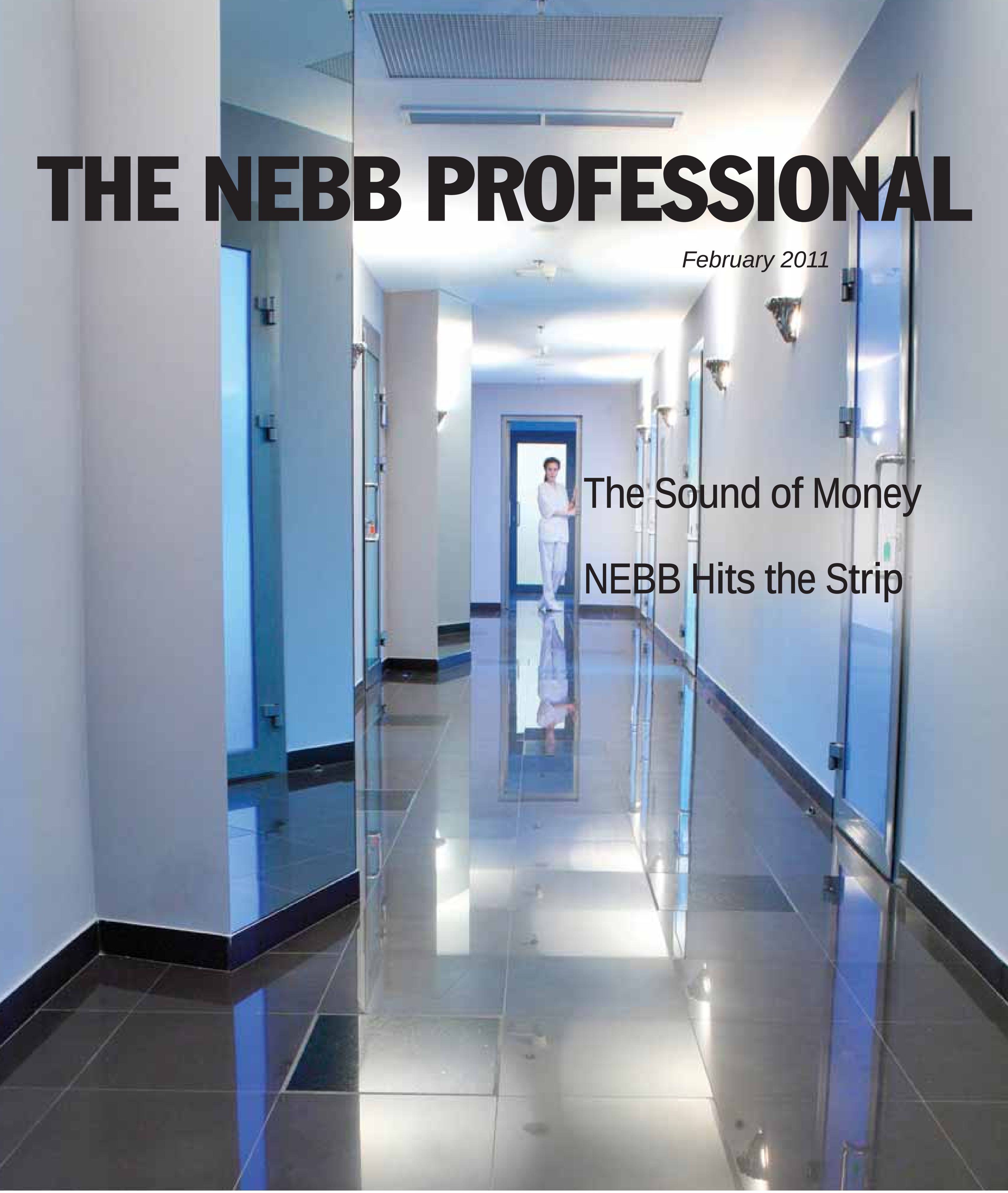
THE NEBB PROFESSIONAL

February 2011



The Sound of Money

NEBB Hits the Strip

The Official Magazine of the National Environmental Balancing Bureau

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The NEBB Professional is a quarterly magazine published by the National Environmental Balancing Bureau, 8575 Grovemont Circle, Gaithersburg, Maryland 20877-4121

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New Look for The NEBB Professional

Welcome to the new look of *The NEBB Professional*! For the last two years, we are worked hard to develop effective content, secure advertisers and increase our subscription base. With each issue of *The NEBB Professional*, the magazine grows and improves. The magazine is developed at the National Office and relies heavily on volunteers to author articles and share their expertise with our readership.To all those who have contributed to the magazine, thank you.

This magazine was the vision of Eric Jenison, NEBB Past President and Former Marketing Committee Chairman. Eric wanted the magazine to serve as a resource, a promotion tool for NEBB Certified Professionals, and an opportunity to inform and educate the industry. Although our magazine is still evolving, we are growing closer and closer to recognizing Eric's vision.

The NEBB Professional needs to hear from you. Submit story ideas, offer to author an article, share a case study on a NEBB project, review articles for technical content—but contribute your talents to the magazine. If you are interested in being a part of the magazine, please email Karen@nebb.org. As the old saying goes – *It is easy to point out the problems, but it is better to be a part of the solution*.

NEBB Hits the Strip for the AHR Expo

NEBB Joins 1800 exhibitors in Las Vegas

As the largest and most comprehensive HVAC/R exposition, the AHR Expo was held at the Las Vegas Convention Center from January 31st -February 2nd. As it has been done in the last twenty years, NEBB continued the proud tradition of being an endorsing organization joining 32 of the leading industry organizations in support the Expo.

“We are proud to be an endorsing organization of AHR Expo,” said Karen D. Groppe, Director of Marketing. “ Our presence provides us with an opportunity to engage with potential NEBB Certified Professionals, promote NEBB capabilities to building owners, contractors, while meeting with vendors and supporters of NEBB programs.” In 2011, more than 500 visitors stopped by the NEBB booth for information on NEBB Certification, publications and how to hire a NEBB Certified Firm.

Since 1930, the AHR Expo has been the HVAC/R professional’s best resource for new products, new ideas and new services. It is a hands-on, interactive event that showcases a wide spectrum of equipment, systems and components. The AHR Expo is held concurrently with the Winter ASHRAE Meeting.

NEBB Seminar Schedule 2011

NEBB conducts several seminars to enhance the educational experience of each NEBB discipline.

In June, 2011, NEBB TEC will be closing and NEBB will offer a regional approach to its training programs.

For more information about NEBB Seminars, please visit www.nebb.org. Seminars are added and updated on a regular basis, please check back on the NEBB website.

NEBB Seminar	Dates	Location
Basic BSC Seminar	March 7-11	NEBB TEC
FHT Seminar	March 14-18	Labconco, Kansas City, MO
Advanced BSC Seminar	April 11-15	Boland, Gaithersburg, MD
Retro-Cx Seminar	June 7-10	ASHRAE, HQ, Atlanta, GA
FHT Seminar	September 19-23	Labconco, Kansas City, MO
Basic BSC Seminar	November 7-9	MAEBA, Philadelphia, PA

If your office or chapter would be interested in conducting an S&V Seminar in your area, please contact Elana Noel, Director of Certification at elana@nebb.org for details.

Competing Smoke Control Systems

Daniel Picciano, PE (MN), CFPS, **Ryan Bierwerth,** PE (WI), CFPS, **Summit Fire Engineerings**

A Case Study in Elevator Shaft Pressurization with Stair Pressurization

The Appleton Medical Center new Bed Tower included an addition to an existing building located in Appleton, Wisconsin. The design of the project occurred primarily in 2009, with construction being completed in the summer of 2010. As such, the applicable building code for the project was the 2008 Wisconsin Commercial Building Code (WCBC), which is based on the 2006 International Building Code (IBC). Further, as a health care occupancy, the Authority Having Jurisdiction (AHJ) also enforced the 2000 edition of NFPA 101 *Life Safety Code*.

The addition consisted of a new Bed Tower that is nine stories in height, not including a partial Basement. The construction of the Bed Tower is noncombustible, fire-rated—Type I-B. The Appleton Medical Center proper is used as a hospital and medical office building, including emergency rooms, surgery wings, cancer center, etc.; and, the Bed Tower addition consists primarily of patient rooms. As such, the primary occupancy in the Bed Tower is Group I-2 (Institutional). The main building and addition are provided with automatic fire sprinkler protection throughout.

The elevation of the top-most occupied floor of the Bed Tower exceeds 75 feet above the lowest level of Fire Department vehicle access; and, as such, the Bed Tower is classified as a “high-rise” building. Prescriptively, the IBC requires high-rise buildings to be provided with additional protection for egress stairs and elevator shafts against the migration of smoke vertically throughout the building under a fire condition. The IBC allows various options for providing the necessary protection of egress stairs and elevator shafts, including both passive and active means that are capable of satisfying the intent.

For taller egress stairways, “smokeproof enclosures” are required. Traditional methods of providing smokeproof enclosures are fairly well-established in the construction industry and have been utilized over the years – via both passive and active means. Although the code allows for passive means of providing smokeproof enclosures, active systems are often more preferable from an architectural standpoint. For example, exterior vestibules – an available option for passively providing smokeproof enclosures – is likely infeasible for egress stairs that are interior to the building footprint. As such, it is very common for egress stairways to be provided with mechanical stair pressurization as a means of complying with the smokeproof enclosure requirements of the IBC.

Elevator shafts, on the other hand, have historically been protected using passive means – such as enclosed elevator lobbies, additional (UL listed) doors, etc. Enclosed elevator lobbies tend to be the most cost-effective solution, even though they are oftentimes not desirable. With the 2006 revision to the IBC, however, an additional option was included to allow mechanical pressurization of the elevator shaft in lieu of providing enclosed elevator lobbies. For the first time, elevator shafts were permitted to be protected with active systems, similar (in concept) to the stair pressurization systems commonly utilized in egress stairs. Unlike stair pressurization, however, elevator shaft pressurization systems are relatively new to the design and construction industry; and, as such, present unique challenges.

In the Bed Tower, the architectural desire was to achieve protection of the two egress stairs that served the entire Bed Tower via mechanical stair pressurization; and, similarly, provide elevator shaft pressurization in one of the two elevator shafts. Given that both the stair pressurization systems and the elevator shaft pressurization system would activate simultaneously under certain fire scenarios, standardized calculation methods were unavailable to provide design guidance and assure that the performance criteria of each pressurization system could be satisfied during simultaneous operation. Although the specified performance criteria for stair pressurization and elevator shaft pressurization differ in the IBC, both sets of criteria must be satisfied during simultaneous operation of the pressurization systems. So-called "competing" smoke control systems often require computer simulation modeling in order to estimate the design capacities and parameters for each pressurization system, since the available empirical equations typically apply to stair pressurization or elevator shaft pressurization – separately.

Summit Fire Consulting utilized CONTAM for modeling the expected airflows in the Bed Tower under smoke control conditions. CONTAM is a computer simulation program that is available from the National Institute of Standards and Technologies (NIST) that was originally developed as a multi-zone model to analyze airflow, contaminant transport, personal exposure, etc., for building ventilation systems. The program has been adapted for applications involving pressurization smoke control systems, which rely on maintaining airflow criteria at distinct points in the building.

Data was input into CONTAM to create a computer model of the building. Such input included the following: stairwell enclosure and door locations, elevator shaft and door locations, wall areas, floor areas, roof areas, leakage areas and factors, shaft locations, building temperatures, expected exterior temperatures, and exterior door locations. In addition, *conceptual* wall routing and locations were input into the model, where such walls were expected to have an impact on the expected airflows– such as smoke barriers, separations from the existing hospital, etc. The primary intent of inputting the routing and locations of interior walls was to determine which areas (i.e. "zones") of the building communicate with each other for the purposes of leakage between zones. In this fashion, the airflow in the building is modeled from zone-to-zone, both horizontally and vertically.

Through a series of simulations, Summit Fire Consulting adjusted fan sizes, injection points, and other mechanical design features (such as relief vents) in order to estimate ranges of expected capacities that would accommodate the various design criteria of the "competing" smoke control systems. Such simulations included a wide range of exterior building temperatures, as well, in order to estimate their effect on the operation of the pressurization systems due to potential “stack effect” conditions in the stairwells and elevator shaft. In this fashion, the design of the pressurization systems incorporated the expected variations in exterior environmental conditions.

The design guidance developed for the pressurization systems was communicated to the Mechanical Engineer, the project team, and the AHJ for the project via a Design Report. The Design Report documented, in detail, the rational analysis conducted, proposed design criteria, code background and applicable navigation, etc., for the purposes of final approval by the AHJ and incorporation into the Construction Documents for the project. In addition, given that both the WCBC and NFPA 101 applied to the project, the Design Report documented the means of complying with both codes – and/or the intent of both codes where prescriptive compliance was not possible. Although the stair pressurization and elevator shaft pressurization systems could not satisfy all of the prescriptive requirements of the applicable sections of the WCBC and NFPA 101, the proposed design satisfied the overall level of fire- and life-safety that is intended by both the WCBC and NFPA 101.

Special Inspection of the stair pressurization systems and elevator shaft pressurization systems are also required by the IBC. Such tests and inspections are to be carried out by a qualified agency, and be sufficient to “verify the proper commissioning of the smoke control design in its final installed condition.” In addition to the design consulting previously provided, Summit Fire Consulting was also selected as “Special Inspector” for the stair pressurization systems and elevator shaft pressurization system in the Bed Tower.

The Special Inspection generally occurs over the course of the construction and installation process, and is recommended to include three primary phases: documentation review, equipment inspections, and sequence testing. Each phase of the Special Inspection is utilized to confirm specific design and installation requirements for the pressurization systems that are detailed in Section 909 of the IBC and the Construction Documents. Documentation review includes the review of pertinent shop drawings and product submittals to confirm that certain equipment requirements– such as listings for mechanical or fire alarm equipment– are satisfied. Equipment inspections, on the other hand, include actual field observations at key milestones during the course of construction to confirm that the installed equipment corresponds to the shop drawings and product submittals, as well as additional equipment requirements specified by the IBC – such as wiring installation requirements, pressure testing of ductwork, etc. Finally, sequence testing occurs near the completion of construction and involves physical testing of the activation features for the pressurization systems and airflow measurements.

All three phases of the Special Inspection were conducted over a six-month period of time, concluding with final sequence testing in the summer of 2010. Sequence testing involved multiple “pre-tests,” during which the project team identified discrepancies between the installed condition and the approved design—in order to make any necessary modifications to ready the pressurization systems for a final demonstration with the AHJ. The scope of the final demonstration was ultimately at the discretion of the AHJ, and involved limited sequence testing and airflow measurements. Ultimately, adequate performance of the pressurization systems was observed during the final demonstrations; and, upon completion and issuance of a Special Inspection Report, a Certificate of Occupancy was issued for the new Bed Tower.

Given the relatively limited implementation of elevator shaft pressurization systems, compounded by the complexity of utilizing “competing” smoke control systems, the project team encountered many unique challenges throughout the design and construction process. For example, the CONTAM model idealized the Bed Tower as essentially a separate, isolated building. In reality, however, the separation of the Bed Tower from the existing Appleton Medical Center proper was not complete– as far as airflow and communication between the spaces is concerned.

Additionally, due to the nature of health care occupancies and the use of the Bed Tower, the integration of the fire alarm system with normal building tempering involved different sequences for different levels of the building as well as different areas within a single level of the building – due to the compartmentalization of individual levels of the Bed Tower with smoke barriers. From a smoke control perspective, however, the desire was to minimize the number of possible activation sequences and "airflow" conditions under which the pressurization systems would operate. The desired sequencing in the Bed Tower created multiple "airflow" conditions which introduced factors of uncertainty into the design, as well as cause for additional testing to be conducted during the Special Inspection.

Finally, perhaps the greatest challenge in the design of the pressurization systems (and, thus, the subsequent balancing of the systems) was in the estimation of leakage areas and leakage factors for the building. For input into CONTAM, an approximation of the actual amount of leakage in the building construction is required. Such leakage is inherent to all building construction, to some extent, and can play a significant role in the sizing of fans utilized for pressurization systems. While some data is available in fire protection engineering literature for approximating expected building leakage, the available data is very limited and are only approximations for leakage based on the type of component (i.e. interior wall, exterior wall, roof assembly, floor assembly, etc.) and the qualitative type of construction (i.e. "loose," "tight," etc.). Slight errors in estimating the leakage expected for the building can cause significant errors in the actual airflow requirements to achieve the performance criteria of pressurization systems.

In the end, through mechanical balancing and sealing of visible leakage points, adequate airflow was

observed during testing. In addition, simultaneous operation of the stair pressurization systems with the elevator shaft pressurization system was successfully tested and confirmed under multiple activation sequences and "airflow" conditions in the Bed Tower.

Even as soon as the 2009 edition of the IBC, modifications and revisions to the performance criteria for elevator shaft pressurization systems have been implemented, undoubtedly due to the growing pool of experience with respect to implementation of elevator shaft pressurization systems in building construction – transitioning from theory to reality. In a realm where active fire protection and life safety systems are becoming ever more prevalent, there is reason to anticipate that elevator shaft pressurization will continue to be refined in building construction as a reliable means of protecting elevator shafts. In the meantime, projects such as the new Bed Tower at the Appleton Medical Center will continue to pioneer the design and installation of such systems.

Continuous Commissioning

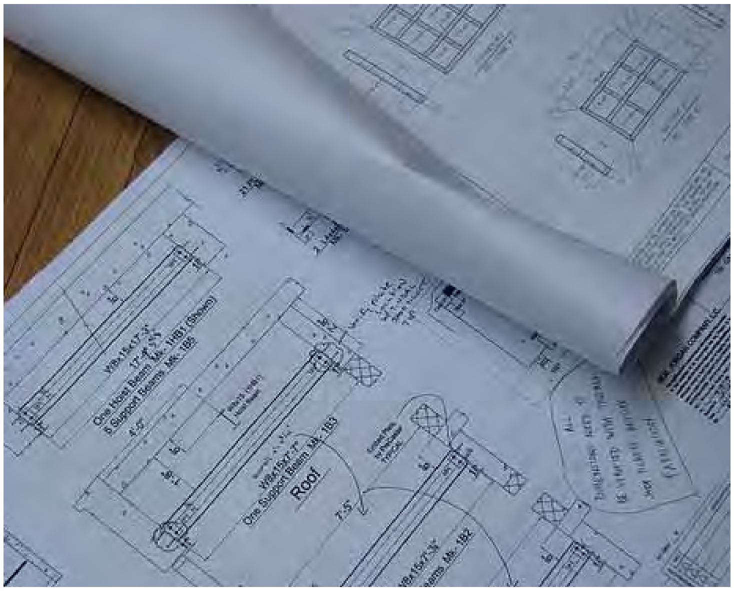
Ed Culp, MacDonald Miller Facility Solutions

NEBB defines Retro-Commissioning as, "the process of improving the performance of an existing building". Additionally, NEBB defines Continuous Commissioning as, "A continuation of the Commissioning Process well into the Occupancy and Operations Phase. This process verifies that a project continues to meet current and evolving Owner's Project Requirements". Continuous Commissioning Process activities are ongoing for the life of the facility as an evolving effort to maintain the level of performance achieved during the initial commissioning efforts as well as improving the performance of the building and its energy using systems as the new technologies and methods become available in the industry. The following discussion will outline how MacDonald-Miller Facility Solutions, in partnership with the building engineering staff, has been able to improve the energy performance and creature comfort of a building to achieve a current Energy Star Rating of 99 (Certified in August 2010) through the process of Retro/Continuous Commissioning. The subject building is Key Center located in Bellevue, Washington. Key Center is a 518,713 square foot Class A office tower. The facility is a 22 story steel and glass structure with 800 underground parking stalls. Construction of the facility was completed in 2000. The HVAC systems consist of a built-up rooftop air handling system with water-cooled central cooling plant and terminal FPVAV Boxes with electric re-heat coils.

We performed a Performance Benchmark on the facility to compare it to similar facilities. It was clear that that although the building was performing well with an Energy Star Rating of 88, there may be room for significant improvement in the performance of the facility. The decision was made to move forward with a comprehensive Building Performance Audit to identify specific Energy Conservation Measures or ECMs in order to reduce the operating costs of the facility. The identified ECMs were then implemented and commissioned. At the completion of this initial Retro-Commissioning a Report Carding System was put in place in order to verify that (at minimum) the projected weather adjusted energy savings were indeed being realized as well as an ongoing Performance Management partnership with the property management company.

Benchmarking The first step in developing a plan to improve the performance of a facility is to get a comparative benchmark with other like buildings. In the case of Key Center we used the EPA's Portfolio Manager Method for determining the baseline **Energy Usage Index** or **EUI**. The "base year" for Key Center is the twelve month period ending in August 2008. All performance comparisons and weather adjustments are done in reference to that twelve month period. For that twelve month period the EUI for Key Center was 69.48kBtu/ft2/Year, the annual energy spend was $875,057/Year (or $1.69/ft2/Year), and the annual carbon emissions were 6,307 Metric Tons/Year. These statistics resulted in an **Energy Star Rating (ESR)** of 88. In many cased an ESR of 88 would be considered very good and may not prompt the operations staff to look for improvements. However, MacDonald-Miller Facility Solutions felt that there was significant room for improvement in the overall performance of this facility. We presented our opinion to the property management company and sold them on the idea of moving forward with the next step which was to perform a **Comprehensive Building Performance Audit** on the facility.

Comprehensive Building Performance



MacDonald-Miller's comprehensive Building Performance Audit consists of a thorough review of six systems:

- Heating
- Building Envelope
- Lighting
- Domestic Hot Water
- Cooling
- HVAC & Lighting Management System

During this review it was determined that the property management company keeps the Lighting Systems up to date with efficient product, the Domestic Hot Water System is maintained at correct temperature and run times, and the Building Envelope is considered to be tight. Therefore, the focus was primarily on the Heating, Cooling, and the HVAC & Lighting Management Systems. After a thorough review of these systems we found significant opportunity for improvement.

Heating and Cooling System

The investigation of the Heating and Cooing Systems discovered a number of functional issues common to this type of system. We found several VAV Box transducers to be failed, some air balance values out of calibration, and some failed damper actuators. We also found some miscellaneous broken parts and pieces such as sensor tubing and flow switches. There were also some failed fans in the series fan powered VAV Boxes.

HVAC & Lighting Management System

Our investigation of the HVAC & Lighting Management System uncovered several opportunities for improvements to the sequence of operations of various components of the system. At the zone level we found that the existing control software from 2000 did not have the capability to utilize separate space temperature set points for heating and cooling (for both the occupied and the unoccupied modes). At the AHU Level we discovered that there was significant room for improvement in the morning warm up sequences, DAT set point re-set, Duct Static Pressure set point re-set, and economizer function. We also discovered multiple failures in the lighting control system.

Recommendations

- Retro-Commissioning of the Fan Powered VAV Boxes: Based on the number of air balance values that were found to be out of calibration we recommended a Retro-Commissioning of 20% of all boxes in the facility selected in conjunction with the engineering staff's knowledge of known comfort complaints and our spot checks during the audit.

- Re-Program the zone controls to utilize separate heating and cooling space temperature set points for both the occupied and the unoccupied period: The existing zone controls were not capable of separate heating and cooling set points. However, one of MacDonald-Miller's seasoned controls programming technicians, Bill Heath, was able to write an algorithm to mimic separate set points thus creating the desired dead band between the two set points. This eliminated the need to replace upwards of 600 zone controllers which made the cost to benefit ratio of the recommendation attractive to present to property manager and the building owner.

- Tune the morning warm up sequence: The zones were found to switch to the occupied mode virtually all at the same time causing a spike in demand. This recommendation stages the occupancy over several hours ultimately reducing both demand charges and kWh consumption.

- Replace the AHU Controls and upgrade the Front End with the Tridium Platform vendor neutral software product and implement Sequence of Operations Enhancements: This recommendation was driven primarily by two factors: 1) To make the front end function more user friendly to the engineering staff; 2) Enhance the capability to implement set point re-set schedules for the Discharge Air Temperature and the Duct Static Pressure and also enhanced economizer tuning.

- Repair/Replace failed Lighting Controls: The lighting controls at several floors had failed for a variety of reasons. We recommended that these controls be repaired or replaced as required and the TOD schedules be tuned to the occupancy of the tenant on each floor with staging in the morning to reduce demand charges in much the same way as the staged occupancy of floors for the HVAC System.

Projected Savings and Financial Benefit

The proposed total cost of the above recommendations was approximately $282,051. The combined projected savings from the recommendations was approximately 807,609kWh/Year which equated to $66,870/Year or a 7.6% reduction in energy spends per year. The projected Simple Pay Back (SPB) was 4.2 Years, the projected Return on Investment (ROI) was 23.7%, and the resulting projected Asset Valuation was $1,114,500. Based on these projections the property management company and the building owner made the decision to contract MacDonald-Miller Facility Solutions to perform all of the recommendations.

Implementation and Testing of Energy Conservation Measures (ECMs)

MacDonald-Miller Facility Solutions completed the implementation and testing of all ECMs with in house personnel. The installation of the new Front End, AHU Controls, and affected Lighting Controls was completed by our low voltage electrical staff and the programming and point to point testing on these items was completed by Bill Heath. The Air Balance corrections and Retro-Commissioning of affected zones and subsequent full load testing of the AHU was completed by our field TAB and Commissioning Technicians and supervised by Ed Culp-NEBB Certified Professional for Air and Hydronic TAB and Brian Wheeler-NEBB Certified Professional for Commissioning.

Initial Results (first quarter after implementation)

The results documented during the first quarter after implementation and testing were much better that we had expected. For example, the implementation of dead band was likely creating more simultaneous heating and cooling than our estimates during the audit phase of the process. This combined with the demand savings from staging the morning occupancy of zones created the welcome additional savings. The actual first quarter savings was $45,356 which was 71% higher than the original projections.

Ongoing Commissioning

MacDonald-Miller, in partnership with the property management company, has implemented an Ongoing Commissioning process in order to sustain the savings of the implemented ECMs over time and also to look for additional savings on a continuous basis. We practice Ongoing Commissioning with a three pronged approach- 1) Monthly Report Carding; 2) Performance Management; 3) Implementing additional ECMs “on the fly”.

Monthly Report Carding

Our Senior Building Performance Engineer Dave Nieman has developed what we call an Energy Optimization Report Carding System via an excel spread sheet to track the weather adjusted energy performance of a building over time. This system has proven quite useful as an M & V tool where savings are guaranteed or in the case of Performance Contracting projects. This system reports the performance of the building on four graphs- 1) energy cost trends; 2) The most recent 13 month history of base year consumption, base year weather adjusted consumption, current year consumption, and the base load of the building; 3) The monthly savings and the cumulative savings from the base year to present; 4) Consumption trends vs weather data with weather adjustments.

Performance Management

MacDonald-Miller has a Performance Management Contract with the property management company to monitor the control system on a daily basis with alerts set to let us know when a problem occurs that may affect the energy consumption of the facility and also to recommend additional adjustment to operational sequences to improve the performance of the facility. Dave Nieman is also in charge of this effort.

Implementing Additional ECMs “On the Fly”

Occasionally, either from research, new technology in the industry, or experience at one of our other facilities, we discover strategies that we feel would improve this facility. In these cases we present the idea to the property management company and then implement the ECM as a change order to the Performance Management Contract then track the results on the Report Carding Process already in place. For example, we were experimenting with a “staged warm up” process in one of our own buildings here in Seattle on single zone units with very good results. So, we again tasked Bill Heath with writing an algorithm that could be implemented at each VAV zone at Key Center and sold the idea to the property management company. This measure has resulted in a reduction in demand charges of 8.1% in the first two months after implementation.

Results of the Cumulative Effort

Even with the very good starting point (ESR of 88) the results of our efforts at Key Center have been phenomenal. The following data is as of November 2010.

- Energy Usage Index:
  44.96kBtu/ft2/Year
  (35% reduction)
- Annual energy spend:
  $635,029/Year or $1.22/ft2/Year
  (27% reduction)
- Carbon Emissions:
  4,185 Metric Tons/Year
  (24% reduction)
- Energy Star Rating:
  99 (Certified in August 2010)

Conclusion

Our efforts at Key Center have been very rewarding. We have shown that with a collaborative effort between contractor, building owner and property manager, even a building that is considered high performing can be tuned to function even better than expected. MacDonald-Miller Facility Solutions, the property management company and the building owner are continuing to work together to improve this facility even more. If we are able to achieve another 4% reduction in weather adjusted energy consumption Key Center would become only the second building in the United States to earn an Energy Star Rating of 100. Key Center will once again be eligible to re-certify its Energy Star Rating in August 2011. We are working toward that additional 4% savings and hope to be able to report the new rating of 100 at that time.

Key Center

Energy Optimization Report Card

Customer	Unico			
Square Footage	518,713	Gross	HVAC LOAD 60.0%	SLIDE BAR Nov-2010
Facility Usage	Profesional Office			
Base year period	Sep-07	Aug-08		

DATA	Base Y AVG	Current	Change
DRI	59.42	47.07	-12.3
EUI	69.48	44.96	-24.5
ESR	88	99	11.0
$/SQFT	$1.89	$1.22	-$0.67
$/Annual	$981,411	$635,029	$346,382
$/Energy	$0.0243	$0.0272	10.84%

Degree Days	12 Mnth AVG	Decrease	-7.58%
Energy Usage WX	12 Mnth AVG	Decrease	-30.68%
Energy Annualized	Overall Usage	Decrease	-35.29%

Load Factors (Monthly)	Load Factors (Annually)
Electrical 100.00%	Electrical 100.00%
Gas 0.00	Gas 0.00
Steam 0.00%	Steam 0.00%

Actual Savings					
This Month	12 Months	Annual savings	Annual Target	Annual DELTA	Above Target
$34,732	$346,505	$346,382	$66,870	$279,512	418%

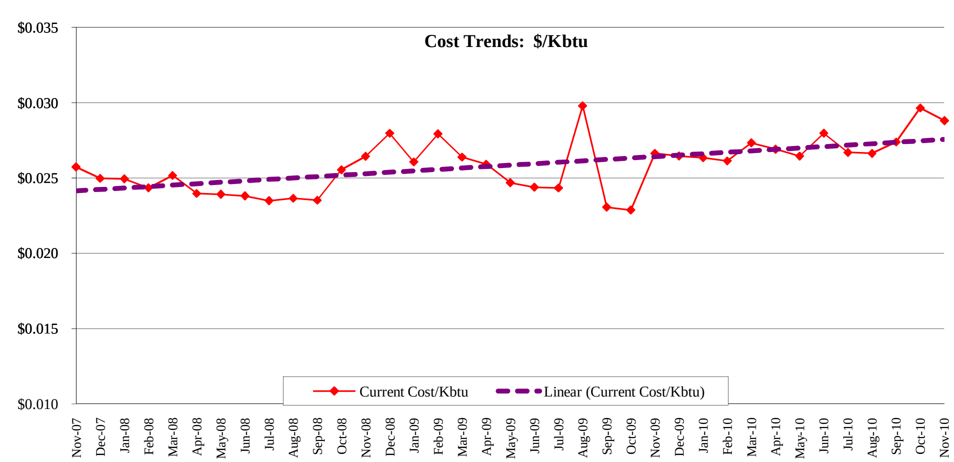
Demand KW (Annualized)		
Base Year	Last 12 Months	Reduction
30821	24417	20.78%

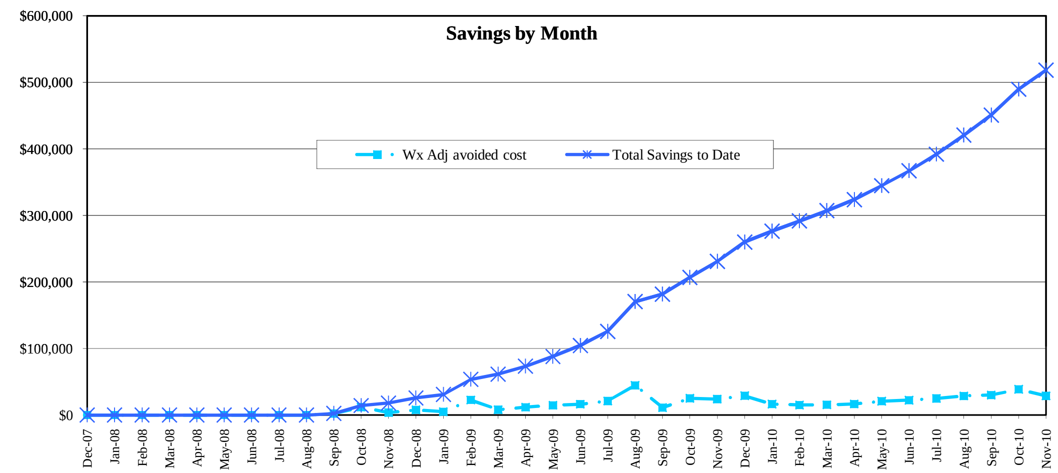
COST / mBtu		
Ele $27.23	Gas $0.00	Stm $0.00

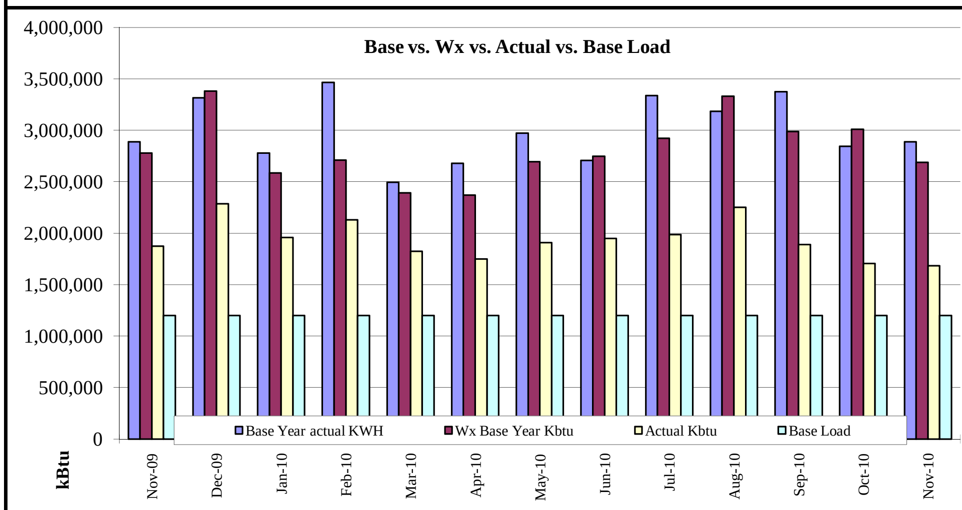
Weather Adjusted Avoided Cost		
This Month	12 Months	Contract to Date
$28,926	$287,447	$518,347

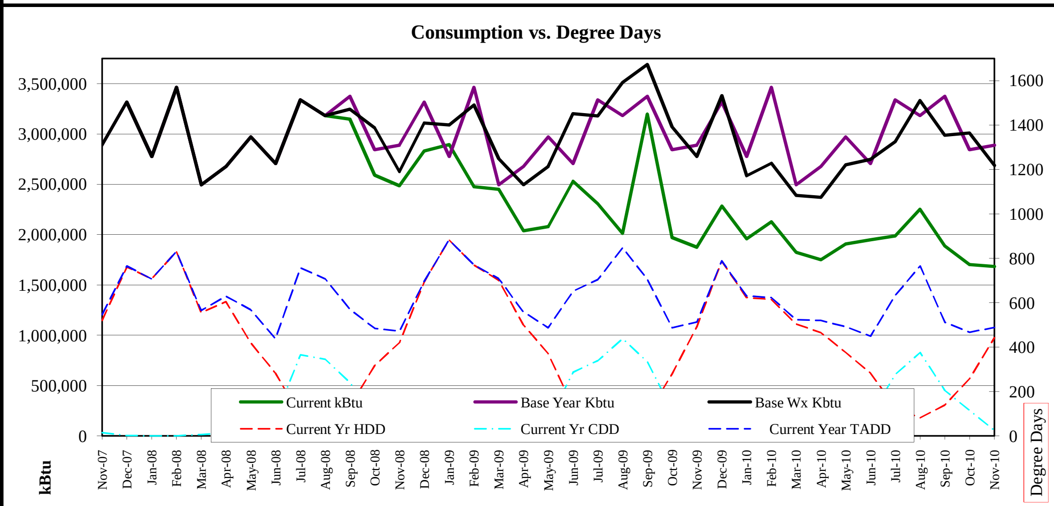
Environmental Impact (Annualized)		
CO2 Savings	2122	Metric Tons
Equates to	1414	Autos off the roads annually

Financials		
Used for tracking Energy investments		
INV	$332,052	Current
SPB	1.30	YEARS
ROI	130.99%	Projected 3Yr
IRR	48.94%	Projected 3Yr
NPV	$741,567	Projected 3Yr
ROI	861.20%	Projected 10Yr
IRR	74.25%	Projected 10Yr
NPV	$1,556,874	Projected 10Yr









The Sound of Money

Jim Huber, NEBB S&V Committee Chairman, Board of Directors

Why you need to add sound and vibration certification to your company's toolbox

As more and more attention is being directed towards sustainability and high performance buildings, one of the areas seeing the most attention is sound and vibration. Why the sudden interest in S&V? Because for a space to perform at a high level, it must be completely functional. An acoustically correct environment (both from a sound and vibration perspective) is paramount to the functionality of spaces:

- In any space where speech intelligibility is important
- Where there is a PA system
- Where speech privacy is important
- Where confidentiality is important
- Where music is important
- Where both speech and music is important
- Where a quiet atmosphere is important
- In spaces that can get too loud
- In spaces with delicate instruments
- In spaces with precision machinery
- In laboratory environments
- In manufacturing spaces

In fact, I challenge you to name a type of space in which acoustics doesn't need to be considered.

Until recently, sustainable design has concentrated on energy efficiency. What was often overlooked is human efficiency. Employees are usually a company's most valuable asset. On average, labor is 100 times more expensive than energy. Think about that- ***If a proper acoustic environment can increase worker productivity by even a couple of percent, the money saved can pay for the energy use in the entire building.***

But wait, there's more! Think of the role that sound and vibration plays in health and safety. Hearing loss (from noise exposure) is one of the top occupational hazards (and is 100% preventable). Studies have shown that employees that suffer from hearing loss are also 55% more likely to have an accident. Noise can cause headaches, tinnitus, high blood pressure, and heart problems. Some studies have even linked excessive noise to respiratory ailments and negative fetal development.

Still not convinced? How about the affect of noise on employee morale and relations? Building occupants can be annoyed and uncomfortable in a noisy space, without consciously making the connection to noise. Noise can cause irritation, annoyance, anxiety, anti-social behavior, hostility, and even violence.

Vibration also plays an important role in high performance buildings. Vibration can contribute to or cause excessive noise as outlined above. Vibration testing and analysis allows for smooth (quiet) equipment operation, minimum wear to rotating parts, and maximum life expectancy of HVAC equipment. Vibration analysis also helps to identify improperly installed or aligned equipment, and gives the owner documented baseline data for equipment vibration that can be used for early diagnosis of equipment faults.

A space that contains any of the scenarios above can hardly be considered to be a “high performance” environment. In fact, it is just the opposite. The industry as a whole is realizing the impact of buildings on our environment through not only air, water, and land pollution, but light and noise pollution as well.

The Industry is Changing

Owners have already taken note of the impact of acoustics to their bottom lines. How is the industry addressing these issues? For starters, sound & vibration is being referenced to a much greater extent in building codes and design standards, as well as LEED. For example:

- ASHRAE Standard 189.1- (Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings) contains mandatory requirements for acoustic control and treatment. Noise sensitive spaces (such as offices, classrooms, conference rooms, etc.) require minimum sound transmission class (STC) ratings for interior wall and floor-ceiling assemblies. Buildings exposed to higher exterior noise levels have minimum Outdoor-Indoor Transmission Class (OITC) requirements.

- The Uniform Building Code (UBC) contains requirements for sound isolation for dwelling units in Group-R occupancies (including hotels, motels, apartments, condominiums, monasteries and convents). UBC requirements for walls: STC rating of 50 (if tested in a laboratory) or 45 (if tested in the field). UBC requirements for floor/ceiling assemblies: STC ratings of 50 (if tested in a laboratory) or 45 (if tested in the field). In both cases, the field test evaluates the dwelling's actual construction and includes all sound paths.

- The International Building Code includes Appendix Chapter 35 of the '91 UBC, and Appendix Chapter 12, Division II of the '97 UBC. Not all municipalities have adopted this appendix chapter, but it is still recognized as an industry standard.

- LEED 2009 for Schools New Construction and Major Renovations includes requirements for maximum background noise levels (45 dBA) and reverberation time. Classrooms and core learning spaces < 20,000 ft2 must include a minimum total surface area finished with a material with a Noise Reduction Coefficient of 0.70 or higher that equals or exceeds the total ceiling area. Calculations demonstrating compliance with ANSI Standard S12.60-2002 are also acceptable for areas < 20,000 ft^2. The maximum reverberation time for classrooms and core learning spaces ≥ 20,000 ft2 is 1.5 seconds or less.

- LEED 2009 for Healthcare includes IEQ Credit 2 for acoustic environment. Once point is available for measuring or calculating sound levels in each representative room type to confirm compliance with criteria in the ASHRAE 2003 Handbook, Chapter 47, Sound & Vibration Control, Table 34.

- Properly commissioned buildings also include sound & vibration testing specifications, and those specifications are being enforced.

It is my opinion that acoustic requirements will be included in future LEED updates for the other programs, including new construction, commercial interiors, and retail. As these acoustic requirements are included in more building standards, codes, and specifications, the demand for sound or vibration testing will increase greatly. Someone needs to do that testing- if you don't do it, your competitor will!

NEBB Continues to Lead the Industry

NEBB already offers sound or vibration certification for firms and their professionals, as well as their technicians. To meet the demand that the changing industry is providing, the NEBB S&V committee is presently developing training modules based upon ASTM standard E336 for field testing of STC assemblies. The NEBB S&V committee is also working with the Building Systems Commissioning committee to incorporate sound and vibration testing requirements and guidelines into the NEBB commissioning standards and specifications.

In addition, the sound & vibration committee has also made a change in the way training and certification is being provided. We are now providing regional training on a more frequent basis to reduce the cost of certification to our firms. Minimum class size is 8 candidates for each discipline, but hosting training at your local chapter results in a tremendous cost savings to our member firms. For more information on requirements or costs associated with the NEBB Certified Professional and Certified Technician programs, please contact Elana Noel at the National Office.

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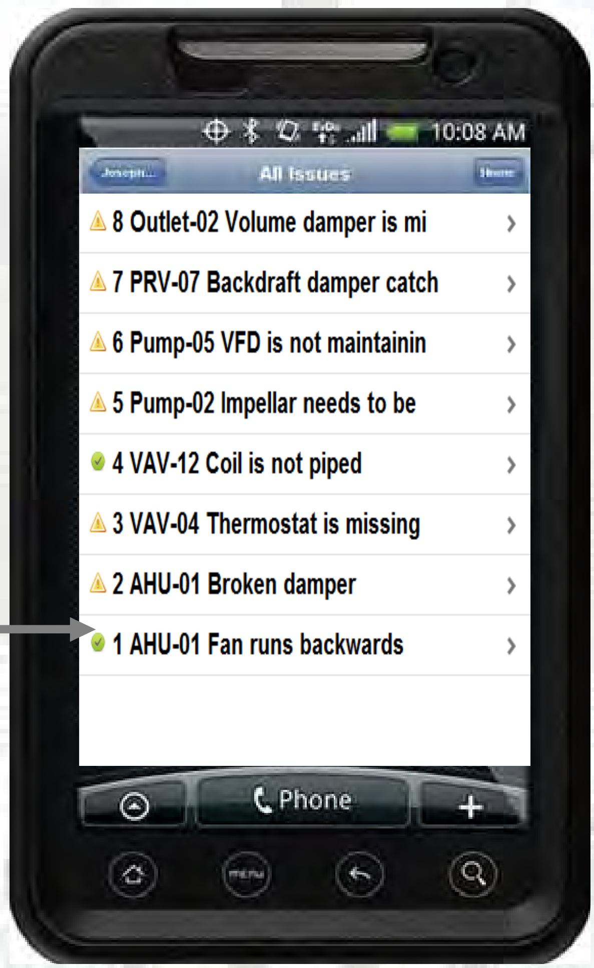

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