

ISSUE

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THE ELECTRONIC MAGAZINE FOR HOTEL & LODGING ENGINEERS

Holiday Greetings From NAHLE



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Room Preventive Maintenance

By Todd Isbell

**Director of Engineering,
Hilton Clearwater Beach Resort**

For the preventive maintenance of our guest rooms, where do I start? It is hard to get a good rooms pm program in place and keep it there, but I have found a way that helps me keep up with this program and if staffed properly, can turn the rooms faster than three times a year.

First, all engineers must be on board, and the way to explain it to them is this; all engineers pm 2 rooms per day. The catch is that I have set up a special pm program that touches on what the guest sees and complains about most for each month, or every three months depending on how many times you want to turn your rooms. I understand that more hotel rooms or less staff means fewer rooms being completed, but at least you are getting more rooms PM'd than you normally would which in turn means fewer service calls and happier guests. And again this includes all engineers from painters, to electricians, to plumbers. All engineers are involved.

The list should contain no more than 15 to 20 minutes of work in each room, so that only thirty to forty minutes a day is used for room pm's and the rest of their eight hour day is spent doing projects and service calls. More rooms per day can be added if you have the staffing or down times.

My first list consists of: checking the door to ensure it closes by itself and the lock is working properly. Second is touch up paint on walls ceil-

ing and baseboards. Notice it is not "painting the entire wall" but touch up. Painting the entire wall would fall under your projects list to be done by your painter, and the engineer that is performing the pm is not lost in the room painting when he has other things to do. In and out of the room as quickly as possible touching only the points of the list you have prepared for your individual properties is the key. Obviously, if the engineers see something broken they need to repair it or call it in as a project, but the jist is to get in and out, and keep their day moving forward. Third is to check caulk and grout and redo that if it is necessary. Never just go over the old caulk or grout, cut or scrap it out and start from scratch. It may take a few more minutes, but it is worth the effort. Fourth is to check your tub bottoms, ensure non slip strips or the bath mat is in place. Next check your tub and sink drains for proper drainage. Then on to the toilet, check the seat, bolt caps, caulk or grout around the bottom, check the toilet paper holder, then on to the room. Check lights, the phone face plates should have printed not hand written numbers, and clean.

Then furniture knicks, tie up loose wires and you're done for this month's PM program.

The next month add, take out or leave what needs to remain on the list, but at least add something else to it such as AC filters, rest room exhaust



Room PM involves every engineer contributing on a daily basis.

vents, and or maybe clean behind the armoires and television cabinets. The main goal is to have all engineers do two rooms a day, five days a week so if you have three engineers doing ten rooms per week, that's thirty rooms pm'd every week, or one hundred twenty rooms per month.

Keep your new pm program exciting for your engineers. Offer an incentive program for all engineers that do their pm's every week such as a gift card, or buy them a pizza. Incentives are a great motivational tool, and you want your associates to feel part of the team because they actually are a part of the team, and their thoughts and ideas do in fact matter.

You can also talk to your housekeepers and get their feedback on some items that need attention in the rooms and add them to the list as well. After all they are the ones in the rooms the most. Working together as a team means you and the property move forward in a positive manner and it just makes life so much easier and gives everyone more initiative to want to go to work and be happy in what they do.

My list is simple; It is typed up so that it doesn't look intimidating, and once the engineers see it is not a full on preventive maintenance of the room, they seem to be more willing to get in there and get it done. An example of my first pm list is below:

Make sure door closes by itself

Touch up closet door

Touch up entrance door

Touch up rest room door

Touch up walls

Check grout

Check tub strips or bath mat

Check toilet seat and caps

Check toilet paper holder

Check lights

Check phones and face plates

Change AC filter

Touch up furniture knicks

Tie up loose wires

Seeing the list in this manner shows that it is not so much of a chore, and it can be done in 15 to 20 minutes and then the rest of their day is set up for success. Even if the room is occupied, the engineers can enter when the housekeeper is in cleaning the room and perform this preventive maintenance program without hindering the housekeeper. One important note is that in the room to be pm'd, the housekeeper should do this particular rest room first so that if caulking is needed, the housekeeper doesn't wash out the caulk before it dries. While the housekeeper is in the rest room cleaning, the engineer can be in the guest room

checking off the list, and when the housekeeper is finished in the restroom, the engineer can go in and complete the rest of the assignment. You will want to keep a record of which rooms are pm'd so you can spot check to ensure everything on the list is completed, and so you know which rooms have been done so as not to pm any rooms twice for this go-around. And again, reward and recognize to keep the positive attitude and this program will work for you too.

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Pest Activity Can Heat Up When Temperatures Cool Off



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

For a good portion of the country, fall presents the prettiest landscapes all year. Leaves change color and fall with the temperatures, and guests turn toward your lodge or hotel as a place to get out of the cold.

Some pests will also be looking for a warm place to wait out the winter. And just like the weather, the pest landscape shifts across the country as the days get shorter. Here is a snapshot of the pests that are active during the fall months throughout the different regions of the country:

Southeast

Pest threats: Spiders, roaches, lady bugs, kudzu bugs, stink bugs, rodents and ants.

Mid-Atlantic States

Pest threats: Stinkbugs, lady bugs, rodents and spiders.

Northeast

Pest threats: Stinkbugs, spiders, roaches, lady bugs and rodents.

Midwest

Pest threats: Box elder bugs, lady bugs, spiders and rodents.

South Central U.S.

Pest threats: Crickets, ground beetles, rodents, spiders and ants.

Pacific States

Pest threats: Spiders, ants, rodents and cockroaches.

Many fall pests like lady bugs, stink bugs and box elder bugs are considered occasional invaders. The good news is that these invaders typically do not pose any physical threat to humans or building structure; however they can pester your guests, which in turn can hurt your reputation and bottom line.

Occasional invaders that may challenge your property are drawn to it with survival in mind. Many of these insects need a warm place to stay over winter. They often sneak inside unnoticed, then hide in wall voids, behind baseboards and in storage areas out of site. Usually, these pests won't become too active until springtime, but if temperatures heat up briefly these insects may emerge from their hiding places and become more active inside your hotel. They may show up on south- and west-facing walls of your facility – where the sun hits – searching for warmth.



“IPM takes a proactive approach to pest management through an ongoing cycle of inspection, prevention and monitoring.”

When seasons change and temperatures heat up, these pests leave their hiding places – and at times in greater numbers thanks to fast reproduction – searching for a way to get back outside.

Rodents and roaches can also prove to be pesky critters during the winter months. These cold weather invaders can be difficult to control once inside because their hiding places are scattered and hidden. Unlike the occasional invader insects discussed earlier, rodents and roaches remain fully active during the months – and will reproduce prolifically behind your walls and in less-frequented spaces throughout your property. There are a few differences of note between the two pests. Rodents are commensal and do not hibernate if they have access to food and water. Usually, we don’t notice the first few that make it inside the walls, but once the first litter is born a month or two after the parents’ arrival, they are hard to miss. This is generally because rodent pups are less cautious as their wiser parents. Roaches on the other hand can struggle to survive at times. American, Oriental and Smokey Brown cockroaches can live on things other than typical food sources, such as mold, rodent bait and even moisture and other natural environments or materials. They’ll do their best to stay away from human activity, and in turn most sanitation routines. The best way to stop both pests from turning your hotel into their

extended stay facility is to keep them from getting inside in the first place.

Fortunately, implementing Integrated Pest Management (IPM) tactics throughout the year can keep these fall invaders out of your buildings. IPM takes a proactive approach to pest management through an ongoing cycle of inspection, prevention and monitoring.

Exclusion is a pillar of any IPM program and is the first step in keeping fall invaders out. Now is the time to take a good look at the exterior of your buildings to ensure there is no way for pests to enter. Remember, it’s important to implement preventive measures before the mass migration to get inside begins. Seal cracks and crevices with caulk and metal mesh to eliminate entry points and harborage areas for pests around the exterior of your facility. Tightly seal doors and windows with weather stripping and make sure window and door screens, which can add a second buffer between your guests and pests, fit snugly.

To create a buffer from rodents, trim back bushes about 18-30 inches and stay away from putting down mulch around your buildings’ perimeter – rodents and other pests can use these as cover and harborage. Instead of mulch, consider installing a gravel or pebble strip around your perimeter.



Pay close attention to gaps around doors – if you can see daylight, pests can see a way in. Remember, insects need just a fraction of an inch to work their way inside, and even mice can sneak through holes the size of a dime and rats the size of a quarter. Seal doors with weather stripping, and change the stripping regularly. Automatic doors and mounted fans at your high-traffic entrances will make it even harder for pests to sneak in.

Encourage your housekeeping and maintenance staff to keep watch for pest activity both inside and out of your establishment– talk with a pest management provider about setting up training for your staff on how to spot and help prevent activity as you get ready for the New Year. Together with your pest management provider, you can build a strong IPM partnership that can show rodents, seasonal invaders and all pests a “No Vacancy” sign during these cold months and beyond.

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 rharrison@orkin.com or visit www.orkincommercial.com for more information.

Webinar Shares How to Provide Guests a Good Night's Sleep

Protect-A-Bed and the National Association of Hotel and Lodging Engineers recently teamed together through a hospitality webinar to educate hotel engineers, owners and operators on how innovative sleep offerings are designed to offer guests a clean and hygienic sleep zone.

As hoteliers know, a quality night's sleep is important to guests. Webinar guest speakers, including hotel managers and Protect-A-Bed representatives, shared proven ways to meet guest needs with an investment in clean mattresses and protective bedding. Watch the full webinar at www.protectabed.com.

Speakers included:

- Marc de Grave; VP of Business Development – Protect-A-Bed (Hospitality)
- Sandra DiVito; Vice President of Protect-A-Bed – Hospitality and Healthcare
- Holly Algauer; General Manager – Hilton Chicago/ Northbrook
- Dan Gustafson; General Manager – Chicago Marriott Naperville
- Jeffrey White; Technical Director – BedBug Central & Cooper Pest Solutions



R-22 PHASE-OUT PRESENTS COST LIABILITY FOR HOTEL POOLS

**Ralph Kittler, P.E., Vice President,
Seresco Technologies**

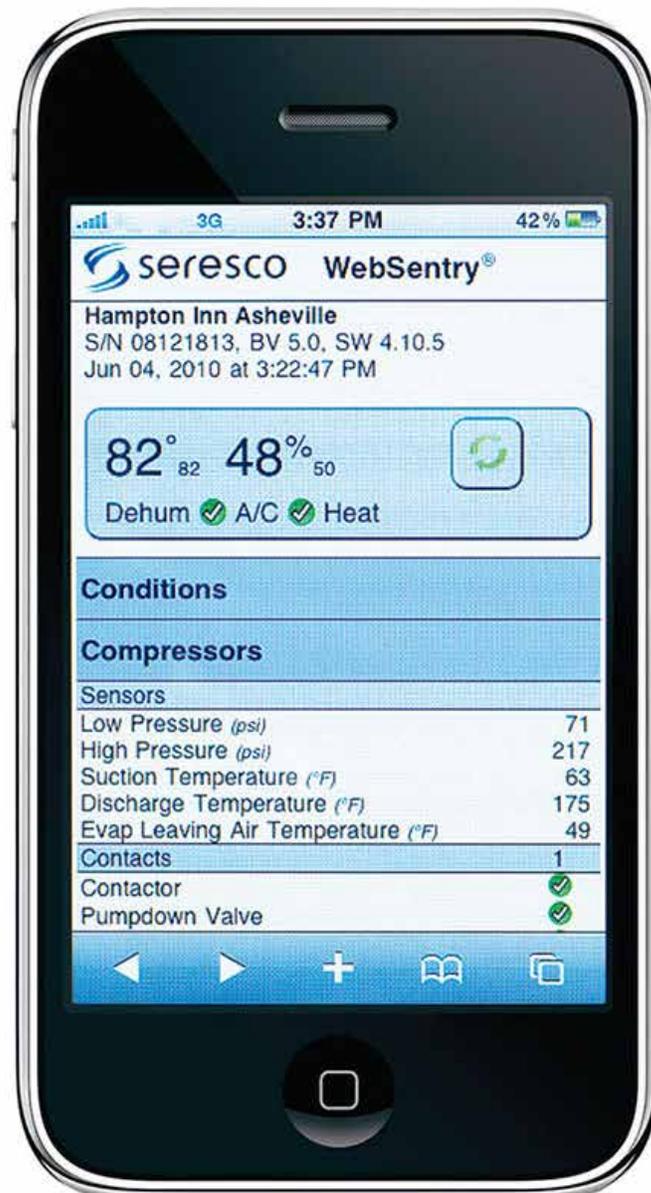
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Any hotel/motel with an indoor pool likely has a monster hiding in its closet. If that facility is at least five years old and still operates with its original dehumidifier, chances are that monster is the unit's R-22 refrigerant.

As a result of the 1989 international treaty on protecting the ozone layer, Montreal Protocol on Substances that Deplete the Ozone Layer, this hydrochlorofluorocarbon (HCFC) refrigerant is in the process of a ban, because the gaseous chlorine or the "chloro" in its composition has ozone-depletion potential.

Consequently, R-22 is amid an ongoing world-wide phase-out. Since 2010, it is unlawful for manufacturers to use R-22 in new air conditioning equipment. Now the EPA is limiting production of the refrigerant itself, which will be needed in the future to top off equipment low in refrigerant or to replenish systems that have lost their entire charges due to a leak. The phase-out—which currently calls for R-22 production reductions of 90 percent in 2015 and 99 percent in 2020—has already spiked prices due to dwindling supplies. Price volatility is illustrated by contractor refrigerant material service-call charges ranging anywhere from \$50 to more than \$200 per pound of R-22.

Add the R-22 dilemma to the fact that all refrigeration coils and field piping probably leak at least once and possibly multiple times during



WebSentry sends alarms out when dehumidifier parameters drop below desired set-points to authorized maintenance people at Hampton Inn – Asheville, NC.

their lifecycle, and the inevitable event of losing part or all the R-22 refrigerant during a leak can now cost a hotel thousands of dollars in just refrigerant only costs. Here's the math:

- The average-sized hotel dehumidifier ranges from five to 12 tons (of refrigeration).
- A hotel dehumidifier could have up to ten pounds of refrigerant/ton.
- In the example of smaller five-ton unit that loses its total charge of 80 pounds of refrigerant, the hotel will be paying upwards of \$8,000 for recharging with refrigerant, with no guarantee it won't leak again.

For indoor water parks popular at hotels and resorts in Ohio, Indiana, Michigan, Wisconsin and other upper Midwest areas, a total loss of refrigerant would be catastrophic. These large systems dehumidify hundreds of pounds of moisture/hr out of their indoor pool environments, therefore they require several hundred pounds of refrigerant that carry significant replenishment or replacement costs.

The hotel management that knows its exposure is essential. An \$8,000 bill just to recharge a small unit could be devastating. An aged R-22 dehumidifier that isn't broken should be expected to someday need refrigerant. Therefore, it's a good strategy to budget for a future breakdown or perhaps start implementing replacement measures before prices become unreachable. Foresight reveals that it may only require two service calls to equal a new unit's cost.

Here are three options to consider:

- **Keep Existing Equipment:** There is no rule-of-thumb, but a dehumidifier that's more than 15 years old, may only have another five years left,

depending on how well the unit, the pool and the facility was maintained. There are many energy saving advancements in new systems, such as new direct drive fan technology versus belt-driven equipment. Just direct-drive technology itself can potentially cut a natatorium's fan operating expense by 20-percent or more, depending on the existing equipments' design inefficiencies. Since natatorium dehumidifier fans generally run 24/7 to control humidity, a 20-percent reduction in fan operating costs for example, could contribute nicely to a facility's new dehumidifier payback.

- **Retrofit Existing Equipment:** A five or 10-year-old dehumidifier may be too new for scrapping. One alternative is retrofitting the unit to a more environmentally-friendly refrigerant to eliminate R-22 cost liabilities. Two types of retrofits are possible that involve hydrofluorocarbon (HFC) refrigerants, which the EPA condones as environmentally-safer than the aforementioned HCFC's, because they don't have ozone depleting chlorine molecules. R-22 can be reclaimed from an existing dehumidifier and replaced with the HFC refrigerant, R-407c. No equipment modifications are required, however the R-22 system's mineral oil must be replaced because R-407c can only operate with polyolester oil (POE). These trade-offs should be weighed along with the cost-effectiveness of a retrofit and a dehumidifier's remaining lifecycle. A newly developed HFC refrigerant, R-438A uses the same refrigeration oil type as R-22 and requires little, if any, equipment modification. R-438A and R-407c both cost considerably less than R-22 and don't have government-mandated production bans in the foreseeable future that could escalate prices. Another modification variation is converting the system to dramatically reduce the refrigerant charge. Conventional dehumidifiers send refrigerant hot gas to an outdoor condenser

via dozens of feet of refrigerant piping, which increases the amount of refrigerant and the chance for leaks. Converting the outdoor condenser circuit to a dry cooler with a glycol loop potentially reduces the refrigerant use by at least half, because the majority of the system can use cheaper, environmentally-safe glycol. While this is an ideal alternative for systems with long, refrigerant-filled line sets to outdoor condensers, the fact it would require an additional cost of a heat exchanger for glycol heat rejection could decrease cost effectiveness.

- **Replace Equipment:** Buying new equipment requires budget planning, therefore some hotel owners wisely work a new dehumidifier purchase into projects that involve remodeling other parts of the facility. The final argument for a new dehumidifier is the tremendous technological advancements in energy efficiency that have been developed in the last 20 years. The efficiency of today's dehumidifiers, versus a 20-year-old model, can generally reduce operational costs by as much as 40-percent because of technological advancements that deliver better performance and reliability. The new system will undoubt-



This rooftop dehumidifier system uses up to 85 percent less refrigerant by relying on glycol.

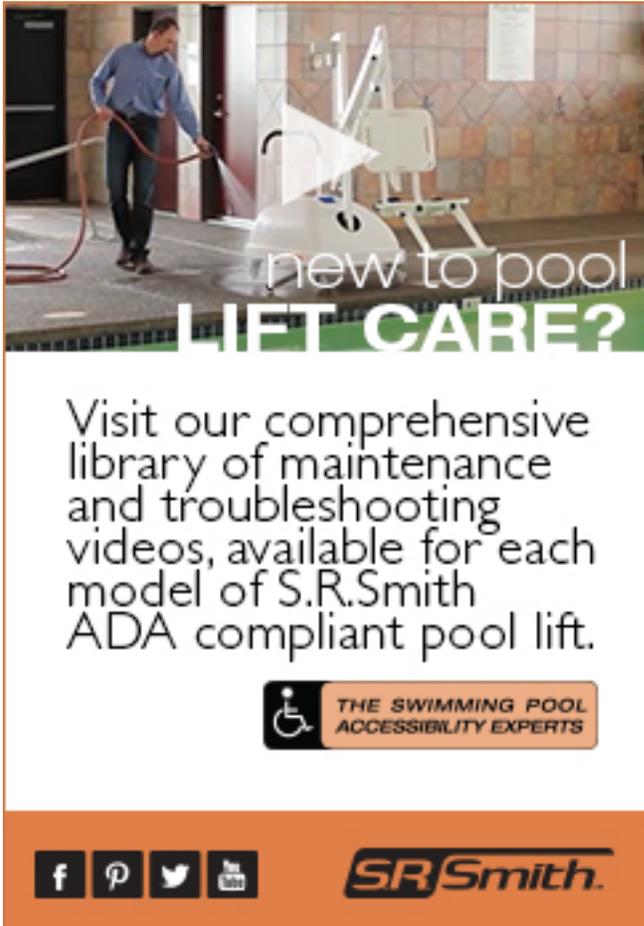
edly use the new HFC refrigerant, R-410A, an HFC that is not presently scheduled for a ban and costs significantly less than R-22. Another variation is a hybrid system that uses R-410A in the refrigeration circuit, but also uses glycol for heat rejection. If a leak occurs, glycol is cheap, environmentally-friendly and requires minimal service costs. Alternatives to HFC's, such as glycol, should be investigated because of current speculation of a phase-down (not phase-out yet) of HFC's that could ramp up prices.

Incidentally, hotel franchisees or chains with several dehumidifiers at multiple locations might be able to recover and store R-22 refrigerant from a retrofitted or retired R-22 system for use at other locations, similar to how a blood bank operates. R-22 can also be sold on the open market, but only if it is first reclaimed (cleaned and restored to its original chemical composition by a refrigerant specialty company) properly and under the Air Conditioning Refrigeration Institute (AHRI) Standard 700 "Specifications for Refrigerants" guidelines. However, the EPA mandates it must be used within the same organization and not sold on the open market. Currently, there are no Federal tax incentives for retiring R-22 equipment, however, there may be local energy efficiency rebates for upgrading equipment. For more information, visit <http://energy.gov/savings>

Besides dehumidifiers, refrigerant liabilities also relates to hotel rooftop, split-system and chiller air conditioning equipment using R-22. These units can also leak and not only strain a maintenance budget, but also pollute the environment.

Hotel maintenance engineers should be proactive before catastrophic leaks occur. At the very least, they should learn the age, type of the dehumidifier and what refrigerant it uses. That way they won't get blind-sided by an exorbitant materials charge on the unit's next service call.

BIO: Ralph Kittler, P.E., is a co-founder and vice president of sales/marketing at Seresco USA, Decatur, Ga., a subsidiary of Seresco Technologies Inc., (www.serescodehumidifiers.com) an Ottawa, Ontario-based leading manufacturer of natatorium dehumidifiers. Kittler has 24 years experience in the HVAC industry and is an ASHRAE "Distinguished Lecturer" and ASHRAE Technical Committee 9.10's reviser responsible for Chapter 25 "Mechanical Dehumidifiers and Related Equipment" in ASHRAE's 2012 Systems and Equipment Handbook as well as Technical Committee 9.8's reviser responsible for Chapter 5 which covers Natatorium Design in (Large Building Air Conditioning Applications) in ASHRAE's Applications Design Handbooks since 1999. Kittler can be reached for hotel dehumidifier consultation at ralphkittler@serescodehumidifiers.com.



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“I think that the course benefits every Chief Engineer that takes it and also the company. It helps do the work more organized and it helps understand the functions of each system you work with.”

“The information was presented good and was easy to understand. The online tracking was easy to get to and follow along with. The program overall was very good. 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.”

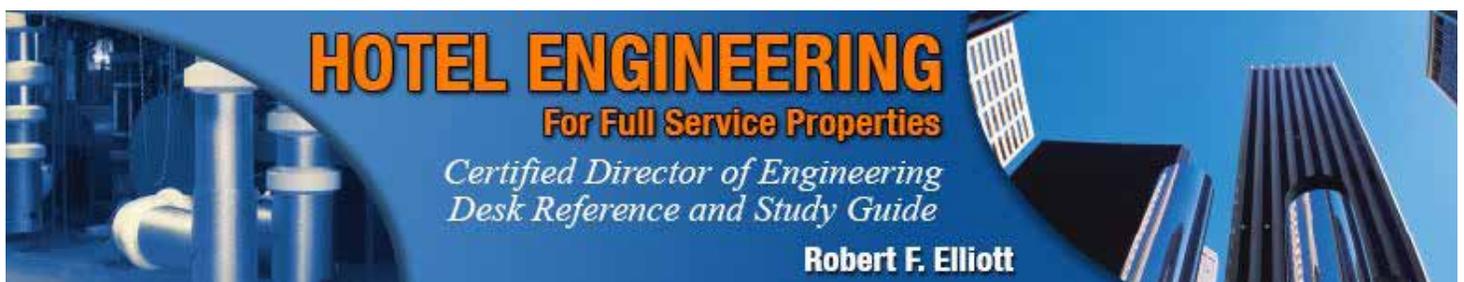
“I think the program is great. It definitely was a reinforcement in some areas that I was familiar with and a great learning experience in others I didn’t have much knowledge. Very straight forward, seems to me that whoever put this course together must have been in the field.”

Certified Director of Engineering (CDOE)



Robert Bell, CDOE, Chief Engineer, at Marriott Renaissance Plantation Hotel in Plantation, Florida was the first designee as Certified Director of Engineering.

“I’ve been an engineering manager for over 14 years, 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 from NAHLE and a proud member.”





ELECTRIC MOTORS IN HOTELS: PART TWO

William Blackmon, CDOE

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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/.

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.

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

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.

Disclaimer: Neither the author nor publisher makes any guarantees, warranties, or claims to the accuracy or completeness of the information contained in this series of articles, nor for errors or omissions in the content. This and any subsequent articles are provided and intended to only serve as a general overview of motors and motor systems and NOT as an instruction guide or text book. It is the responsibility of the reader

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Guests with Pets: Fighting like cats and dogs!

Does your property allow pets in guest rooms? Many hotels are “pet friendly” and other hotels, like the Kimpton group, go as far as to provide a pet (a gold fish) to their guests. And, other hotels do not allow any pets. To be successful, a hotel must, at a minimum, be clean and have good services to maintain a hotel’s most important asset – the guest room. An often over looked service is accommodating a guest’s pet, which often has an impact on the guest room.



Guests may be concerned about allergens and pet damage to rooms. Some hotels set aside rooms for pets, while other hotels do not. The best hotels have a system in place that notifies the housekeeping and engineering staff of a pet-occupied room. With this information, the hotel employees are able to pay special attention when cleaning the room to ensure it is ready for the next guest. Many hotels charge an extra fee for the extra work needed to accommodate pets.

Generally, hotel groups use some variation on the idea of “special attention” to rooms, sometimes calling what is done “deep cleaning” or “sanitizing” which can include shampooing carpets, changing air filters, and other efforts to get rid of allergens. The hotel engineer may have to give special attention to the PTAC unit grates and the PTAC filter. The hotel engineer may have to spot repair any guestroom items such as wallcoverings, painted surfaces, or scratched or stained wooden furniture.

If a hotel room is thoroughly cleaned, a guest with allergies may still have problems. The presence of

a pet in a hotel room from a previous guest’s stay could leave sufficient allergens behind to cause allergy problems in an allergic individual. No matter how well a room is cleaned, or how isolated those pets-only rooms are, people who have severe allergies may still have a reaction. The lingering presence of allergens could trigger an asthma attack in sensitive guests. A decline in allergens occurs over weeks to months no matter how deep the cleaning.

A guest with a pet cannot be confused with a guest traveling with a service animal. A service animal is not a pet. A hotel cannot require a guest with a service to pay the pet deposit, to assign them to a pet floor, and to subject them to the hotel’s pet policy.

You should look at the hotel through your guest’s eyes. An occupied, clean, comfortable room, which may include your guest’s pet, is a profitable room.



ONE IF BY LAND... LED IF BY SEA

By Art Attaway

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One if by land... Two if by sea! A story we all know about the beginning of our country. The United States of America! These tower “lights” were lanterns illuminated by candles or some crude oil extracted from a dead animal, and only sources used to “light up our lives” as human beings for millennium. Then, somewhere around 1860, and soon after the creation of the combustion engine, John D. Rockefeller discovered a by-product of crude oil processing, kerosene, was a perfect slow burning low heat oil to light lanterns. Thus the creation of Standard Oil Company and the creation of wealth that led to one of the richest men on earth. Soon, almost every home in America had a few kerosene burning lanterns to light their way at night. Then, of course, in 1880 Thomas Edison refined the incandescent light bulb. Thomas Edison was responsible for hundreds of inventions and 1093 patents that changed our lives. He had a dedicated complex covering 2 city blocks with over 200 hundred employees at Menlo Park, NJ, where he had what is considered to be one of the first “Research and Development” centers in the world. Edison called this facility the “Invention Factory” and those 200 men dedicated their entire working day to “invent”.

That incandescent light endured for over a hundred years. But now we have once again “discovered”, or refined a known discovery, and are embracing a more energy efficient method to create illumination. As all of you know, as of January 1, 2014 the manufacture, import, and sales of 40/60 watt incandescent light bulbs is prohibited by law, thus the days of incandescent lighting are behind us in America. Now we need to figure out, from the new and somewhat confusing categories of “new age” lighting options, what is best for our property and operations, staff and guest.

There seem to be many options, but the truth is...

ICL= Incandescent Light

CFL = Compact Fluorescent Light

LED = Light Emitting Diode

The primary reason to eliminate ICL was the mercury present in the bulbs, and the environmental impact that presents. Of the potential replacement options; Halogen, CFL’S (Compact Fluorescent), Magnetic Induction, and LED, only LED is mercury free. Halogens are 40% more efficient than ICL’S were and operate basically on the same scientific principles. CFL’S offer 1/3 the energy consumption of

a ICL, and are estimated to last longer than 8-15 times longer. CFL's contain only a small amount of mercury, and are a simple and affordable (based on the usage life) replacement for ICL's using the exact same electrical circuitry. Magnetic Induction works by stimulating mercury particles, and also works on the same electrical platform as ICL. LED is by far the most versatile and least environmentally impactful. But also the most expensive (initial investment) option, but offers excellent ROI, and comes with many rebates from local power companies nationwide. Many LED lines qualify for EnergyStar@ ratings.

LED's contain no mercury, no glass, and emit no UV nor heat. They turn on instantly, are directional, and dimmable, all features no other bulbs fully possess. And being made of metal and plastic are the most environmentally friendly in my opinion. The efficacy rating (the amount of light produced for each watt of energy consumed) is 60. CFL's are rated at 40, and ICL's are at 14.

Cost: \$114,500

Energy rebate: \$52,500

Estimated energy savings: \$82,750/yr. (1.2 gigawatt-hours)

Payback: 9 Months

Hilton Minneapolis Airport, Minneapolis, MN

Project: Upgraded some 3000 public area fixtures and bulbs with LED

Cost: \$181,000

Energy rebate: \$83,500

Estimated energy savings: \$57,400/yr. (721,000 kilowatt hours)

“LED's offer the longest life of any option, and have the lowest maintenance cost as well.”

Most LED's are manufactured to retrofit directly into ICL fixtures. A retrofit of 10 ea. - 6" cans from 60W ICL with 12W LED, used for 10 hours per day, have a payback period of 2 years and 3 months, and a total ROI of \$4,810 over the life of the bulb, or \$480 per light.

Specific case studies for the hospitality industry are as follows:

Hilton Downtown Minneapolis, MN

Project: Convert 4000+ ICL bulbs in public space to LED bulbs

Payback: 1.7 years

**If the fixtures are changed the bulbs are more efficient since they do not have to have a resistor to manage conversion.

**Conversion energy savings calculators are available on most manufacturer websites

**Case study rebates provided by Excel Energy

In a 2014 survey of Mayors from 288 cities nationwide, the number 1 focus emerged as LED conversion, citing 82% of Mayors consider it the

number 1 technology for reducing energy use and carbon emissions.

LED's are available with up to 4000 lumens, and controllable (dimnable) from 850 to 3000 lumens. They offer soft, warm lighting for an excellent guest experience, save serious dollars to the bottom line, and are my number 1 choice for conversion.

Some things to look for:

1. What is the CRI (color rendering index)? The CRI is the ability of the light source to reproduce the colors of the object it is illuminating as if it were a natural light source. Most LED's are between 82-92, with 100 being perfect. Most CFL's are in the 60-70's range, and yellow parking lot lights (high pressure sodium) are a 49.

2. Consistent color. This is controlled by color temperature management.

3. Directional. Does the light point where I need it to. A LED light emits light in only 1 direction, and this is then managed by a lens. But most LED lights come with a specific beam spread.

4. Overall life. Does the light have a thermal management system? LED's do produce some heat and the management of the heat affects the life of the bulb.

5. Is it dimmable? If, so, by what method. Some can use the old ICL dimmer, but others require specific new dimmers, either magnetic or electronic low voltage units.

Improvements constantly focused on by manufacturers include efficiency, quality of light output, color rendition, and thermal management.

Overall, LED's have the most expensive initial

replacement cost, but the payoff is not only monetary in the end, but also in the ambiance created by soft, warm light. LED's offer the longest life of any option, and have the lowest maintenance cost as well. They come in architectural, outdoor and indoor, and street varieties. LED's can be used as retrofits in spots, recessed, and candelabra fixtures. They are mercury free and offer the most environmentally friendly option for lighting. These lights come in a wide range of lumens and are dimmable. Energy companies nationwide offer rebate programs for retrofitting properties, and the long-term ROI and ongoing energy savings are the highest among all options for the immediate future. But who knows where new technology will take us? Creative and scientific minds like Edison's are constantly looking to improve our options.

Art Attaway has a broad background in the hospitality industry, having worked for Hyatt and Ritz Carlton hotels at property level management. He managed hotel renovations for 15 years, and has focused on specialty green energy products for the past decade. art@stonerestorationservices.com



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DO YOU KNOW HOW SUCCESSFUL YOU WILL BECOME?

By Manny Mercado, CDOE

Many of us take it for granted and stay in a cycle of routine. The routine cycle is like a washing machine that just agitates and spins. You wash your clothes and know what to expect from the washer. As an engineer you have to get out of the routine cycle and focus on different ways of improving your skills. I have seen it over many years where skilled techs would just go to work, put in a day's work then repeat the same routine next day. Everyone has I guess their own personal goals in life in what they want to achieve. I can say for most of you out there that you find yourselves in this routine cycle and don't realize it until sometime. So for all you skilled trade engineers out there, stop what you are doing and ask yourself this question. How successful do I want to be in my career?

If you said you want more, then get out of the daily routine cycle and set a goal for yourself. If you feel you are lacking certain skills that is preventing you from becoming more successful, then you already know what you need training on. I for myself can say that I found myself in this routine cycle and worked at the same property for 16 years. I was comfortable and yes I was stuck in the routine cycle. Yes time passed by and by and by again. I don't



think I ever had thoughts of how successful I wanted to become so I stayed and stayed and yes stayed all those years.

Many chiefs I met over the years have told me I was over my limits to being at one property for so long. Max time should be around 5 years. Apparently I was not in the same mindset they were in which was to keep climbing towards success. After those 16 years I put on some wings and started to explore how successful I can really become. I ventured off to other properties as chief and I also tried apartment communities as well as property maintenance

manager. I can say after taking flight I have reached an ultimate high in success with this hungry property. I am currently in the Westin Governor Morris, in Morristown New Jersey. This property has been my home for over two years and it is always an adventure.

vendor repair companies they have the skills you need when they show up to make repairs on your equipment. Once you catch on to their repair skills you will be steps closer toward your career's success.

“I recommend all of you shadow vendor repair companies when they show up to make repairs on your equipment as they have the repair skills you need for success”

All of you out there stop and think about it, where do you see yourself in the near future. If you feel you don't have what it takes then think again. If you love what you do and have pride in your work you will be very successful. My success was from early on in my career, I came on board with trade skills I picked up from high school vocational tech classes. The hands on experience came to play when I was hired as a maintenance person at the property I stayed for 16 years, following vendors throughout the property making repairs. I recommend all of you to shadow

Resources are all around us, we just have to focus on what we want to get out of our careers. So if you want to be successful then you have to position yourself towards that goal. Resources within reach could be learning from other engineers, chiefs, training materials from your company, you tube videos and trade associations such as NAHLE. Many of you out there that read our articles, we want to hear about your success stories. Our survival depends on us feeding into the media super highway, so that others can learn from us and maybe follow our foot steps towards success.



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Drain Maintenance - How To Avoid Costly Plumbing Repairs

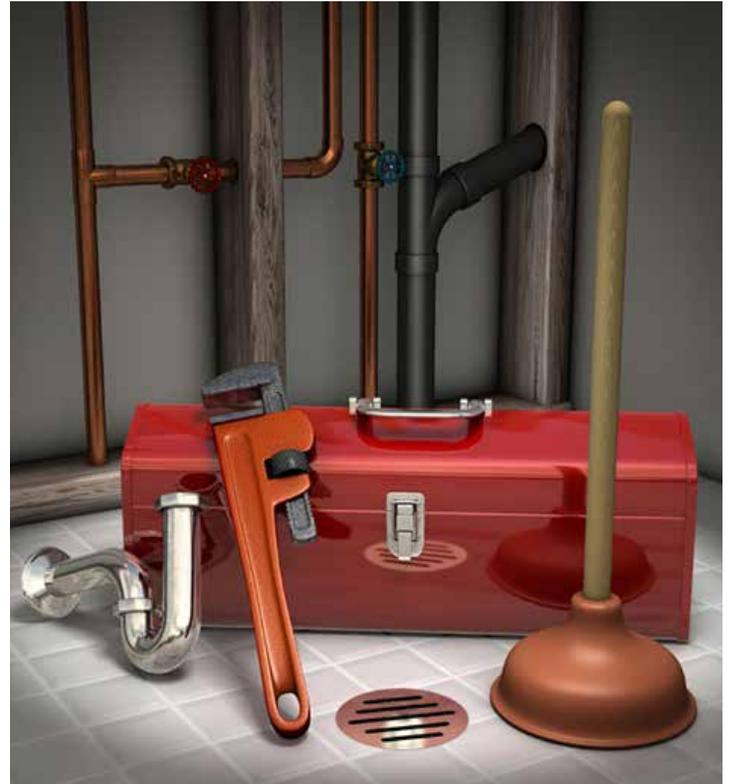
What can you do to maintain clear drains and pipes? How do you avoid calling expensive plumbing companies?

The cost of a blockage, both in terms of financial costs and customer service, can be enormous. So proper preventative maintenance of these drainage systems is critical.

Some of the most potentially expensive and time-consuming hotel maintenance involves plumbing and drain cleaning. Sewer drain lines fed by hundreds of laterals from individual rooms, kitchen, and laundry are much more likely to become blocked by waste, grease, and other obstructions. However, most stopped-up sinks, plugged toilets, and drains can be fixed without calling a plumber. A hotel engineer needs the right tools and a little determination to complete the job. There are proven techniques and tools to dislodge virtually any clog. However, if the hotel engineer cannot clear a clog after a few attempts, a drain-cleaning service or licensed plumber may be needed.

Plumbing Tools

Generally, plumbing tools used to unclog drains are affordable and readily available. The first tool to reach for when trouble arises is a plunger. The plunger clears clogs from most fixtures, including sinks, tubs and toilets. To dislodge clogs located farther down the drainpipe, use a cable auger, or plumber's snake (a long, flexible steel cable wound around a spool fitted with a hand crank). Cable augers are available in lengths up to 100



feet. A closet auger is specifically made for snaking toilets. The closet auger is also equipped with a hand crank with the cable encased in a rigid shaft. The auger end is bent at a precise angle to fit through the tight curves of a toilet trap. For a very large clog or one that's far from the fixture, an electric power auger may be needed. This machine—basically a large cable auger powered by an electric motor or drill — is very effective at cutting through virtually any clog.

Sink Clogs

Most minor sink clogs can be cleared with a plunger. The hotel engineer should partially fill

the sink with water and then start plunging. Vigorously work the plunger up and down several times before quickly pulling it off the drain opening. If it is a double-bowl sink, you will need to stuff a wet rag into one drain opening or the overflow opening while you plunge the other one. The rag helps deliver the pressure directly to the clog.

If plunging doesn't work, the next tool to use is the cable auger under the sink. You should remove the sink trap by hand or with a pipe wrench. First make sure the trap is not clogged. Remove the horizontal trap arm that protrudes from the stubout in the wall and feed the cable until you feel resistance. Pull out 18 inches of cable, then tighten the lock screw. Crank the handle in a clockwise direction and push forward at the same time to drive the cable farther into the pipe. Repeat the process until you break through the blockage. If the cable bogs down or catches on something, turn the crank counterclockwise and pull back on the auger.

After the cable is clear, crank and push forward again. When clear, you should retrieve the cable and replace the trap arm and trap. Turn on the hot-water faucet to see if the sink drains properly. If it does not drain properly, debris from the busted-up clog may have settled into a loose blockage and you will need to plunge the clog to clear the debris.

Bath Clogs

A bathtub rarely becomes clogged suddenly. A clog in the tub usually builds up over a period of several weeks, with the tub draining more and more slowly each day. If housekeeping does not recognize the slow drain, the hotel engineer may not be informed until the tub is very clogged. As with a sink clog, start with the plunger. First, un-

screw the screen from the tub drain and use a bent wire to fish out any hair and soap scum. If there is a pop-up drain on the tub, raise the lever to the open position, then grab the stopper and pull it from the drain hole. Clean it of all hair and soap. This will often take care of things. If not, cover the holes on the underside of the overflow plate with a wet rag and start plunging.

If that does not clear the clog, use the cable auger. Remove the overflow plate from the end of the tub; the stopper linkage will come out with it. Feed about 30 inches of cable down the overflow tube. Push forward while turning the hand crank. You will feel resistance almost immediately, but keep cranking on the auger until the cable passes all the way through the P-trap that lies underneath the tub. Retrieve the cable, then run several gallons of hot water down the drain. Finally, replace the overflow plate and screen or pop-up drain.

Free a toilet clog

Toilet clogs almost always occur at the top of the tight, up-curving trap that is part of the fixture. In most cases, a plunger can provide enough power to clear the way, but if it does not, you may have to use a closet auger. Place the auger end into the bowl with its bent tip aiming up. Hold the tool shaft steady as you crank and push down on the handle. You will feel the cable snake its way up and through the trap. Continue cranking until you've dispensed the entire cable—about 3 feet. Retrieve the cable by simultaneously cranking and pulling up. Flush the toilet to clear out the drainpipe. If it is still a little sluggish, run the auger through the trap twice more: once up the left side of the trap, then again up the right side. This three-pronged attack should clear any matter clinging to the sides of the trap.

Clear a floor drain

Hotel engineers will encounter clogged floor drains that carry wastewater from central air conditioners, washing machines, and water heaters. Over time, these drains can collect large quantities of soap scum, laundry lint, and slimy bacteria that crystallize inside a long drainpipe. To break through these tough blockages, a hotel engineer will need an electric power auger with at least 50 feet of cable. Start by removing the strainer that covers the drain hole. Then, look for a clean-out plug on the side of the drain basin. Remove the plug with a wrench, which allows bypassing the trap and feeding the cable directly down the pipe.

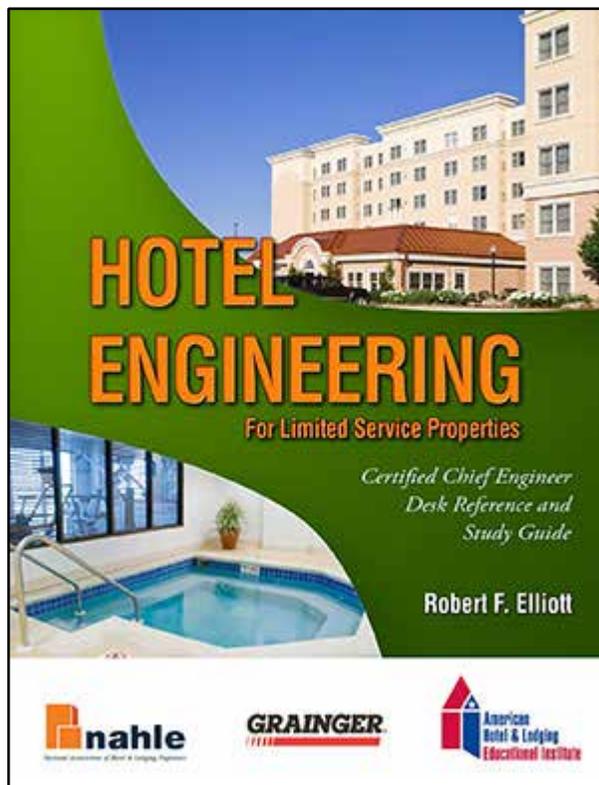
If the drain does not have a clean-out plug, you will have to snake the cable through the trap, a somewhat more difficult approach. Plug in the power auger and position it near the drain. Most models are fitted with a foot-pedal switch, leaving both your hands free to guide the cable. Feed several feet of cable down the drainpipe. Set the motor for clockwise rotation, then step on the switch to start the cable turning. Push the cable into the pipe until you feel resistance or hear the motor start to bog down. Stop the motor, reverse the rotation and back out a few feet of cable. Switch back to clockwise rotation and feed the cable farther down the pipe. Repeat this back-and-forth procedure until the clog has been cleared away. Retrieve the cable and flush out the drainpipe by pouring several buckets of hot water down it. Before replacing the clean-out plug, wrap Teflon tape around its threads to make it easier to unscrew the plug in the future. Do not forget to replace the clean-out plug or dangerous sewer gases may seep into the facility.

A Preemptive Drain Cleaning Program: Chemical Drain Cleaners

The hotel engineer may want to perform prophylactic drain cleaning to prevent clogs before they happen. Drain cleaning must be done often before flooding occurs and damages carpets, floors, and ceilings. Commercial kitchens face unique challenges in drain cleaning due to fat, oil and grease drainage. Kitchen floor drains get dirty over time when dust, food, fat, oil, grease, and debris enter the drains along with dirty water. Also, sinks often overflow, resulting in more contaminants being forced down floor drains. This environment causes bacteria growth and corrosion, emphasizing the need for routine drain cleaning. Another area of concern for many hotels is the basement where there are usually many storage areas, water heaters, laundry services, and central air conditioners.

Chemical drain cleaners use extremely corrosive chemicals to clean drains. These chemicals “eat” through materials such as hair, soap, and grease. They can be harmful and require careful handling and storage. Some ingredients commonly found in these drain cleaners include sulfuric acid and lye. The chemical reaction caused by these chemical drain cleaners dissolves the materials that clog pipes and hinder proper drainage. Chemical drain cleaners when used regularly can corrode or damage the plumbing connected to the drains. Additionally, chemical drain cleaners in high enough concentrations can harm the microbial bacteria necessary to help maintain septic systems. Further, the use of chemical drain cleaners can be harmful to the environment as these toxic chemicals are flushed through the drainage system and eventually into the ground or well water.

The hotel engineer should carefully follow all manufacturer instructions for storage and safe



disposal. When using the drain cleaner make sure you never come in physical contact with the chemicals. The hotel engineer should wear a pair of rubber gloves and protective goggles or a face shield in case any chemicals splash out of the drain. After the operation, be sure to avoid the drain area as chemicals are likely to bubble up, which releases harmful fumes and liquids.

You should never use a chemical drain cleaner on a garbage disposal or with a plunger. The chemicals can linger in the garbage disposal after the work was done on the drain. If someone decided to turn on the disposal, chemicals could splash and cause bodily harm. plungers may pull up the chemicals and spill on the operator.

Do not use chemical drain cleaner on a completely clogged drain. The chemicals will remain on top of the clog and further increase the difficulty of removing the clog. Also, do not mix different types of drain cleaner. If you mix an alkali

cleaner and an acid cleaner together the mixture may be explosive.

Outside Help

While hotel engineers may be able to work on small plumbing repairs, there are some problems that will inevitably require outside help. While professional drain cleaning can sometimes cost more than some hotel owners would like to pay, it is absolutely vital that you keep your drains as clean as possible to prevent expensive failures. The price of a professional drain cleaning to clear obstructions from hotel drains is much less than what it costs to replace a line that becomes unusable due to poor maintenance.

The hotel may be able to obtain deep discounts if it signs a maintenance contract for regularly scheduled drain cleaning services throughout the year. Before settling on a drain cleaning or plumbing company to service your hotel, make sure that you obtain references and price comparisons. By doing the necessary research on local drain cleaning and plumbing companies early, you will save yourself plenty of time and money when a real plumbing emergency arises at your hotel.

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HELP FOR LOW BACK PAIN

As a hotel engineer, it is easy to hurt your back when you lift, reach, or overdo activities, especially if your muscles are weak. Fortunately, we know a lot about relieving most back pain. Typically, low back pain will ease up in a few days or weeks.

How can you help your lower back feel better? Rest no more than 1 or 2 days and then stay moderately active. It's a myth that you need to rest for a long time (unless your health care provider tells you to because you have a serious condition). Use ice and non-prescription pain relievers to reduce inflammation. Treatment for low back pain may involve easy stretching and strengthening exercises, or physical therapy.

These back-friendly habits can help reduce strain and everyday backache:

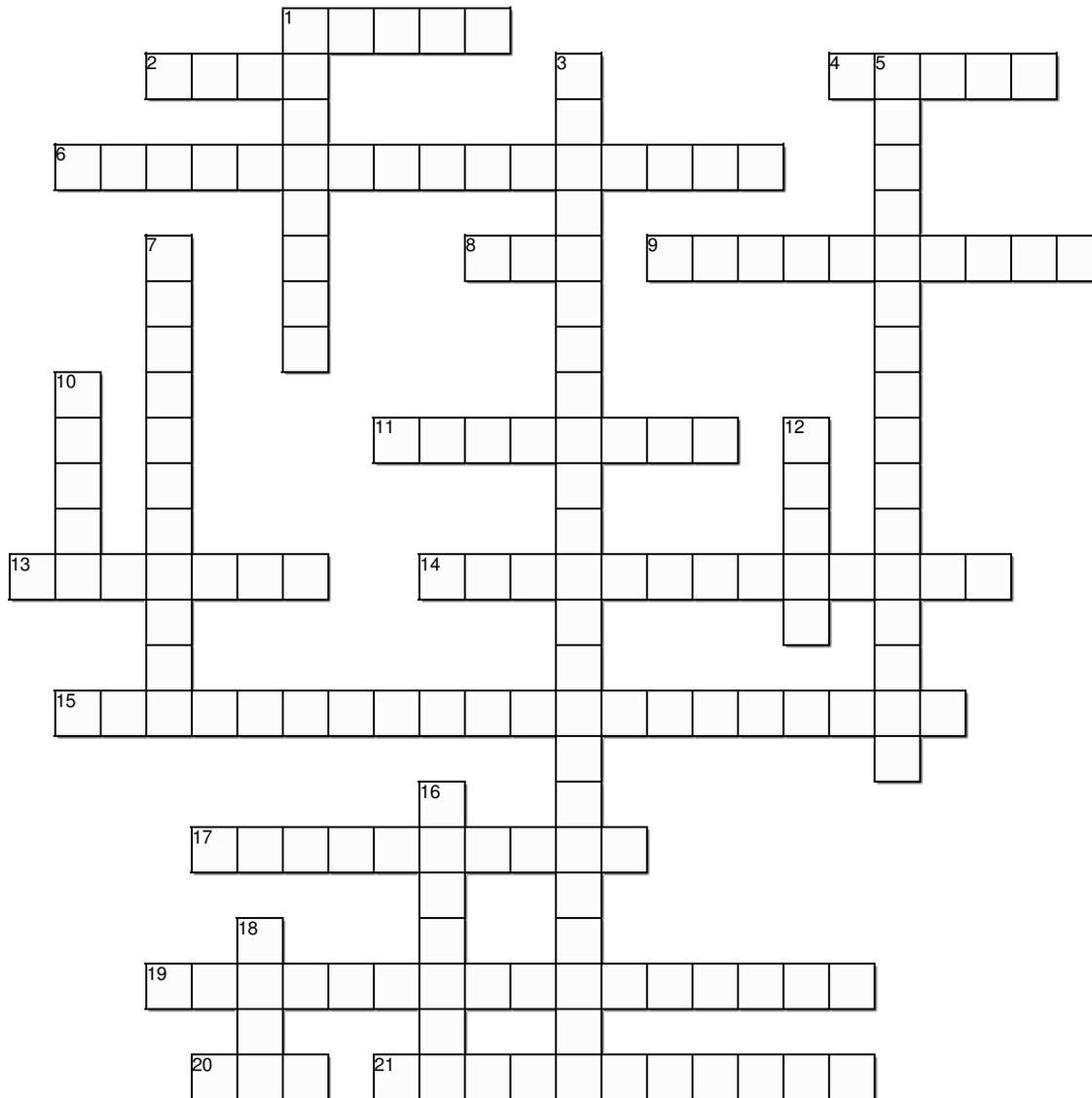
- Maintain good posture, especially while sitting and squatting. No slouching.
- Sit less. Get up and move about frequently.
- Do low-impact cardio exercise to improve circulation and strength.



- Use an exercise ball to help strengthen your core.
- Lose excess weight, especially abdominal fat.
- Let your strong leg muscles power the effort of lifting.

See your health care provider if you have persistent back pain. Discuss lifestyle changes and exercise needs – and find relief.

CROSSWORD PUZZLE FOR HOTEL ENGINEERS:



Created on TheTeachersCorner.net Crossword Maker

Across

1. Device for dislodging obstructions in curved pipes
2. Instrument of manual operation
4. National Association of Hotel Engineers
6. method to improve the 'value' of goods, products, and services by examining function
8. Certified Chief Engineer
9. carry wastewater from central air conditioners, washing machines, and water heaters
11. To free from dirt and germs
13. plunger clears clogs from most fixtures, including sinks, tubs and toilets
14. maintain property in good repair
15. corrosive chemicals to clean drains

Down

1. something that causes an allergy
3. maintenance plan to prevent unscheduled breakdowns
5. use the heat released by the reaction to break down the blockage
7. Under the authority of another person
10. Provides lodging on a short-term basis
12. Something, as a pipe or conduit, by which a liquid drains
16. A person with control or direction
18. Certified Director of Engineering



The National Association of
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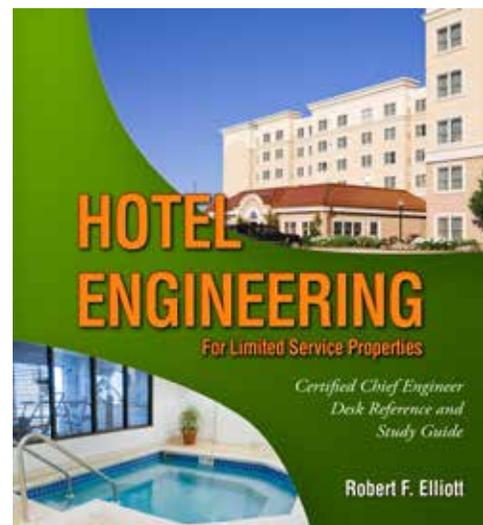
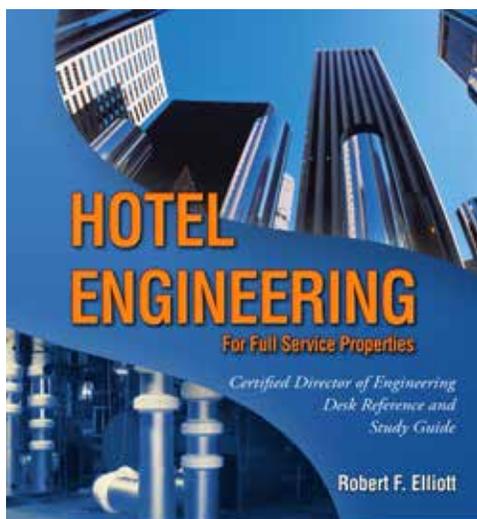
**American Hotel &
Lodging
Educational
Institute**



NAHLE Partners with AHLEI to provide two professional development and training programs for hotel engineers and maintenance professionals.

**Certified
Director of Engineering**

**Certified
Chief Engineer**



Training Today’s Hotel Engineer To Be Tomorrow’s Asset Manager

Certified Director of Engineering The (CDOE) is designed for full-service property engineers and their department heads or second(s) in command.
31 Chapters – 437 pages

Certified Chief Engineer Our (CCE) program is designed for limited-service property engineers and maintenance professionals who are often hourly employees. 19 Chapters – 265 pages

Our Curriculum is written in plain English with simple and easy to understand words. Our program includes information related to the planning and organizing of tasks, overviews of building engineering systems, and the financial and ethical skills required to operate effectively within a hotel organization. The limited-service program includes many common CDOE chapters as well as additional chapters that among others, focuses on; low-rise wood-frame construction, through-wall penetrations, saline pools, moisture infiltration and PTAC units.

The following provides a detailed program chapter analysis:

Management	Building Systems	Building & Grounds
<p>Both Full & Limited Service</p> <ul style="list-style-type: none"> • INTRODUCTION ** • PRIORITIZE TASKS / TIME MGMT.** • PROJECT MANAGEMENT** • ENVIRONMENTAL HEALTH & SAFETY** • EMERGENCY RESPONSE PLANNING** • MAINTENANCE OF THE HOTEL** <p>Full Service Only -----</p> <ul style="list-style-type: none"> • REPORT & LTR. WRITING* • RECORD KEEPING* • BUDGETING* • SUSTAINABLE OPERATIONS* • CONTRACTING FOR SERVICES* • BUSINESS ETHICS* • PROPERTY ACQUISITION/ DISPOSITION* • RISK MANAGEMENT* • BUSINESS CONTINUITY* 	<p>Both Full & Limited--</p> <ul style="list-style-type: none"> • ELECTRICAL SYSTEMS** • LIGHTING SYSTEMS** • FIRE & LIFE SAFETY SYS** • PLUMBING SYSTEMS** • HVAC** • VERTICAL TRANSPORT SYSTEMS** <p>Full Service Only----</p> <ul style="list-style-type: none"> • SECURITY SYSTEMS* • ENERGY MANAGEMENT* • BUILDING MANAGEMENT SYSTEM* 	<p>Both Full & Limited--</p> <ul style="list-style-type: none"> • BUILDING DESIGN & CONSTRUCTION** • PARKING STRUCTURES** • SWIMMING POOLS & SPAS** • INTEGRATED PEST MANAGEMENT** <p>Full Service Only-----</p> <ul style="list-style-type: none"> • BUILDING COMMISSIONING* • WASTE MANAGEMENT* <p>Limited Service Only--</p> <ul style="list-style-type: none"> • MOLD & MILDEW* • PTAC UNITS* • THROUGH-WALL PENETRATIONS*
<p>FULL SERVICE = *</p> <p>LIMITED SERVICE = *</p>	<p>Both programs are available for \$685 each.</p>	<p>Additional test is \$125 per.</p>

Program Attributes

Transferable: By focusing on the principles of management, building engineering systems, and the hotel building and its property grounds, we created a curriculum that is easily transferable across different hotel brands and property types.

Informed Decision Making: When hotel engineers become better informed, their decision making process improves and they in turn tend to lead others, especially their own staff, to a higher quality standard. This new level of professionalism is best reflected in your property's appearance, staff productivity and efficiency and increasing the useful life of your property's building systems and equipment.

Hotel Centric: Both our Certified Director of Engineering (CDOE) and our Certified Chief Engineer (CCE) programs are written exclusively for hotels and lodging properties. From the heart-of-the-house to the property's perimeter access, NAHLE's certification programs are all about hotels and the unique environment of mixed-use occupancies.

Self-Paced Study: Our programs are designed for engineers to study at their property and learn at their own speed. An experienced engineer should complete our full service (CDOE) program in about 40 hours typically stretched out over a few months. While the limited-service (CCE) program averages about 20 hours of study. Our curriculums are both based upon the engineer remaining on property and studying on the job.

Online Registration & Technical Support: Both Nahle and EI register candidates online and provide technical phone support.

Reporting: Nahle has online software available should you want to track study hours for limited-service candidates. We can also provide exam results for groups of properties.

Multiple Property Roll-Out: Our programs are designed for management companies to enroll multiple engineers in the program at the same time and have all candidates working toward their certification concurrently.

Online Exams: Candidates are designated as a certified engineer upon the successful completion of multiple sectional tests administered online by EI. The CDOE program has two tests and the CCE has three tests. Each sectional test is comprised of numerous multiple-choice test questions drawn from the Study Guide's individual chapters. A minimum passing score of 70% is required. Applicants may take Sectional tests twice.

Track Study Time: CCE (select-service) applicants may track their study time on NAHLE's website by accessing their own unique membership login. Hours of study may be entered for each calendar day in increments of 15 minutes and notes may also be typed in for future reference. A downloadable log of an applicant's total study time is available.

Certificate of Completion: Upon successful completion of the course, NAHLE issues an electronic certificate suitable for high quality color printing. The certificate designates the candidate as successfully completing the educational requirements to become a Certified Chief Engineer or Certified Director of Engineering.

NAHLE - Membership Services

- **Lodging Engineer** - NAHLE's official digital trade magazine focuses specifically on hotel engineering and maintenance. All articles are exclusively written for *Lodging Engineer (LE)*. Members can access archived issues and print pdf versions. The electronic version of *LE* magazine also contains links for accessing additional product information including advertisers' websites.
- **eNewsletter** - our weekly eNewsletter focuses on current events and regulatory issues. Links to other online articles and magazines are provided allowing members to download featured articles and product advertisements for hotels.
- **Forum/Blog** – a electronic forum where 'members only' can exchange ideas and information with their peers in a threaded discussion format.
- **Job Bank** – a single source for finding and posting hotel engineering and maintenance job openings.
- **Calendar** – lists upcoming events, webinars, and meetings
- **Resource Library** – an organized and searchable database of both print articles and video. Documents include past LE articles, federal regulations, case studies, and maintenance checklists, etc. Videos are searchable and include 'how-to instructions' and product information.
- **Buyer's Product Guide** – an electronic buyer's guide which lists service vendors, suppliers and product manufacturers. Searches for local vendors by zip code.
- **Warranty / Permit / License Management** – a document management system that catalogues and tracks time sensitive information and documents such as warranties, permits and licenses. Program tracks unlimited number of documents in a three level searchable database that you create. The program sends you and other identified recipients a reminder via email of a future specified date or impending expiration that you choose .

Nahle's Value Proposition: Investing in your staff's professional development challenges engineers to apply their knowledge to the very same systems they are responsible for maintaining on a daily basis. Educational training creates trust and loyalty among your employees. And, perhaps most important, uniform education and training creates an environment of informed decision making. For hotel engineers and maintenance workers, completing a certificate program can be the most cost effective way to **Catch Up, Keep Up and Stay Ahead** of the competition. ([Read more at Lodging Engineer](#)) Studies show that men who complete certificate programs of less than one year earn roughly 10% more than those who do not have such a certificate ([Georgetown University Study 2012](#)). More and more owners expect their engineers to know and apply what is quickly becoming 'common knowledge.'



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