling pest activity at your hotel.
- **Non-Chemical Prevention:** Exclusion and facility maintenance should play major roles in your IPM program to help prevent pests from entering the building. Common techniques include sealing all cracks and crevices with weather-resistant caulking, closing any holes on exterior walls, adding weather stripping around windows and installing door sweeps to limit gaps under doors. You may also consider mounting air curtains and working with an HVAC professional to ensure there is positive airflow at doors that pushes pests away from entrances.

- **Sanitation Regimen:** Sanitation is an important component of IPM that helps manage pest activity. Work with your pest management provider to establish a stringent sanitation regimen that covers indoor and outdoor areas. Inside, keep food covered in continental breakfast buffet areas and otherwise stored in airtight containers. Clean spills and crumbs immediately. Outdoors, inspect the grounds and parking lots frequently to look for trash or standing water that can attract pests. Consider using an organic cleaner to break down the malodor molecules that create pest-attracting odors in your dumpster, which should also be placed as far away from the building as possible.
- **Chemicals as a last resort:** While IPM focuses on proactive prevention instead of reactive chemical use, some pest issues may require targeted use of chemicals. Your IPM partner should only use chemicals when all other proactive, non-chemical-based methods have been exhausted. After the targeted treatment, your partner should follow up with non-chemical methods and monitor the program for effectiveness.
- Trimming vegetation and tree branches and removing any dead or diseased plants or limbs to create an 18-inch buffer around your building's perimeter.
- Inspecting door sweeps, weather stripping and window screens to ensure they are in good condition throughout the hotel.
- Sealing all cracks and crevices on exterior walls of your hotel to prevent ants from slipping in unnoticed.
- Cleaning all food and drink spills as soon as possible both indoors and outdoors as the debris and residues are an attractant to ants and other pests.

Now that you have a basic understanding of IPM, here are more specific tips regarding two common summer pests: ants and mosquitoes.

**Ants** are often considered the most annoying pests because they can pose health risks and cause structural damage. Their tendency to colonize in high populations also makes them incredibly difficult to manage. If you have an active ant infestation, work with your pest management provider to identify the species of ant on your property. Correct identification of the ant is vital, as the treatment program is fully dependent on the species. However, you shouldn't wait until you see ant activity to manage the situation – there are plenty of ways you can proactively prevent ants from coming in your buildings, including:



**Mosquitoes** are not only annoying; they pose serious health threats to your guests. Mosquito bites can be dangerous because they are capable of transmitting West Nile virus, Dengue fever and the recently discovered Chikungunya virus, along with other conditions that cause encephalitis, or swelling of the brain. According to the Centers for Disease Control and Prevention, in 2013, more than 2,300 cases of West Nile virus were reported in 48 states.

Ways to help protect your guests from mosquitoes include:

- Removing any sources of standing water, such as gutters, birdbaths and plant pots— mosquitoes only need 2 to 3 inches of water to breed.
- Inspecting window screens to ensure they fit tightly and have no holes.
- Installing automatic doors at entrances to your hotel, and using double doors at the busiest entryways.

- Treating breeding sites (and sometimes vegetation) around the property. This can significantly reduce mosquito populations.

By establishing a robust IPM plan and following these tips to proactively prevent ants and mosquitoes or, you will help ensure your hotel is ready to give a warm welcome to visitors this summer – and show the door to pesky pests.

*Ron Harrison, Entomologist, Ph.D., is Director of Technical Services for Orkin and an acknowledged leader in the field of pest management. Contact Dr. Harrison at [rharriso@orkin.com](mailto:rharriso@orkin.com) or visit [www.orkin-commercial.com](http://www.orkin-commercial.com) for more information.*

### Maintenance Tip:

Bed Bugs are the bane of the hospitality industry's existence. These transient pests can make their way room to room on your guests' luggage, their clothes and even their bodies all year long. Miss just one female bed bug and your hotel can become infested with more than 300 adults and 1,000 eggs in just three months. These pests will not only irritate your guests, but will quickly tarnish your hard-earned reputation. Here are a few tips for spotting activity:

- Bed bugs are nocturnal and difficult to spot during daytime hours. Inform your staff to be on the lookout for tiny ink-like stains or molting skins on mattress tags and seams, between or beneath furniture cushions and behind headboards during their daily routines.

If you spot a bed bug or signs of activity, your pest management provider may advise you to take the following steps:

- Move loose furniture like desks and chairs into the center of the room and turn them over.
- Keep the conditions of the room the same as



when signs were spotted – do not adjust the temperature or attempt to clean the room.

- Remove any items from the walls and place in the center of the room.

Lastly, your pest management provider may recommend a few different service options to clear the area of bed bugs. This may include vacuuming, heat treatments and/or targeted residual treatments. To ensure the bed bugs haven't traveled to adjoining rooms, your pest management provider may recommend DNA testing or a canine inspection to determine if the infestation has moved outside of the initial room.



# ELECTRIC MOTORS IN HOTELS: PART TWO

**William Blackmon, CDOE**

[WilliamBlackmon@tech-center.com](mailto:WilliamBlackmon@tech-center.com)

In the first article of this series, we discussed the broad range of machines and equipment at a typical property that rely on electric motors. When you stop to consider the total number of electric motors that are in operation every day at your property, it is apparent electric motors are highly reliable. However, they can and do fail. Without a solid understanding of motor systems, repair and troubleshooting can be difficult for even the most experienced engineers. This can lead to costly mistakes and unnecessary delays. To help you prepare and be ready to overcome that challenge, NAHLE and the author have teamed up to bring you this series of articles.

Before we begin our next topic of this series, we need to review the two main points I introduced in the previous article. First, safety must always be your most important priority when working on, or near, electric motors. You must be fully qualified, trained, and authorized to work on energized electrical equipment, as well as rotating equipment. This is not a training course for the inexperienced, nor is it intended to be. Second, always keep in mind that electric motors are not stand alone pieces of equipment. Rather, electric motors are part of a complete system. Issues or failures in one part of the system can, or will, effect or cause failures in other parts of the system. If you missed the first article, it is critical that you take the time to read and understand these two topics. The first article can be found at: [http://nahle.org/eMag/Lodging-Engineer\\_Summer-2014/](http://nahle.org/eMag/Lodging-Engineer_Summer-2014/).

Now, we will look into the basics of electric motor design and operation. This is the area where the majority of lodging engineers, maintenance technicians, and even electricians fall short in their knowledge and understanding. Without understanding these basics, it is difficult, if not impossible, to develop competency in troubleshooting and repair of equipment powered by electric motors.

You may be surprised to learn motors are basically nothing more than electromagnets. Manufacturers manipulate the internal design and construction of motors to take advantage of the properties magnets exhibit, attraction and repulsion. As children, we were amazed by how one magnet could create motion in another magnet, either by drawing it closer or forcing it further away. Unfortunately, these magnets could not sustain that motion. The magnets either attracted tight against one another, or were forced far enough apart they no longer had any influence on each other. However, if you could hold the magnets at a specific distance apart, you could feel constant force between them. This is the exact method employed to keep electric motor shafts in motion. By developing and maintaining magnetic forces at specific distances, we can manipulate those forces to convert electrical energy into mechanical motion.

If this sounds too simple, you are correct, in a manner of speaking. While the basic theory is simple, the actual design is complex. Many factors govern the way the magnetic forces are developed and utilized. This is the reason there are many different types of motors and even variations within each type. To develop a more complete understanding of an electric motor, we must take a closer look at these factors to determine what effect they have on the operation and performance of an electric motor. Only then will we be able to identify issues as they develop. Since we are limited in time and space, we could not attempt to cover all the different motor types by just a series of articles. Therefore, we will limit the focus of these articles to the one main type of motor you will encounter most, the AC induction motor. There are many other types of motors, but the AC induction motor is the most common motor in use today and is considered the workhorse of the world.

AC induction motors are manufactured in both single phase and 3 phase variations in a wide range of horsepower ratings. As you are probably aware by the name, they are designed to operate on alternating current systems. The term induction comes from the manner in which the current flow induces magnetic fields. They are fairly economical and are highly reliable, if properly installed and maintained. Now, let us cover some basic terminology that you need to know before continuing.

**Winding:** Wiring that is installed and wound inside a motor in a specific manner. The type and size of wire is dependent on the design and horsepower rating of the motor.

**Stator:** The winding that is mounted to the main housing and serves to produce an electri-

cally rotating magnetic field. Stator is derived from the term “stationary” as it does not move physically, but the magnetic field it produces is said to have electrical motion. Simply put, the current flow moves through a specific path due to the way the stator is designed. The effect basically causes the magnetic field to rotate in a circular motion around the circumference of the motor.

**Rotor:** The conductive assembly that rotates in the middle of the stator winding and that is mounted to the motor shaft. Rotor is derived from the term “rotary”. It is forced and kept in motion by the magnetic attraction it has to the revolving stator magnetic field.

**Shaft:** The part of the motor that the rotor mounts to and is used to connect and transfer the power of the motor to whatever the motor is designed to drive. Since the rotor and shaft are connected together, the terms can be used interchangeably.

**End bells:** The ends that enclose the motor housing and hold the bearings that the motor shaft rides in or passes through.

**Induction:** The manner current and magnetism is produced in a conductive path when it is passed through a magnetic field.

On the following page you see an image of a disassembled induction motor. The largest component is the main housing. Notice the winding inside. That is the stator winding and is the winding that is connected to the power source via a control. The smaller round component is the rotor. Notice how the motor shaft passes directly through the middle of the rotor. The flat round plates are the end bells. When assembled,



*A typical induction motor is disassembled to show its internal components*

the rotor and shaft are one assembly and rotates inside the center of the stator winding. The rotor and shaft are free to turn and are held in position by the bearings mounted in the end bells. There is a specific air gap that is maintained between the outside edge of the rotor and the inside edge of the stator. Remember we talked earlier how we realized as children if we could maintain a certain space between magnets we could maintain a force between them. We now see how this principle is put to work in electric motors.

The basic operation of the induction motor is as follows. When the motor is energized, current passes through the stator winding, causing an electrically revolving magnetic field to develop. The magnetic field created by current flow in the stator then induces current flow in the rotor. As the induced current then begins to flow through

the rotor, it develops a magnetic field that is attracted to the revolving stator field. Since the rotor is mounted to the shaft, the rotor and shaft begin to rotate. Hence, the mechanical motion that the motor is designed to produce. This sequence is sometimes difficult for some to understand. While the stator does not move, the magnetic field it produces does. This electrical movement of the stator field is what creates the motion of the rotor. The stator motion is due to the design of the stator winding and the fact that the current is alternating. If the stator field did not revolve, the rotor field would move only slightly until its poles aligned with the opposite poles of the stator and it would stop. An animated demonstration of the operation can be seen at <https://www.youtube.com/watch?v=LtJoJBUSE28>.

There are a few specific points that we need

to cover in more detail. While these points do not address every cause of failure or issue that can arise, they cover the basics most engineers and technicians are unaware of. From here on, we will simplify and only use the term shaft when referring to the rotor and shaft assembly, since they are mounted together and act as one component.

ings are not designed to carry this much current, the motor will almost always be permanently damaged when this occurs. This can require major repair or replacement. If the control is sized, wired, and set up properly, it **may** shut the power off before the motor is damaged, but sometimes it will not. The amount of damage depends on the duration of time before power was shut off to the motor.

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*“Never assume, always verify the wiring is correct.”*

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First, the amount of current drawn by a motor in good condition is inversely proportional to the speed of the shaft. Simply put, if the shaft speed decreases, the current drawn by the motor increases. The motor nameplate normally lists the design speed of the motor, as well as the motor current when running at that speed. When power is turned on to the motor, current instantly starts to flow in the stator. For a brief second, the shaft does not move and this causes a very high current to be drawn by the motor (this is referred to as inrush current and is 6 to 10 times the amount of current the motor draws when running). The magnetic force then induced by the stator current overcomes the inertia of the shaft and it begins to rotate. As the shaft speeds up, less and less current is drawn by the motor. Once the shaft reaches its designed speed, the motor will draw its rated running current. If at any time the shaft slows down below its rated speed, current draw increases. If the motor shaft ever stops turning with power still applied, or does not begin turning when power is turned on, the motor will draw excessively high current (this is referred to as locked rotor amps, LRA, since the rotor will not rotate). Since the wind-

Second, current flow in the motor creates heat. The insulation protecting the windings in a motor is only capable of withstanding the heat created by the normal starting and running currents, plus a small margin of safety. If a motor draws even a slightly higher than rated current, the limitations of the insulation can be exceeded and the insulation will start to breakdown over time. Eventually, the motor will fail. Failure can also happen almost immediately, as in the case of a motor drawing LRA for enough time. Also, a motor subjected to numerous starts in a short period of time can overheat the motor and cause insulation failure. Heat related failures can also happen if the motor does not receive adequate cooling airflow or if debris and contamination is allowed to collect on the motor housing.

Third, the applied voltage and frequency of the motor must be within the recommended ranges given by the motor manufacturer. It is also critical that the motor connections are made correctly. Many motors have dual voltage ratings. They can be operated on systems supplying different voltages **provided** that the motor windings are correctly connected internally by the installer

and the correct wires are connected to the power source. Typically, a wiring diagram is located on the nameplate of the motor or inside the motor terminal enclosure. If the connections are incorrect, the motor can be destroyed as soon as the power is turned on, or fail in a very short period of time afterward. Usually, when connections are made incorrectly, the motor speed is noticeably different, severe vibrations are transmitted through the housing and shaft, and additional noise can be heard coming from the motor. Never assume, always verify the wiring is correct.

Now, take the time to read this article again. Review the terminology and commit it to memory. Study the operation of an induction motor. Watch the animation link again and memorize the main parts of an induction motor. Study each of the 3 points above. There is a tremendous amount of basic information we have covered in this article. It is very important before we move on that you develop a thorough understanding of this information.

The beginning of the next article will focus on the specifics of both single phase and 3 phase induction motors. We will then turn our focus to the various types of controls that are used to start, stop, and protect motors. We will examine issues that develop within the controls and how those issues can lead to motor failures as well. We will then finish the next article with a look at the various load related issues that can create failures in both the connected motor and controls.

There are many topics that we will cover by the conclusion of this series of articles. Hopefully, you will continue along with us and advance your level of understanding on this subject. This is an expansive topic and can be somewhat intimidating. However, by remaining committed to learning you will gain both confidence and capability while adding value to your property. NAHLE is committed to providing the best level of ongoing professional development and training to all those who carry the Certified Director of Engineering distinction.

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# Evolving Technology



By: August Craanen  
Craanen Technical Services

The Hospitality industry is one of a respectable age. Around 550 BC, boarding houses existed. The first resorts were build near the mineral and hot springs in ancient Greece. The first inn located in America was recorded in the year 1607. The first modern hotel (the Tremont) opened in Boston in 1809 and the first business hotel (the Buffalo Statler) opened in 1908.

From its early beginnings the hotel industry has continued to develop and stay on the cutting edge of modern technological advances. In the next 5 - 10 years the following advances are expected:

- Apps for cell phones to operate TV in Hotel rooms eliminating the need for remote controls.

## 1800s

- 1829 - Indoor Plumbing
- 1846 - Central Heating
- 1859 - Elevators
- 1881 - Electric Lights



## 1900 - 1950



- 1907 - Telephone
- 1927 - Radio
- 1940 - Air Cooling
- 1947 - Television

## 1951-1970s

- 1961 - FM Radios
- 1965 - Message Lights
- 1970 - Color TV
- 1971 - Water Beds
- 1973 - Free Movies

### Late 1970s

- Electronic Lock Systems
- Life Safety Systems



# in the **Hotel** Industry

- Apps for cell phones to operate lighting and HVAC in Guest rooms.
- Cell phone as Hotel Internal Phone (Room to Room / Hotel Services etc.)
- The use of smart phones which connect directly to the hotel phone systems. As guests' phones become virtual extensions of the hotel's PBX systems, hotel investment in telephone infrastructure takes on heightened value by enabling unsurpassed levels of guest service, connecting travelers to hotel staff, or to other travelers – even optional VoIP based international calls at the hotel's discretion.
- Integrate Internet/ Computer & Large screen HD Display
- Improved room acoustics
- Expanded "secure" voice command to control all manner of room functions from AC to lighting to TV to even the bathroom's plumbing ("flush!"; "shower on"; "warmer", etc.)
- Biometric Check-in

## 1980s

- Self Check In/Out Devices
  - PC's
- 1981 - LD Direct Dial
- Business centers, including computers and copiers.
  - In-room Electronic safes
  - In-room Check in/out



## 1990s

- Voice mail systems
- LAN Technology
- Improvements in all Hotel Based Systems PMS, PBX, POS, S&C, CAS, ELS, EMS etc.
- Internet / Intranet
- In-room entertainment
- High speed internet access
- On Command Video
- Web TV



## 2000+

- WiFi Internet access
- Enhanced exercise facilities
- Sustainable Design and Construction
- LEED and Green Buildings
- V.R.V./ V.R.F. Systems combined with Heat recovering
- Total control / Integration with individual IP addresses
- Emphasis on Super Bathroom



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