ISSUE
33
SUMMER 2019

Lodging Engineer

Featuring :

Fundamentals of Hotel Concrete Repair
Legionella Water Management Planning Overview
Highest and Best Use of Hospitality Capex
Hurricane Season - Are You Really Ready?

NAHLE Updates Certified Chief Engineer (CCE)

ADDS: SPANISH Translation

&

Legionella Water Management Planning Overview

LODGING ENGINEER™ reports about people, events, technology, public policy, practices, study and applications relating to hotel and motel engineering, maintenance, human communication and interaction in online environments.

CONTACT
P.O. Box 30844 • Alexandria, VA 22310
703-922-7105
www.nahle.org

Editor
Robert Elliott (robert.elliott@nahle.org)

Contributing Writers
Thomas Daly, Robert Elliott, Ed Golden, Bill Pearson, Thomas Riegelman, Werner Rodriguez

Correspondence address to: articles@nahle.org

Administrative Issues: admin@nahle.org (all submissions, editorial matter, artwork, subscriptions, address changes)

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This article, written as supplement to our CCE program, provides an overview for learning about additional safeguards and testing protocols to consider when administering a water management program to reduce disease risk exposure to water borne pathogens within a hotel setting.

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by Thomas Riegelman

There are four important concepts that hotel owners and operators need to know about CapEx useful life. Applying these concepts is crucial to good CapEx decisions and achieving highest and best use of owner's capital.

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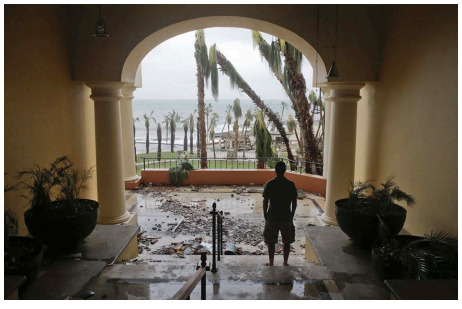


HURRICANE SEASON—ARE YOU REALLY READY? by Tom Daly

While beachfront hotels and other hotels in historical storm paths have encountered and survived previous hurricanes, some hurricanes of unprecedented strength (Class 4 or 5) have struck resulting in massive property destruction and a threat to the lives of both hotel staff and guests.

AS I SEE IT

Robert Elliott. President NAHLE

Greetings! I trust you are reading *Lodging Engineer* from a nice cool air-conditioned space, it's 98 degrees outside here in the DC area. I typically write a little something when NAHLE reaches a major milestone in our development or has plans in the making to improve our educational outreach and grow membership. I think I have both and want to take this opportunity to tell you about it.

I am pleased to announce our translation of the Certified Chief Engineering (CCE) study-guide to Spanish is near completion. We have completed all 19 chapters and are now working on translating a recently acquired chapter provided by Bill Pearson, ASHRAE Standard 188 Committee vice-chair, on reducing risks associated with water safety management planning and Legionnaire bacteria. The entire CCE Spanish program will be available online soon. Hopefully this translation to Spanish will impact hotel management companies' seeking to find qualified workers in the field of hotel engineering and maintenance as well as opening the door for many new workers wanting to enter the hospitality job market. I want to thank Werner Rodriguez, who was one of our earlier CCE candidates as part of Apple REIT's initial roll-out for stepping up to the challenge of accurately translating the many engineering terms found in our program's curriculum. This is truly appreciated. We are including an excerpt in this issue for all of our Spanish friends and hope to continue expanding our international reach. NAHLE has certified numerous engineers from various countries including South Africa, UAE, Saudi Arabia, Caribbean Islands, and Hungary among others.

Did you get a chance to see this summer's webinars? The first was provided by Outdoor Lighting Perspectives and our most recent was on "Reducing The Risk of Legionnaires' Disease at Hotels and Resort Properties." This last webinar was truly impressive by any standards and timely considering the two recent hotel outbreaks. In my opinion, it ranks right up there in quality and content with Orkin's webinar on bed bugs (also available in our CCE program). Our Legionnaires webinar would not have been possible without the help of Kristin Majeska, Leslie Dillon and the rest of the IDEXX team. I would also like to thank our speakers: Chris Eden of the CDC (Center for Disease Control) and, ASHRAE committee members Bill Pearson and Patsy Root of *ASHRAE's Standard 188 on Legionellosis: Risk Management for Building Water Systems*.

About every three or four years the face of Nahle, our website, becomes dated and needs a new look and technology updates. So, we are rebuilding our website and hope to have this completed soon. Last count our website (www.nahle.org) had over a ¼ million 'Unique Visitors' worldwide and over one million 'Hits.' To me, this equates to a lot of men and women in the field of hotel engineering and maintenance seeking more knowledge and personal professional development. We are also 'cloning' our new website so we may offer independently managed websites to any potentially new forming local chapters.

Nahle is currently looking into beginning a local chapter here in Northern Virginia. A few years ago Grainger sponsored a NAHLE luncheon in DC. We learned that a DC hotel engineers' chapter already existed. As we look into this further, we are hoping that some of the same vendors that currently supply hotels in the DC Metro area will support our endeavor and a local network of hotel engineers. If we move forward, we certainly plan to have some fun along the way, like a National's baseball game in addition to some good food, networking among fellow engineers and vendor sponsored educational outreach. I recently had lunch with an engineering manager of a local hotel management company and we were discussing the possibility of a chapter from a due diligence perspective when our CCE program came up. I mentioned that some hotel companies are reluctant to move forward with their portfolio because sometimes the engineer gets his training and then moves on for one reason or another. He said, and I quote because I literally took a moment to write it down, "What happens if I train my people and they leave? Answer: What if I don't train them and they stay?"

We've got some great articles in this issue. I'd like to thank Tom Riegelman and Ed Golden, both former chairman of AH&LA's Engineering Committee, Tom Daly (former Hilton senior vice-president & AH&LA Security Committee), Werner Rodriguez and especially, Bill Pearson, for their contribution to this issue of Lodging Engineer.

Very truly yours,

Robert Elliott

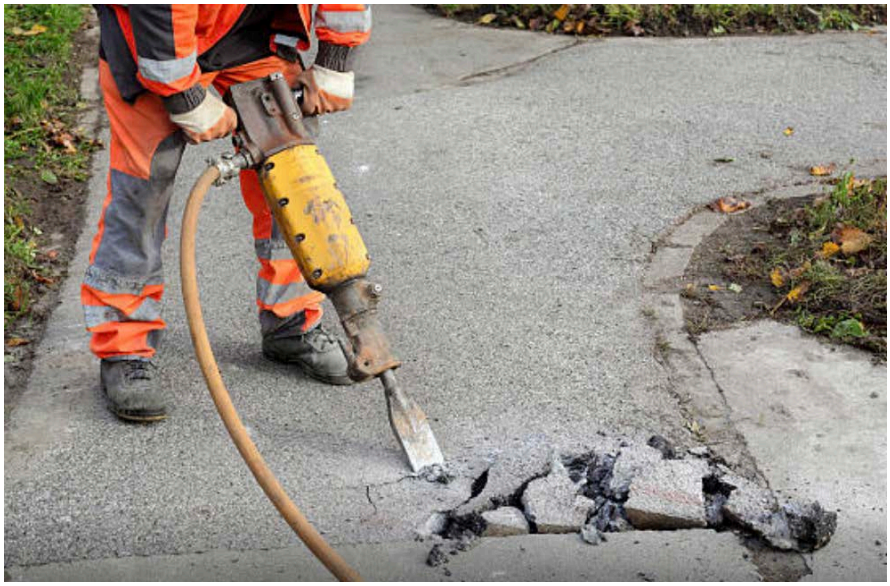
THE FUNDAMENTALS OF CONCRETE REPAIR, IT'S CAUSE, EFFECT AND RESOLUTION

By

Ed Golden

Past Chair AH&LA Engineering & Environment Committeee

Large sums of money are spent annually in the Hospitality Industry repairing concrete structures. In conjunction with the concrete repair costs, there are significant indirect repairs costs associated with the disruption of the property under repair. Unfortunately, the repairs may not address the root cause of the concrete deterioration. It is not unusual to find that repaired structures continue to deteriorate and will eventually require additional funding to "repair the repairs."



Water and moisture, of any kind, has always been the enemy of any concrete structure. For those of us who own or operate properties in salt laden atmospheres, the problem is compounded. The wetting-drying process accelerates corrosion in structures due to the increase of moisture content in the concrete.

All things being equal, a structure in an environment of 95% moisture has a corrosion rate of 50 to 100 times that of a 60% moisture condition. When moisture, especially salt laden moisture, enters a concrete structure, corrosion starts the building deterioration process. New buildings can be designed with corrosion protection in mind, whereas older buildings that were built using iron or mild steel, without protection from corrosion can have serious concrete deterioration problems.

If moisture is concrete's Achilles' Heel, ferrous metals are the catalysts for deterioration. Ferrous metals oxidize when exposed to moisture. This causes rust or iron oxide. Rust expands and this expansion results in more occupation of space or volume of the original metal. When this happens, the concrete surrounding the steel cracks.

To prevent moisture from entering a concrete structure, it can be coated or sealed. Clear sealers are designed to reduce water penetration into the concrete without changing the appearance of the building. The sealant reacts chemically with the surface cracks, allowing existing moisture to escape while preventing new exterior moisture from entering the concrete's surface. These breathable penetrating sealers, once applied, are difficult to remove and could affect the bonding of concrete repairs.

Colored coatings can reduce the penetration of water into a concrete structure and also change the appearance of the building and help disguise concrete surface repairs. All in all, concrete is a very complex product. It's myriad of uses in the Hospitality Industry is extensive and beyond the scope of this paper. To simplify the various issues concerned, we should direct our attention to a simple horizontal concrete slab found in every hotel as a primer to this very interesting topic.

The effect of deterioration of concrete is normally expressed as Spalling. Spalling is defined in most dictionaries as follows:

SPALL (1758 M.): to break up, small fragment or chip, esp. of stone/reduce by or as if by chipping with a hammer/to break off chips, scales or slabs.

SPALLING: the cracking or flaking of particles from a surface.

THE REPAIR OF A HORIZONTAL CONCRETE SLAB

We shall assume that a new slab of concrete is to be joined to an existing slab. The finished product is to be covered with sheet vinyl flooring, tile or carpeted. The existing slab is cracked, has steel reinforcement and is separated by concrete joints.

CRACKS

Concrete loses its moisture in its hardening process, due to the evaporation of the water. This causes the volume of the concrete to shrink, the result is called shrinkage stress and shrinkage cracking. The loss of water through evaporation is caused by the concrete's exposure to the atmosphere as it dries. Shrinking, if not restrained can result in shortening. If the concrete slab is prevented from movement, stress will build up and result in failure of the strength of the mix. It is important to understand that the proper placement of the reinforcing steel in the mix is critical in providing equal distribution of the shrinkage stresses. This in turn, can control area shrinkage cracking.

Cracks in concrete are undesirable for the following reasons:

- Structures can become unsafe and collapse.
- Structures develop leaks.
- The durability of the concrete is compromised.
- Appearance of the concrete becomes unacceptable.

CONTROL JOINTING (The purpose of jointing is to control natural transverse and longitudinal cracking from internal slab stresses)

Concrete cracking can be avoided with the correct placement of control joints. Joints accommodate movement, provide planes of weaknesses and cause cracks in concrete in defined places. The isolation joint, for example, is used to isolate two separate slabs, i.e. an existing and new slab. A construction joint is used when concrete is placed in one area and cannot be finished due to the weather or other constraints. When the concrete pour is continued, a construction joint is used in the stop/ start areas. A third joint is the contraction or control joint, which allows cracks to occur where you want them to occur. Isolation joints must be made at the full depth of the slab, whereas, contraction control joints should be cut to one quarter of the slab thickness and placed not more than six feet on center in both directions. It should be noted that concrete masonry (CMU) also needs control joints normally 25 feet on center, as the CMU will shrink over time.

To keep cracking to a minimum, new concrete should be covered with a plastic sheet for 3 days to control the evaporation losses. Any reinforcing steel in the pour should have a concrete cover 3 times the aggregate (rock) size. Crushed aggregate has better interlocking or bonding features than rounded or smooth aggregate of the same size.

If wire mesh used in the pour, the mesh should be placed one third from the top of the slab.

EMBEDDED METAL CORROSION

The most common concrete failure in the hospitality industry is the process of embedded metal corrosion. To understand the principal of how and why this corrosion takes place, it is necessary to understand the electrochemical process that manifests itself inside a piece of concrete that has reinforcing steel placement. Concrete is a high alkalinity material, the pH of newly produced concrete ranges between 12 and 13.

Wire mesh at 3 inch embed caption & photo

At this level of alkalinity, the embedded steel is protected from corrosion by a passive film bonded to the reinforcing steel surface. If the passivity is disrupted, corrosion of the steel will take place. It follows that corrosion is an electrochemical process requiring an anode, cathode and electrolyte. In the concrete mix, the moist concrete mix forms an electrolyte while the steel provides the anode and cathode. A known reaction takes place when small electrical currents flow between the cathode and anode which results in a swelling of the reinforcement steel. Water and oxygen in the concrete mix allow this reaction to take place. It goes without saying that in good quality concrete, the corrosion process takes a very long time, but accelerated corrosion will take place if the alkalinity pH is lowered or if chemicals or dissimilar metals are introduced into the concrete.

CORROSION INHIBITORS

- **High quality concrete**
- **High alkalinity pH**
- **Good concrete coverage that protects the steels' surface from corrosion**

CORROSION PROMOTERS

- **Oxygen**
- **Water**
- **Stray electrical currents**
- **Environments that lower the alkalinity pH**
- **Chlorides**

CHOLRIDES

One of the most significant corrosion promoters that are of interest to the hospitality industry is chlorides. Chlorides can be introduced into concrete when it comes into contact with moisture, salt air or seawater. The concrete absorbs the chloride-laden moisture at the surface, which draws it in until it reaches the reinforcing steel. The time taken for penetration depends upon the amount of moisture present. Over a period of time, the chlorides come in contact with the reinforcing steel and when mixed with oxygen and moisture, the corrosion of the steel takes place. As the corrosion (rust) grows the reinforcing swells which causes the concrete to crack and delaminate. Once the concrete is cracked, the corrosion process accelerates and begins to affect the reinforcing steel buried within the concrete. Chlorides are not consumed in the corrosion process but act as catalysts and will remain in the concrete, to promote progressive corrosion, which can result in structural failure.

SURFACE REPAIRS

In the hospitality industry, repairs to damaged concrete structures are normally limited to deteriorated surfaces which are referred to as spalled areas or spalling. With spalled concrete, the reinforcement steel is corroded; the swollen steel has delaminated, cracked or lifted the concrete surface away from the reinforcement steel. Repairs to the deteriorated surface include edge conditioning, removal of the spalled concrete and undercutting of exposed reinforcing steel cleaning, reinforcing steel protection, preparation of concrete for the repair material and finally, placement of the repair material to suit the existing conditions.

SPALLING REPAIR PROCEDURES

Non load bearing surface repair involves the process of conditioning the existing concrete and reinforcing steel to receive repair materials. The conditioning process allows for the bonding of the repair materials. It follows that surface preparation must be thorough. The necessary bond between existing concrete and the repair materials is to be permanent. Areas of repair are not normally uniform in shape. It is recommended that irregular boundaries of spalled concrete be laid out square or straight edged patterns used to reduce boundary edge shrinkage. If after saw cutting, the spalled area corroded reinforcement steel is visible, the following remedial steps should be taken:

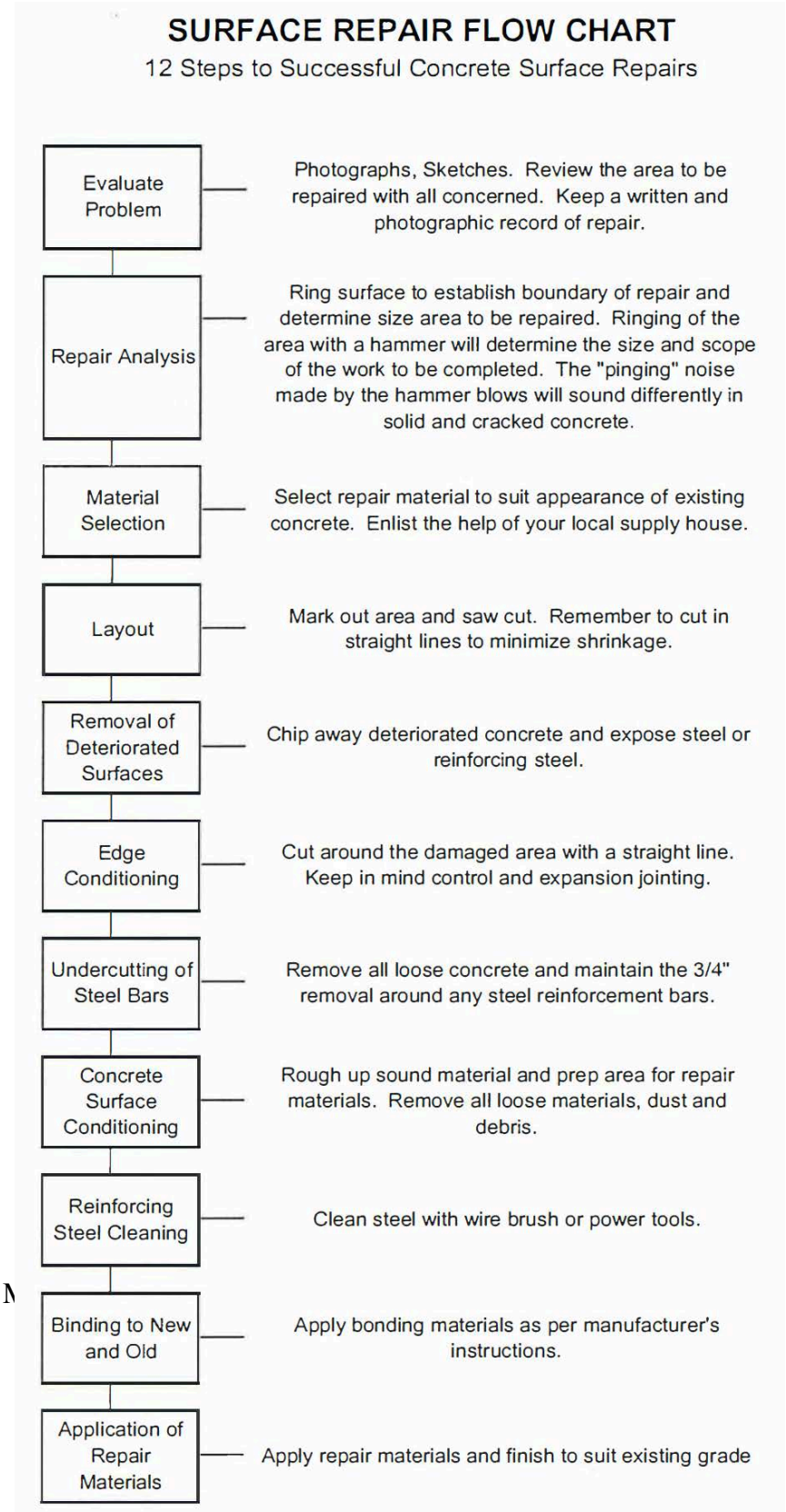
1. Expose the reinforcing steel by removal of a minimum of%" of concrete under the corroded bars.

2. If supporting uncorroded bars are exposed and/ or disturbed in the removal process, then those bars shall be fully exposed as if they were corroded. Again, use the%" minimum as a guide in preparing the steel and concrete surfaces for bonding. Clean all reinforcement steel to accept the bonding materials. Apply the bonding material to the steel bars after thoroughly cleaning all exposed steel. Remember that the bonding material must achieve a strong bond between the cleaned concrete and reinforcing steel. Bond durability is as important as bond strength.

3. The surface of the existing concrete to be repaired must have an open pore structure to allow absorption of the repair material.

4. Rough up the surface of the concrete to be repaired and clean the area of dust, oil, fats and debris.

5. Mix the repair materials following the manufacturer's instructions. When applying the repair material, make sure that the reinforcing steel is fully encapsulated.



6. Apply the repair materials following the manufacturer's instructions. Finish the repaired section of the concrete to match the surrounding finishes.

7. Care must be taken in the selection of your bonding and repair materials to ensure compatibility with your existing concrete surface. A variety of epoxy and concrete products are available for use in repairing spalled concrete. Check with your local material agent for information on product usage for your particular problem area.

The finished repairs must successfully marry existing and new materials into a permanent bond capable of supporting everyday usage and exposure to the environment.

Reference Source: Concrete Repair and Maintenance Illustrated, by Peter H. Emmons, Kingston, MA R.S.

***

Open Letter To Ed Golden:

Dear Ed,

I trust this letter finds you in good health and spirit.

If you ever run across this article in **Lodging Engineer** magazine, please accept my apologies for not directly obtaining your consent to publish your article on concrete spalling, now, a couple of decades later. As you may recall, you authored the following article on concrete spalling and requested that it be published in the American Hotel & Lodging Association's (*AH&LA*) ***Lodging Magazine***. I was unable to get it published then but it is still relevant today and after all these years is now being published.

With warm regards,

Robert Elliott

At the time, Ed Golden, Director of Facilities for Out-Rigger Hotels was the chair of the Engineering and Environment Committee. I was AH&LA's vp of regulatory affairs and staff liaison to the E&E Committee. On behalf of the E&E Committee, Ed wanted to have the following article on concrete spalling published. I believe the Committee was hoping to see more articles like Ed's published. However, at the time I was unable to get the first article published. Years later after starting ***Lodging Engineer*** *magazine I remembered Ed's article and looked for it on occasion. However, I was unsuccessful in locating the floppy disc that I remembered stored his article. Over the years I occasionally looked for the floppy disc among various boxes of 'important stuff' I accumulated over the years, but never found it. And then a couple of months ago, completely out of the blue someone contacts me from the Open Travel Alliance (OTA) wanting to know about AH&LA's HITIS project which I had the pleasure of chairing its Advisory Committee for four years. Basically the HITIS initiative developed consensus standards from all of the existing 'spaghetti' code (computer code) that ran a hotel's Property Management System (PMS) back in 2000. Among others, HITIS developed the first Computer Reservation and Yield Management Standard (CRS). Anyway, I did recall an overview brochure that was also developed explaining the HITIS project's scope. And, after a brief search I was pleased to find both the HITIS brochure and Ed's article. I passed the brochure on and am printing Ed's article.*

I wish the Open Travel Alliance and their 2nd generation HITIS initiative much success and encourage your support.

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Lodging Engineer

SOON TO BE AVAILABLE IN SPANISH! **¡PRONTO PARA ESTAR DISPONIBLE EN ESPAÑOL!**

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Here is what NAHLE Certified Engineers across the U.S. are saying about our programs:

Certified Director of Engineering (CDOE) – Full Service Hotels

1. *"I've been an engineering manager for over 14 years, 10 in limited service and the last 4 in full service at the Marriott 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."*

Certified Chief Engineer (CCE) – Select Service Hotels

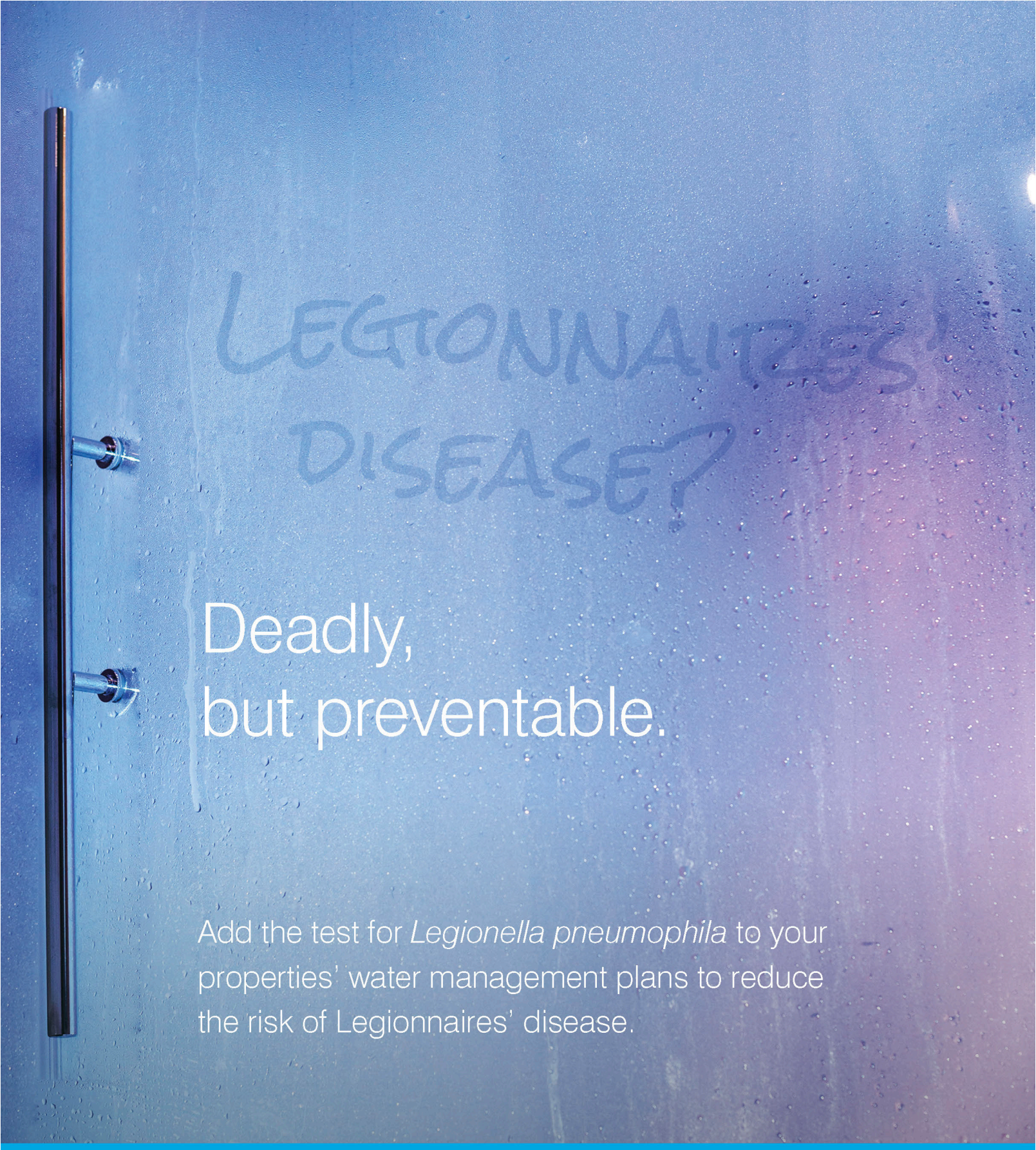
2. In my opinion the course was very informative because it covered very important themes focused on the system or the equipment we work with everyday at the hotel. Everything was explained with basic examples and simple words.

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

4. 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.

5. 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 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).

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



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Add the test for *Legionella pneumophila* to your properties' water management plans to reduce the risk of Legionnaires' disease.

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IDEXX

Legionella Water Management Planning Overview

by

Bill Pearson,
Certified Water Technologist
ASHRAE SSPC-188 / Legionella Standard, Vice Chair
Contact:bpearson249@icloud.com

The following article is submitted to NAHLE for reprint in ***Lodging Engineer***. This document is originally submitted and intended as a supplement to our Educational Training programs Certified Chief Engineer (CCE) and Certified Director of Engineering (CDOE).

This section is provided as a tool to help you meet minimum safety levels for water within a hotel setting and provide a safe and clean environment for your guest and employees in controlling and preventing exposure to water borne pathogens. Swimming pools and spas should be maintained, treated and tested on-site by qualified personnel in accordance with safe practices as required by your local building and safety departments, jurisdiction having authority, and any requirements prescribed by your hotel's management and ownership teams. This appendix section is provided as an overview for learning about additional safeguards and testing protocols to consider when administering a water management program to reduce disease risk.

Disclaimer: This content is not intended to be used, nor should it be used as a substitute for professional advice, diagnosis, or treatment of water or water systems used at a hotel or resort. The National Association of Hotel & Lodging Engineers, LLC (NAHLE) is not responsible for any specific health problems or outbreaks of Legionnaires Disease as a result of information provided herein and shall not be liable for any damages or negative consequences from any action, treatment, diagnosis, application or preparation, to any person or entity reading or following the information in this appendix. References are provided for informational purposes only and do not constitute endorsement of any sources. NAHLE does not recommend or endorse any specific tests, contractors, consultants, products, procedures, opinions, or other information that may be mentioned. Reliance on any information provided by this appendix is solely at your own risk. The responsible parties should consult their local regulations and available guidance documents such as ANSI/ASHRAE Standard 188.

FORWARD:

While there is no single or simple blueprint for a universal water management program, the ANSI/ASHRAE Standard 188: Legionellosis Risk Management for Building Water Systems provides what is needed, along with invaluable guidance. It has become the "standard of care" for owners of buildings with complex water systems and/or water features known to be associated with the potential to cause Legionnaires' disease through the generation of fine mist of water droplets contaminated with (Legionella) bacteria. Legionnaires' disease is a form of bacterial pneumonia which kills one in ten people who are diagnosed with it. The same process and components of an ASHRAE Standard 188 water management program (WMP) can be used to identify and control the risk from other waterborne pathogens as well, such as E. coli and Pseudomonas aeruginosa.

What Contaminants Should You Consider?

First and foremost, follow any state, local or other authorities having jurisdiction (AHJ) regulations. For example, many jurisdictions require specific frequencies of monitoring and recording pool & spas disinfection and pH levels. They may also require periodic microbial testing.

Bacteria are in the hotel water system from the municipality supplied or other water source provider, as well as from biofilm contamination of the water once it's on the property (in the building). Both routes should be considered in the Water Management Program. While fecal contamination may very occasionally stem from the distribution system, it is most often a concern in swimming pools, where contamination can be caused by pool users. Similarly, Pseudomonas aeruginosa typically enters the building water system through individuals' skin contact with surfaces or water. Legionella pneumophila is a naturally occurring environmental bacteria in many types of source waters, generally in very low, even non-detectable levels. Thus, it may be present in the distribution system water, particularly after pressure-related or other water quality disturbance events such as main breaks or construction. However, both Legionella and Pseudomonas only grow to concentrations which create a health risk once they are in building water systems and find a favorable habitat of warm water temperature, biofilm and/or insufficient disinfectant levels – thus, why these need to be and can be "managed".

For pools and spas, the World Health Organization suggests considering periodic monitoring of these microorganisms:

- Heterotrophic plate count (HPC) a measure of overall bacteria
- E. coli or thermotolerant coliforms, indicators of fecal contamination
- Pseudomonas aeruginosa, cause of "swimmer's ear" and "hot tub rash"
- Legionella, cause of potentially fatal Legionnaires' disease

From a public health standpoint, for non-pool and spa water, Legionnaires' disease is the primary concern in hotel settings. Both potable water and nonpotable water elements of the water system should be assessed for Legionella risk.

Who Should Develop Your Water Management Plan?

ASHRAE Standard 188 and the Centers for Disease Control & Prevention (CDC) Toolkit recommend establishing a Water Safety Management "Team" to develop and oversee the ongoing implementation and validation of the Water Management Program.

Collectively, the Water Safety Management Team (members) should bring the following skills (and authority) to the Water Management Program:

- ✓ Ability to oversee program implementation and authority to make cost decisions
- ✓ Knowledge of the building/facility water systems
- ✓ **Ability to identify Legionella control: locations, strategies, limits & corrective actions**
- ✓ Ability to monitor and document performance (is the program being followed)
- ✓ Ability to confirm program performance (is the program working to control the risk)
- ✓ Ability to communicate regularly about the program (internal and external communications)

Hiring a consultant with prerequisite expertise may be needed or helpful for the initial development and/or implementation of the Water Management Program. However, it is essential that hotel management and staff be active members of the Water Safety Management Team. The process requires specific knowledge of the systems and "ownership" of Team activities and functions cannot be completely outsourced.

The CDC suggests considering the following factors when hiring a consultant:

- **Level of experience:** For example, what kind of *Legionella*-specific credentials and experience do they have – particularly the consultant?
- **Laboratory expertise:** For example, is the laboratory they use or recommend accredited for environmental testing?
- **Environmental assessment expertise**: For example, how much experience does the company have with environmental assessments and/or sampling for *Legionella*?
- **Remediation expertise:** For example, how frequently does the company provide remediation services and can they describe situations where they remediated *Legionella* from a building water system in a facility of your size/type?
- **Water management expertise:** For example, how much experience does the company have creating water management programs compliant with industry standards for a facility of your size/type?
- **Knowledge of codes, standards, and regulations:** For example, does the company have previous experience working in your state and/or jurisdiction?
- **Potential conflicts of interest**: For example, does the company have interest in promoting specific services or products?

How Should You Create and Implement the Plan – after (#1) forming the TEAM?

2. Describe the water system/Cooling tower: using simple text or diagrams, describe the system to be managed, flows of hot and cold water, return loop systems, where water enters the building or tower, etc.

Engineering drawings are not required and often not helpful in this process. It is most important to have a schematic which clearly and accurately illustrates the flows of water through the facility and can be easily understood by all members of the team.

3. Identify areas of risk: such as stagnant water areas, areas where high risk populations reside, where water use could create aerosolization or where there could be a low disinfectant residual.

Every hotel and building may be different, with different water flows. You should specifically identify the risk areas of your building(s). The following area of a hotel or resort are particularly important to consider because they create opportunities for contaminated water to become aerosolized and for hotel guests or employees to breathe in contaminate moist air and become infected:

- ✓ Faucets and shower heads
- ✓ Spas and whirlpool tubs
- ✓ Decorative fountains
- ✓ Sprinklers
- ✓ Ice machines
- ✓ Cooling towers and evaporative condensers
- ✓ Humidifiers

4. Decide where to apply control limits: what is the hot water temperature in storage tanks and delivery locations, what level of disinfectant is monitored (being achieved) to control *L. pneumophila,* or other target pathogens to a pre-determined acceptable level.

Identify initial (fix-it actions) to reduce risks. For example, removal of water stagnating "dead legs" or no-flow water sources, such as a deteriorated pipe that is capped and unused – allowing accumulated water to promote biofilm growth and contaminate other parts of the water system.

Also, be cognizant and implement on-going controls (for example) to:

- Keep water temperatures outside the favorable range for *Legionella* growth. "KEEP the Hot water HOT and KEEP the Cold water COLD!"
- Ensure adequate disinfection. Flush programs can be set up, particularly during periods and in areas of low occupancy or use,
- Maintain devices to prevent biofilm, scale, corrosion, which provide a habitat and nutrients for *Legionella pneumophila.* Typically, this requires treatment programs for cooling towers, pools, spas, fountains, etc.

5. Monitor & Corrective Actions: determine what will be done if verification testing indicates a part of the system is out of control limits; have a documented action plan.

For example, if a weekly visual inspection of a decorative fountain reveals slimy growth, the corrective action could be to drain the fountain, clean it per the manufacturer's recommendations, refill the fountain and test the disinfectant residual. Or, for example, if a floor is unoccupied during

a renovation, increase flushing from weekly to daily and institute daily checks of water temperature and disinfectant residual.

The Corrective Action plan should also clearly identify the steps to follow when a water feature or area of the building does not meet the standard in the plan, for example, temperatures or disinfectant were not at sufficient levels. It should also specify who in the Water Safety Management Team and within the hotel management structure should be notified for specific incidences of the water not being "in control".

6. Verification and Validation: verification testing monitors control limits such as water temperature, disinfectant levels to determine if a Program is being implemented as designed; Validation testing determines if the Water Management Program is effectively controlling the pathogen *L pneumophila*, *P. aeruginosa*, etc. by testing water samples from the building/spa/cooling tower for the presence of the pathogen.

Verification confirms that the activities of the Program are being done, aka an internal audit. For example, for the pool and spa, checking the logbooks to see:

- ✓ Were chlorine checks performed and documented?
- ✓ Were monitoring results as expected and, if not, were pre-determined corrective actions taken?

Validation ensures your Water Management Program is successfully controlling the hazard (waterborne pathogen exposure). Focused validation testing on the pathogen of highest risk, in the case of managing Legionnaires' disease, is *Legionella pneumophila.* Sampling should be done using fixed sample sites, regular timing (monthly, quarterly) and a consistent sampling process for each site. For example, procedures such as collecting 100 mL samples, first draw from showers, collection in vessels with sodium thiosulfate, etc. should be followed. Samples should be sent to an accredited laboratory for analysis with a validated method.

The Water Management Program should have various levels of action based on results of validation testing and those actions should clearly describe what the Team must do if the limits of bacteria (i.e. *L. pneumophila*) indicate the system is out of compliance. For example, should a cooling tower be shut down and remediated? Should senior management be notified? At what level of contamination should the local health department be notified?

Validation data that drives decision-making must be reliable both to ensure dangerous conditions are not overlooked and to ensure corrective actions are actually required and avoid unnecessary cost and risk for building owners. To ensure data reliability, the Water Safety Management Team should follow ASHRAE Standard 188, Appendix C guidance and contract with a laboratory accredited to one or more nationally recognized ANSI or International Standards Organization (ISO) standards such as: ISO 17025, AIHA/EMLAP or the TNI Standard.

7. Documentation: all good Water Management Programs are well-documented, with emphasis given to documenting verification and validation testing[i]

Thorough documentation of the Program and of the on-going implementation and review of the Program are essential. First, hotel and resort facilities are constantly changing, with renovations, equipment changes and new personnel – as well as a constant (daily) influx of new clients. Second, the Water Safety Management Team will learn from the process of implementing, verifying and validating the Program and will improve the Program. These changes need to be added and the Program documents updated. Finally, in the event the hotel is ever under scrutiny or the object of litigation, the documentation of the Team's activities and response to their verification and validation results will play a key role in any findings.

Conclusion

Proactive management of your hotel's water systems to minimize disease risk is an essential part of protecting your guests' and employees' health and well-being. A well-articulated, "right-sized" Water Management Program developed by an interdisciplinary team with the required experience and firsthand knowledge of the property is the first step. Carefully implementing and updating that program, including testing to ensure the program is effective, and documenting your actions at every step is your best protection of your patrons and your business.

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[i] US Centers for Disease Control and Prevention (CDC), Federal Guide, 2017, *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings.* Version 1.1

Contributing author: Bill Pearson, CWT / is a Certified Water Technologist with more than 40 years' experience in the water treatment industry – specializing in *Legionella* risk management. Bill is currently the Vice-Chair of ASHRAE SSPC 188 and is an ASHRAE Learning Institute (ALI) instructor for ASHRAE Standard 188. He is President/owner of *BPEARSON* Consulting LLC and may be contacted via email: BPearson249@icloud.com.

Did You Miss our June 14, 2019 Webinar on Legionnaires Disease?

View the entire presentation in video format

NAHLE Announce Spanish Translation Of Online Certified Chief Engineer Study Guide

Introducción

La Asociación de Ingeniería Hotelera te da la bienvenida al Programa de Entrenamiento Básico y Certificación de Jefes de Ingeniería para hoteles de servicio selecto.

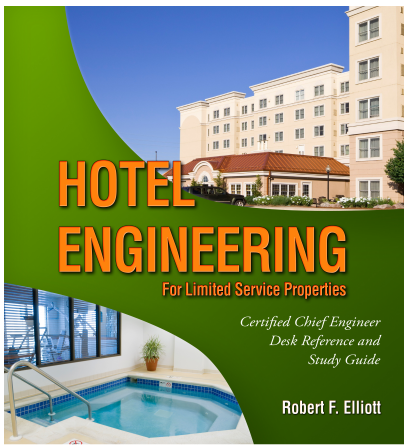
Creemos que para tener éxito y avanzar en tu profesión teniendo las habilidades básicas y conocimientos de porque las propiedades son compradas y vendidas, como los sistemas de operación están diseñados y necesitan funcionar, dar soporte a la administración en las áreas de riesgo y como dar soporte en las tareas administrativas en todos los niveles, hay que empezar en algún lugar, y por qué no aquí y ahora!!

La forma en que los edificios están construidos, operados y mantenidos son fundamentalmente la misma. Un Chiller en un edificio alto en Orlando Florida opera de la misma forma que lo hace en Phoenix Arizona. Una Piscina/Spa en Denver Colorado, tiene las mismas necesidades de control y mantenimiento que una en la ciudad de Nueva York. Los requerimientos de un huésped de agua caliente para un baño en Nome Alaska son los mismos que uno en Austin Texas. Los sistemas de trasportación vertical (elevadores y gradas eléctricas para la gente común) deben ir hacia arriba y hacia abajo tanto en San Francisco como en Nueva Orleans Luisiana. Creemos que has entendido el concepto.

Es nuestra intención proveer a cada uno de ustedes algo del conocimiento básico, adquirido de Fuentes alrededor del mundo, de profesionales en muchas disciplinas y de nuestro equipo, que tienen más de cien años en experiencia en conjunto en la operación y mantenimiento de instalaciones que van desde propiedades de servicio limitado, Hoteles y Resorts, Edificios para oficinas clase A de alto nivel, hasta grandes campus corporativos.

Responsabilidades Generales del Departamento de Ingeniería

Se acabaron los días en que se pensaba que el Ingeniero era el tipo en el sótano del hotel al que llamabas solo cuando algo se rompía. Aún hay algunos gerentes con este pensamiento y algunos ingenieros que piensan de igual forma. Muchos de nosotros solo quisiéramos ser llamados cuando algo está roto pero el trabajo se presta para algo más que esto. Volvamos y revisemos la evolución de las posiciones en los últimos 15 años. El jefe de Ingeniería de hace 15 años, vestía uniforme y cinturón de herramienta para trabajar todos los días. El equipo de ingeniería tomó lecturas manualmente en los equipos de aire acondicionado y tuvieron que ir a las maquinas a ajustar temperaturas. Al chequear voltaje, era usado un voltímetro análogo Simpson y solo se esperaba que el medidor estuviera leyendo con precisión.



Es fácil recordar tener que tomar las lecturas de humedad en las salas de reuniones todos los días con un psicrómetro de honda y hacer cálculos para determinar las lecturas. Recuerdas la vieja carta psicométrica? Todavía se utiliza, las herramientas de hoy pueden hacer las lecturas por ti.

Conforme los años pasaron los departamentos de ingeniería recibieron computadoras para correo y comunicación. Tiempo e innovación han hecho más fácil el trabajo de los ingenieros, pero también más valioso para la organización. Alguna vez has tenido alguna emergencia en el hotel? A quien llaman todos? Lo has adivinado, al Ingeniero. En el hotel de hoy, el ingeniero no es al único al que se llama cuando algo está roto, hay un equipo con el que se cuenta para ejecutar la operación.

Caso de Estudio

José era el jefe de ingeniería en una propiedad en Tulsa Oklahoma. Esta era la primera experiencia como jefe, la emoción estaba en el aire. José había estado en la industria de los hoteles por unos años y era un ingeniero muy competente, pero no tenía experiencia en liderar personas en el departamento de mantenimiento. Como la mayoría de los jefes de ingeniería, José era el indicado para tomar la posición cuando el jefe dejo el departamento, y estaba determinado a hacer un buen trabajo.

José ha estado en el trabajo por casi seis meses y sigue aprendiendo, el departamento estaba prosperando. El puntaje del departamento estaba subiendo y al equipo le agradaba José. José estaba en su oficina un día cuando las luces parpadearon por un breve segundo y el instinto le dijo a José que algo estaba mal. José escucho un sonido gracioso en su oficina cuando las luces parpadearon, pero se fue de inmediato. José le dijo al administrador que llamara a emergencias y que tuvieran a los bomberos en el hotel lo más rápido posible mientras corría fuera de la oficina a la planta central. Después de una corta investigación José llamo al gerente general a la planta central. Había un problema mayor con el sistema eléctrico del hotel y el gerente general tenía que estar enterado. Cuando el gerente general llego, José le informó sobre la situación el interruptor eléctrico principal, se había sobre calentado y había fallado. El departamento de bomberos está en camino y tenemos la situación controlada.

Rol y Responsabilidades del Jefe

Piensa un momento sobre la situación y ponte en los zapatos de José, y cuales habrían sido sus próximos pasos con los siguientes:

- Con el gerente general? Que más le pudo haberle informado José.
- Con el departamento de bomberos? Que información necesitaban.
- Con los huéspedes? Que información necesita el huésped, están seguros.
- José hizo algo equivocado?
- Que otra cosa hubiera hecho José en este punto?

Esta es una situación de la vida real. Ingenieros son comúnmente puestos en situaciones precarias sin una guía sobre qué hacer. Líderes son hechos en situaciones como estas y este es el significado del ingeniero. Recuerda, como ingenieros, la seguridad de todos en un edificio es tu responsabilidad, es algo que no se toma a la ligera. Cuando confrontas una situación como la de José, planifica, comunica el plan, ejecuta el plan, evalúa el plan y comienza el proceso de nuevo. La peor cosa es no hacer nada al respecto o descargar en el gerente general la toma de decisión; ellos cuentan contigo para tomar la decisión.

Principales Innovaciones

Anteriormente hemos mencionado sobre las principales innovaciones durante los últimos 25 años y como la posición de ingeniería ha evolucionado. Preguntándonos cuales son algunas de las innovaciones? piensa por un minuto y luego piensa lo siguiente - la lista hecha por un estudio de CNN:

El internet, celulares, computadoras personales, fibra óptica, correo electrónico, GPS comercial, computadoras portátiles, memorias de almacenamiento, cámaras digitales de nivel comercial, etiquetas de radiofrecuencias, MEMS, huellas digitales, bolsas de aire, cajeros automáticos, baterías avanzadas, carros híbridos, paneles de visualización de óleo, televisores de alta definición, transbordador espacial, nano tecnología, memoria flash, mensajes de voz, audífonos modernos, radios de onda corta y de alta frecuencia.

Cuantos adivinaste correctamente? La pregunta más importante es cuántos de estos utilizas en el trabajo y que hacías antes de que estos se introdujeran. Siempre se está produciendo un pensamiento innovador que cambiara para siempre las funciones y responsabilidades del ingeniero. La diferencia entre un ingeniero bueno y uno fantástico es como ellos usan las ideas innovadoras y cuantas se le ocurren cuando se está en la posición.

Rol y Responsabilidades del Jefe

Piensa en la innovación en lo que se refiere a tu organización. Que productos o servicios tu ofreces hoy como resultado de ideas innovativas? Que hacen ellas para la organización?

Esto es responsabilidad del ingeniero del edificio (y su equipo) desarrollar y practicar un programa efectivo de mantenimiento entendiendo los sistemas mecánicos del edificio, realizando un mantenimiento y documentando las operaciones. Esta declaración será bastante usada durante este entrenamiento. Este es el centro de trabajo del jefe de ingeniería. Se le puede pedir que haga muchas cosas al jefe de ingeniería pero la parte más importante de su trabajo viene a ser:

- Mantener los sistemas del edificio
- Proveer un ambiente seguro para huéspedes y trabajadores
- Mantener el edificio para que cumpla con los códigos locales, estatales y federales
- Mantener un record de todas las acciones tomadas en el departamento
- Mantenimiento continúo para asegurar operaciones adecuadas

Ejemplo de Descripción del Trabajo

La descripción del trabajo del jefe de ingeniería puede variar por el tamaño del hotel y la compañía incluso el nombre del puesto es diferente dependiendo la compañía. En el Marriot por ejemplo el jefe de ingeniería es el líder de hoteles más pequeños. La variedad de hoteles de servicio completo tiene la posición llamada director de ingeniería ya que en algunos hoteles es también llamado jefe de ingeniería. No importa el título, las responsabilidades son las mismas, tener un bien mantenido y seguro hotel. Que aspecto tiene la descripción del trabajo y en que se diferencian? Al ver sitios de trabajo en internet como Carreerbuilder.com o monster.com, por lo general vera una descripción del trabajo real, por ejemplo:

Descripción del trabajo

Debe tener cuatro años de experiencia como mínimo en Gerencia de Mantenimiento o Ingeniería, plomería, y carpintería en propiedades de cuatro diamantes. Habilidad de comunicarse efectivamente en Ingles, y flexibilidad de horarios. También debe tener por lo menos una certificación de las siguientes: Aire Acondicionado y Refrigeración con licencia de CFC, Electricidad, Carpintería, reparación de edificios y equipos. Habilidad de leer Planos y diagramas esquemáticos de preferencia.

Tenga en cuenta que la descripción del trabajo es básica. Aconsejamos a todos los Jefes de Ingeniería que revisen la descripción de su propio empleo para asegurarse de que cumplan por lo menos con uno de los requisitos básicos del trabajo, y evalúe su crecimiento. Este es otro ejemplo de una descripción de trabajo de Jefe de Ingeniería

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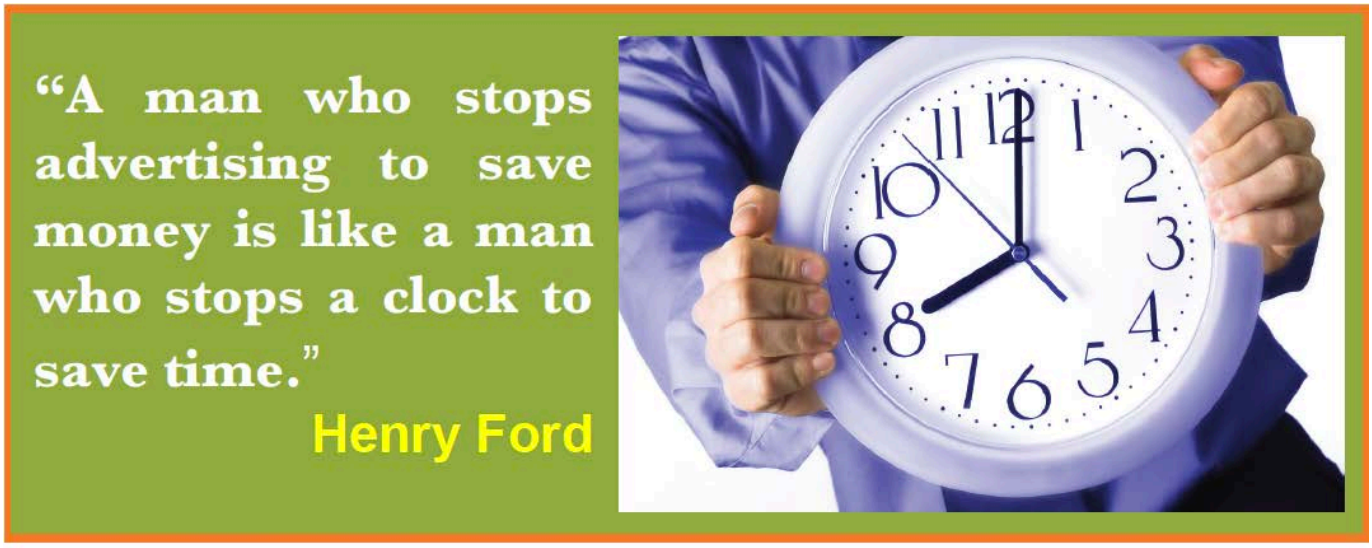

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HIGHEST AND BEST USE

HOSPITALITY CAPEX

CAPEX MATH 101 – USEFUL LIFE

by

Thomas Riegelman

R-A Associates, 27 Connelly Road Arden, North Carolina 28704
312.953.7174 / thomas@r-aassociates.com

Highest and Best Use - CapEx

CapEx Math 101 - Useful Life

There are four important concepts that hotel owners and operators need to know about CapEx useful life. Applying these concepts is crucial to good CapEx decisions and achieving highest and best use of owner's capital.

The four important concepts of CapEx useful life:

- Maximize Useful Life
- Match the Investment Horizon
- Consider Risk, Obsolescence, Technology, and Taxes
- Do the Math

Useful Life

Many hotel capital assets just do their job year after year, with minimal inputs of operating expense. Examples of these assets include roofs, exterior walls and windows, water distribution systems, and fire and life safety systems. These assets are great examples of the most basic rule of CapEx useful life:

Maximum Actual Useful Life = Maximum Return on CapEx $

The longer the actual useful life of a capital asset, the lower the costs become per unit of use. In simple terms, a $900,000 roof that must be replaced after 15 years costs about twice as much per year than if the roof's life is extended to 30 years.

Although it is easier to think about reducing CapEx costs "per year", extending useful life is beneficial only in delaying the capital expense required to replace the asset. There is really no "per year" benefit; only a delay in expenditure of the total replacement cost.

Here is a simple cash flow analysis:

15 Year Roof	*5.0%*	:NPV Discount Rate		*1.5%*	:Inflation Rate	
				Year	Year	Year
Description	NPV	Undiscounted Total Cash Flow	Initial Investment	1	15	30
Installation of new 15 year roof	*(900,000)*	*(900,000)*	*(900,000)*			
Replacement 15 year roof	*(1,071,627)*	*(1,125,209)*			*(1,125,209)*	
Totals:	**(1,971,627)**	**(2,025,209)**	**(900,000)**	**0**	**(1,125,209)**	**0**
30 Year Roof	*5.0%*	:NPV Discount Rate		*1.5%*	:Inflation Rate	
				Year	Year	Year
Description	NPV	Undiscounted Total Cash Flow	Initial Investment	1	15	30
Installation of new 30 year roof	*(900,000)*	*(900,000)*	*(900,000)*			
	0	*0*				
Totals:	**(900,000)**	**(900,000)**	**(900,000)**	**0**	**0**	**0**
Difference in cash flow:	**(1,071,627)**	**(1,125,209)**	**0**	**0**	**(1,125,209)**	**0**

R-A Associates
27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

This analysis is oversimplified to illustrate the point, but clearly demonstrates that there is an advantage to maximizing the useful life of this roof. The 15 year roof costs $1,972K ÷ 30 yrs. = $66K/yr. The 30 year roof costs $1,072K ÷ 30 yrs. = $36K/yr.

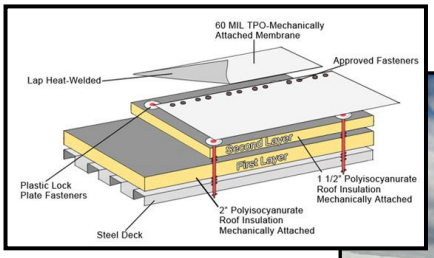
Maximizing Useful Life

How do you maximize the useful life of capital assets? The concepts are pretty simple, and can be applied to most capital assets.

- Buy the right capital asset to begin with, and
- Take good care of it.

Here are some ideas for the roof example:

Design, Specification, and Installation – For both the initial investment, and any subsequent replacements, it is the owner's responsibility to ensure that the roof is properly designed, specified, and installed. This is the opportunity to make good decisions about expected useful life, warranties, maintenance requirements, price, and value.



Inspection, Maintenance, and Repair – Roof warranties generally require documentation of inspections, maintenance, and repair before the warranty will be honored. Although it is the operator's responsibility to ensure that the roof is properly inspected, maintained, and repaired, it is in the owner's best interest to confirm that this work is being done, and that systems are in place to track and document the work.

The obvious intent of the warranty's inspection, maintenance, and repair requirements is to extend the useful life of the roof at least until the end of the warranty term. These same measures will continue to help extend the life of the roof beyond the warranty term. It is absolutely possible to extend the actual useful life of a roof 5 to 15 years beyond the warranty period with regular inspection, maintenance, and repair.

There is also the "maintenance paradox" to consider. Well maintained assets are less likely to require repair, and are less costly to maintain over the life of the asset. Poorly

R-A Associates
27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

maintained assets require more repair work, are more expensive to maintain, typically have a shorter useful life, and are more likely to fail catastrophically.

Finally, it is important to note that extending useful life only applies to existing capital assets, and is almost entirely under the control of the hotel's operator.

- ***Buy right, and insist that capital assets are well maintained.***

Operating Expenses

Capital assets often require ongoing labor, energy, water, maintenance, and repair expenses. In some cases, these annual operating expenses approach or exceed the cost of the capital asset itself.

Capital asset operating expenses typically increase over time. As assets age, they often operate less efficiently and require more maintenance and repair. While operating expenses complicate the analysis of maximized useful life, they do not alter the basic math. For major capital assets, it is important that owners quantify these operating costs, and balance them against the capital replacement costs. Well-functioning capital assets should only be retired when the operating expense balance tips in favor of replacement.

- ***Extend Useful Life until replacement life cycle costs are below current operating costs.***

Investment Horizon

Would you replace the $900K roof in the earlier example if you were planning to sell the property in two years? Probably not.

Say the roof had failed, and there was no choice about replacing it. Most owners would choose the least expensive replacement they could find, with the only requirement that it last at least until after the expected sale date of the property. Let the new owner worry about the roof!

Conversely, if this hotel was a "core asset", and you intended to hold the property for the next twenty or thirty years, you would be well advised to purchase a premium quality new roof with the lowest total life cycle costs.

Coordinating capital asset useful life with the owner's investment horizon requires good judgement about how these decisions will be factored into the sales price.

- Will the prospective buyer discount the purchase price by the full cost of replacing the worn out roof?
- Should you replace the 30 year old chillers two years before sale, and get the value of the increased operating cash flow from energy and maintenance savings?

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27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

- Will the full revenue benefit of a guestroom renovation be reflected in the sale price?
- Will a deferred renovation be discounted in the purchase price by the buyer?

- ***Balance CapEx useful life with owner's investment plans.***

Risk

Operating risk is an important consideration in useful life decisions. Fire suppression, life safety, and security system replacement decisions all carry a substantial element of risk. Failure of one of these systems in an emergency can potentially put a hotel out of business, but replacement is expensive, and has no positive affect on revenue.

Some capital assets also carry regulatory risk. For example, although smoke detectors may continue to function for 15 or 20 years, they have a regulatory useful life of only ten years. They "must" be replaced after ten years by regulation. The regulatory risk penalty is a fine or injunction. The safety risk is a guest or employee death or injury in the event of a fire.

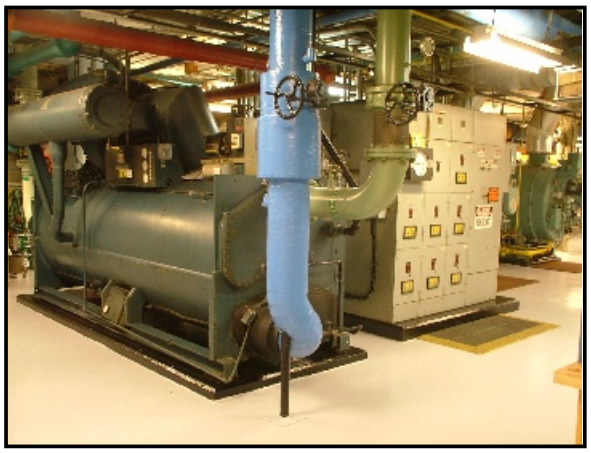
Certain mechanical and electrical systems are critical to the operation of the hotel, and their failure can have a profound effect on the business. For example, a full service Marriott hotel in Virginia suffered the failure of all three of its heating and domestic hot water boilers at the same time. Unfortunately, the failure occurred during the winter, and during a period of high group occupancy.

Had the boilers been replaced in a planned fashion, they would have cost the owner only $275K.

Because of the failure, the owner paid a premium for the replacement boilers, expediting fees, overtime expense for installation, fees for temporary boilers, and substantial rebates to groups using the hotel. The hotel's reputation was also damaged in a very competitive market, reducing future revenues.

The additional one-time costs associated with the failure were roughly twice the cost of a planned boiler replacement.

- ***Consider operating and regulatory risk.***



Obsolescence

While extending the life of some capital assets indefinitely would be ideal (e.g. a hotel's roof), maximizing the useful life of obsolete assets may require replacing them before the end of their functional life.

For example, 30+ year old chillers in perfect operating condition are not at all unusual in well-maintained hotels, but these

R-A Associates
27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

machines may be as much as 25% less energy efficient than current technology. Energy savings alone can often justify early replacement of this equipment.

- ***Replace obsolete equipment.***

Technology

New technology can eclipse the useful life of a capital asset.

In the early '80's, hotels still had electro-mechanical telephone systems that required an operator to place long distance telephone calls. The charges for the long distance call were printed out by the phone company on a dedicated "HOBIC" teletype machine located in the hotel's front office, and then manually posted to the guest folio (an actual printed piece of heavy paper or cardstock) using another electro-mechanical machine.

Regulatory changes, and advances in computer technology completely replaced all of this equipment, required no direct labor expense, and improved accuracy and timeliness of transactions. Computerized telephone systems, call accounting systems, and integrated hotel property management systems reduced operating expense and increased revenues. Front office staffing requirements were halved. System "maintenance" was handled remotely at substantially less expense.

New technology completely changed the operation of the telephone department and front office of the hotel, and also required significant new capital asset investments. Of course, all of the old telephone equipment was still perfectly functional, and could have continued to operate for years had its useful life not been eclipsed by new technology.

New technology has driven similar changes in customer relationship management, property management, lighting, lock systems, energy management, accounting, and maintenance management.

- *Embrace new technology.*

Depreciation and Taxes

There are three depreciation and tax questions related to useful life.

One: What happens if you replace a capital asset before it is fully depreciated?

- EBITDA is not affected.
- Owner's capital is required to purchase the replacement capital asset.
- The owner's P&L must reflect for both the undepreciated costs of the retired asset, as well as the first year's depreciation of the replacement asset.
- Owner's profit goes down by the excess depreciation expense.
- The owner avoids income tax on the decreased profit.

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27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

Two: What happens if you replace a capital asset when useful life equals depreciation life?

- EBITDA is not affected.
- Owner's capital is required to purchase the replacement capital asset.
- Depending on the exact details of the replacement timing, there may be two depreciation payments in a single tax year (one for the old asset, one for the new), or one for the old asset one year, and one for the new asset the following year.
- Profit goes up or down by the change in depreciation expenses.
- The owner pays more or less income tax on the change in profit.

Three: What happens if you extend the useful life of a fully depreciated capital asset?

- EBITDA is not affected.
- Cash is not required to fund purchase of the replacement capital asset.
- Since there is no longer a depreciation expense for the asset on the owner's P&L, profit goes up by the amount of the avoided depreciation expense.
- The owner pays income tax on the increased profit.

Note that in all three cases, cash flow from operations does not change, owner's capital cash requirements change in timing but not amount, and depreciation expense changes in timing but not amount.

Any resultant changes in taxable profit will change the timing of taxes paid, as well as the amount of taxes paid due to changes in tax rates or bracket.

- *Changes in useful life affect the timing of depreciation, taxes, and capital investment, but generally not the amount.*

Doing the Math

See how you do on this quick math test:

Which would you pick (actual prices on Amazon)?

☐ Palmolive Dishwashing Liquid, Original (1.32 Gallon) @ $20.49
☐ Palmolive Dishwashing Liquid, Original - 32.5 fluid ounce (Twin Pack) @ $5.66

R-A Associates
27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

My mother-in-law can do this math in her head faster than I can pull up a calculator on my phone. Although I can estimate the unit costs for each container in my head, it takes a calculator to bring the answer to 4 decimal places of precision.

- The big container costs ..... $0.1227 per ounce
- The Twin Pack costs ..... $0.0871 per ounce

Even though there is a 40% per ounce price difference between the big jug and the twin pack, it doesn't really matter which container of soap you buy; it isn't a material expense. However, while overspending on a bottle of soap is no big deal, choosing the wrong capital asset, or paying more than you need for CapEx may affect the financial success of the hotel. The larger the CapEx, the more material the effect on the owner's financial success.

Once you start considering useful life, inflation rates, revenue effects, energy costs, labor expense, tax effects, and so forth in your CapEx analysis, the math quickly becomes too complex for even my mother-in-law's capable brain.

- Simplify and state your assumptions and alternatives
- Quantify and include all cash flows
- Itemize other decision factors; risk, obsolescence, etc.

Incorporating these factors in a flexible analysis spreadsheet will allow you to test your assumptions about useful life, operating costs, and timing, and to directly compare the costs of alternative CapEx investment strategies. An example analysis is attached.

- *Do the Math, test your assumptions.*

Summary

Understanding how useful life affects CapEx costs and decisions will help owners achieve highest and best use of their capital dollars.

- *Extend useful life*
- *Maintain & repair*
- *Keep an eye on operating expense*
- *Consider risk*
- *Retire obsolete assets*
- *Embrace new technology*
- *Don't worry about taxes & depreciation*
- *Do the math and test your assumptions*

R-A Associates
27 Connelly Road Arden, North Carolina 28704
312.953.7174 | thomas@r-aassociates.com

Return on Investment Analysis

Property: *Marriott Full Service Hotel*
Project Title: *Boiler Plant Replacement*
Project Description: *Replacement of heating and potable hot water plant. Comparison of Atmospheric boiler plant with Condensing boiler plant.*

Cash Flow Summary: ***Condensing Boiler Plant*** *5%* **:NPV Discount Rate** *2%* **:Inflation Rate**

	Item	Description	NPV	Undiscounted Total Cash Flow	Initial Investment	Year 1	Year 2	Year 3
1	Aerco boiler equipment	5-2,500 btuh Boilers, 3-SmartPlate water heaters, onboard controls, accessories	(308,400)	(308,400)	(308,400)			
2	Boiler Installation	Installation of boiler plant, complete	(275,600)	(275,600)	(275,600)			
3	Ancillary Equipment	Pumps, etc. not related to the boiler plant - Included in installation	0	0	0			
4	Energy Savings	Conservative estimate of annual gas and electric energy savings	211,569	311,282		18,000	18,360	18,727
5	Hot Water Storage Tank	Abandoned in place - Not required	0	0				
6			0	0				
7	Temporary Boilers	Cost of temporary boilers required by permitting and contractor delays.	(153,000)	(153,000)	(153,000)			
8			0	0				
9			0	0				
10			0	0				
		Totals:	(525,431)	(425,718)	(737,000)	18,000	18,360	18,727

Cash Flow Summary: ***Atmospheric Boiler Plant*** *5%* **:NPV Discount Rate** *2%* **:Inflation Rate**

	Item	Description	NPV	Undiscounted Total Cash Flow	Initial Investment	Year 1	Year 2	Year 3
1	Atmospheric Boilers	2 heat boilers, 2 hot water boilers, fully installed	(275,000)	(275,000)	(275,000)			
2	Temporary Boilers	4 weeks of additional temporary boilers due to the increased lead time ($16K rental, $2k/day operating).	(153,000)	(153,000)	(153,000)			
3	Ancillary Equipment	Pumps, etc. not related to the boiler plant	(57,000)	(57,000)	(57,000)			
4	Hot Water Storage Tank	Replacement of existing hot water storage tank during chiller replacement to minimize costs.	(161,905)	(170,000)			(170,000)	
5	Mixing Valves	Replacement of inoperable mixing valves with new brand standard electronic valves.	(45,000)	(45,000)	(45,000)			
6	Shorter life	Replacement of water boilers 5 years earlier than Aerco heat exchangers.	(130,952)	(137,500)				
7	Increased maintenance expense	Increased costs of maintaining higher temperature direct fire boilers	(1,175)	(1,729)		(100)	(102)	(104)
8			0	0				
9			0	0				
10			0	0				
		Totals:	(824,033)	(839,229)	(530,000)	(100)	(170,102)	(104)

	NPV	Undiscounted	Initial	1	2	3
Difference in cash flow:	298,601	413,511	(207,000)	18,100	188,462	18,831
Simple Payback:			(207,000)	(188,900)	(438)	18,393

Note: Costs are negative numbers, Savings or Revenues are positive numbers.

Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
19,102	19,484	19,873	20,271	20,676	21,090	21,512	21,942	22,381	22,828	23,285	23,751
19,102	19,484	19,873	20,271	20,676	21,090	21,512	21,942	22,381	22,828	23,285	23,751

Note: Costs are negative numbers, Savings or Revenues are positive numbers.

Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
						(137,500)					
(106)	(108)	(110)	(113)	(115)	(117)	(120)	(122)	(124)	(127)	(129)	(132)
(106)	(108)	(110)	(113)	(115)	(117)	(137,620)	(122)	(124)	(127)	(129)	(132)

4	5	6	7	8	9	10	11	12	13	14	15
19,208	19,592	19,984	20,384	20,791	21,207	159,131	22,064	22,505	22,955	23,414	23,883
37,601	57,193	77,177	97,561	118,352	139,559	298,690	320,754	343,259	366,214	389,628	413,511

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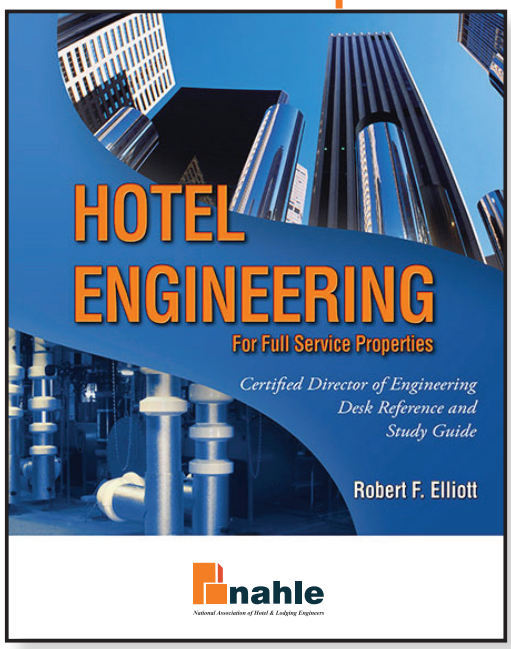

This 31-chapter study guide provides preparation for the Certified Director of Engineering (CDOE) professional designation offered by NAHLE for hotel engineers. The Guide includes information related to the planning and organizing of tasks, overviews of hotel engineering systems, and the financial and ethical skills required to operate effectively within a hotel organization. NAHLE's CDOE curriculum is comprehensive and covers most all hotel building engineering subjects including: HVAC, plumbing, electrical, lighting, landscaping, swimming pools, vertical transport systems and many other areas. NAHLE's certification tests are provided online so that the engineer never has to leave the property.

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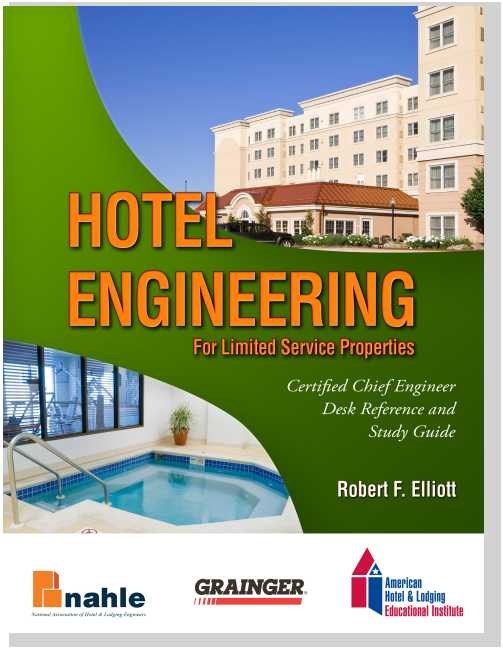

The Certified Chief Engineer (CCE) was developed specifically for hotel engineers at limited service properties. The Study Guide has 19 chapters that focus on low-rise wood frame construction properties with a comprehensive review of subjects including PTAC units, moisture infiltration, building systems and maintenance, and engineering principles. NAHLE's online certification test is provided by our educational partner, the American Hotel & Lodging Educational Institute. Corporate/ Allied members are encouraged to sponsor and support NAHLE's Hotel Engineer Certification programs.

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Thomas D. Riegelman

Principal

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HURRICANE SEASON—ARE YOU REALLY READY?

By Thomas G. Daly CSP, CLSD

In late May, the National Oceanic and Atmospheric Administration (NOAA) released it prediction for the 2019 hurricane season.

Up to 8 named storms (Category 1 and 2—winds to 110mph with storm surges to 8 feet) and up to 4 hurricanes (Category 3,4 or 5 - winds up to or exceeding 155mph with storm surges to 9-19 feet or greater) are projected for the Atlantic, Gulf and Caribbean beginning as early as June 1 and lasting until as late as November 30.

While we don't think of hurricanes in the Pacific, NOAA also predicted, 5 to 8 tropical cyclones for the central Pacific hurricane basin. This number includes tropical depressions, named storms and hurricanes.

While beachfront hotels and other hotels in historical storm paths have encountered and survived previous hurricanes, some hurricanes of unprecedented strength (Class 4 or 5) have struck resulting in massive property destruction and a threat to the lives of both hotel staff and guests.

While staff and guest evacuation, if done in advance of a storm's arrival, is the safest option, the Class 5 Hurricane Katrina in August 2005 taught us that not all staff or guests can or do evacuate, regardless of the predicted storm severity and its path. Recall that 2005's Hurricane Wilma, a storm more powerful than Katrina, two months later stalled over Cancun Mexico for three days, precluding any rescue and necessitating providing for food, shelter, power and communications for the hundreds of hotel refugees trapped by that storm.

When a storm strikes, your normal suppliers of goods and services will not be available for days, if not weeks. Self-sufficiency is the key to survival. You will be on your own for some time.

For those that choose to 'defend in place' when hurricanes approach, the steps which follow, some or all of which need to be taken by hotel operators in advance, will improve the likelihood of survival of all, until the storm passes.

1. **External communications** – Acquire two satellite phones complete with spare batteries and chargers. They can be rented for short durations. Cell phones and traditional communication protocols will likely be useless as we learned in Hurricane Katrina (300 cell phones towers destroyed, email rendered useless and phone company switching centers flooded). Practice using them as the dialing protocols for satellite phones are often different than with a standard land line or cell phone. Produce a list of critical local and distant phone numbers and distribute that list to your management staff.

2. **Internal communications –** Traditional two-way radios, with your own base station, repeater, uninterruptible power supplies (UPSs), spare batteries and battery chargers are your only sure method of communicating with your staff within your hotel. Again, cell phones will be useless.

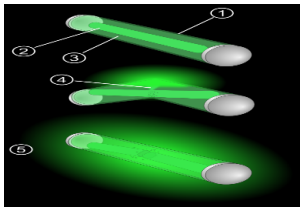
3. **Emergency power** – A well maintained emergency generator will give you limited power and lighting for a short time frame. Knowing what lighting, equipment and systems will be powered (and what will not) and the duration of the generator's operation (fuel consumption in gallons-per-hour under full load) are key information to have in advance. The generator's fuel, oil and air filters should be changed in advance of the storm to ensure continuous operation. A full fuel tank is a must and additional drums of fuel (stored outside) with material handling equipment to move them and manually operated pumps and hoses to transfer the fuel from the drums to the generator need to be acquired before the storm strikes. A fifty-five-gallon drum of diesel fuel weighs about 400 lbs., so a practice drill will be helpful in determining how all this will work and who should be assigned to handle this re-fueling task.

Having a supplemental small wheeled generator with power cords for non-emergency, but necessary systems and equipment (think freezers, walk-in boxes and your Property Management System), can be rented for a short duration and is a reasonable precaution to take. Spare fuel should be stored only in safety cans.

4. **Guests with disabilities**

When power goes out during a hurricane, assume your elevators will not be operational. Move guests with disabilities to a safe location on the lobby level, preferably in a windowless meeting room. Having a stair chair available will make any re-location from upper floors easier.

5. **Portable lighting-** Re-chargeable battery lanterns for staff, 'glow-sticks' to mark exits and to illuminate the interior of exit stairways and inexpensive disposable flashlights for each guestroom should be in your inventory of emergency supplies.
   Check the quantity and serviceability in advance of predicted storms.



6. **Water & sanitation -** Lay in additional supplies of drinking water. Also, hotel water pumps to supply guestroom showers and toilets are likely not the type of equipment an emergency generator will power, so filling bathtubs as a storm approaches to accommodate re-filling toilets is a prudent measure to consider. A supply of plastic buckets will come in handy.

7. **Construction materials** – Having a supply of plywood, lumber, plastic sheeting, duct tape, sandbags and tarps will allow you to temporarily protect your asset if storm damage occurs.

8. **First aid kits** – Multiple kits should be available in key locations known to your staff for use in emergencies. If needed, EMS services may be slow to arrive or non-existent during a storm.

9. **Head count** – A head count, including names, addresses and phone numbers of emergency contacts for staff and guests who remain should be prepared and updated frequently to account for anyone arriving or leaving. If a rescue is anticipated, rescuers will want to know how many people need to be accommodated.

10. **Keys** – Cut additional 'grand master' keys for staff to avoid delays in accessing rooms and back of house areas with electronic locks.

Diligently executing the above list of items will go a long way towards giving a hotel's management team time to make critical decisions and to act promptly to safeguard their staff, guests and asset.

Thomas Daly is the President of the Hospitality Security Consulting Group, LLC (www.myhscg.com) and the retired Vice President Loss Prevention for Hilton Hotels Corporation, now Hilton Worldwide.

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