TABB TALK

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Natural and Hybrid Ventilation

TABB Conference

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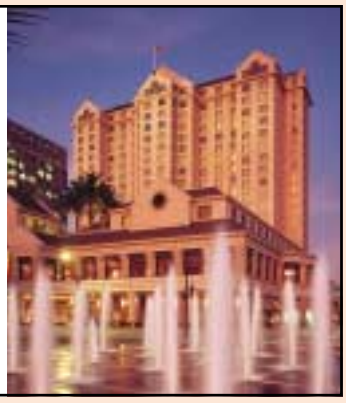
Join us in beautiful San Jose, CA for TABB Conference 2006, see page 6 for the full story!



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Certification Opportunity Knocks

When an opportunity knocks on your life's door, you can choose to open that door (in many cases, whether you *think* you're ready to tackle that opportunity, or not); or you can choose to ignore the knock. Thinking of finding a more convenient time? Thinking of waiting until the kids are out of the house? Why wait when so many opportunities are available now, through certification programs offered by TABB.

Certification is an opportunity knocking on an entire industry's door. TABB is currently certifying supervisors and contractors in testing, adjusting and balancing but is opening the gates up for more certification programs in sound and vibration and building commissioning, with filtration certification not far away.

Certification gives individuals a wider window of opportunity. Since the marketplace is asking for more technically-trained and certified workers, what's the downside of being in demand? Of differentiating yourself from the masses?

There isn't any.

With energy management and indoor air quality making a comeback through the federal government's Green Buildings program, commissioning is being implemented into many different aspects of today's buildings. TABB's Building Commissioning Certification provides even more opportunities. Matt Sano, President, Fisher Balancing Co., Williamstown, NJ explains, "This guy no longer needs to be just laying duct work, they need him to be certified, has to be educated, and it's really helped us." There's also the pride of craftsmanship that accompanies higher skill levels: no small thing on a job site mixing a wide variety of trades.

"Commissioning is a wonderful opportunity to really stretch and grow as a balancing technician and as a company, beyond just basic setup work", says Susan E. Wing, President, Wings Testing & Balancing Co., Inc., Branford, CT

"It's a stamp of approval that says, hey, we know they're TABB certified, we know they've been trained, we know what they're doing in the field, as well as the office support that they're going to get is going to be quality support. So it's giving those who specify a product, so to speak, to put into their specification", states James E. Hall, President and owner, Systems Management & Balancing, Inc., Des Moines, IA

TABB is offering the tools to help open many doors. Are you going to open that door or ignore the knock of opportunity? For more information, visit TABB online at www.tabbcertified.org ■

Natural and Hybrid Ventilation in Non-Residential Buildings:

Evaluation Approaches and Challenges

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As energy costs continue to rise, indoor environmental quality issues remain of concern, and studies continue to conclude that occupants benefit from some amount of control over their environment (Brager and de Dear, 2000), natural and hybrid ventilation technologies will become more palatable alternatives to providing outside air into the occupied space.

Though not popular in the United States, natural and hybrid ventilation strategies as a means to ventilate and passively cool buildings have gained ground, particularly in Western Europe. Currently over 75 percent of commercial buildings use some type of cooling equipment to cool the building space. Most commercial office buildings in the United States are designed with mechanical systems to condition space with large interior loads and a sealed envelope construction. The goal of mechanical systems is to maintain uniform and consistent interior conditions throughout the occupied space. However these systems require a substantial amount of energy to operate and initial capital cost to install. Over 30 percent of primary energy usage in the commercial building sector is used for space conditioning (heating, cooling, and ventilation).

Natural ventilation, driven by the natural forces of temperature and wind, is an alternative method to control the intentional ventilation for a building or space. It is the pressure differences between the outside and inside conditions, due to wind and air temperature differences, that drives the flow of air into or out of a building through purpose provided openings, such as windows and vents. With hybrid ventilation, supplemental cooling and/or ventilation equipment is provided to meet the design loads when natural ventilation alone is insufficient. A hybrid ventilation, or mixed-mode, building extends the climate regions where natural ventilation alone may not be sufficient to provide cooling during the entire cooling season for buildings. The use of hybrid ventilation reduces the size of cooling equipment required, thereby reducing first costs, or allows for an increased level of interior loads within the occupied space. There is the potential for 5 to 50 percent energy savings with the use of hybrid ventilation in many locations in the United States (Spindler, 2002).

Issues with Natural and Hybrid Ventilation

However, in order for natural or hybrid ventilation to be successful, it has to be designed from a whole building concept. Both natural and hybrid ventilation strategies require careful attention to the overall design of the building. Design characteristics that can influence the performance of the building include interior loads, envelope construction and window use and placement. Natural and hybrid ventilated buildings tend to maximize these design characteristics as a means to reduce the cooling requirement during the peak cooling season. Controlling the amount of interior loads from lighting, solar gain, and equipment will affect the amount of cooling required to achieve occupant comfort. These strategies in turn influence the building envelope, window size and availability of natural daylight. The location, climate and surroundings of the building must be considered when evaluating a particular design strategy for natural and hybrid ventilation. Rural versus urban environments, heating versus cooling dominated climates, seasonal temperature variations and wind speed and direction all influence the overall ability of passive cooling strategies to be incorporated into the building design. Many passively cooled buildings also make use of thermal mass and night cooling as a means to pre-condition the occupied space.

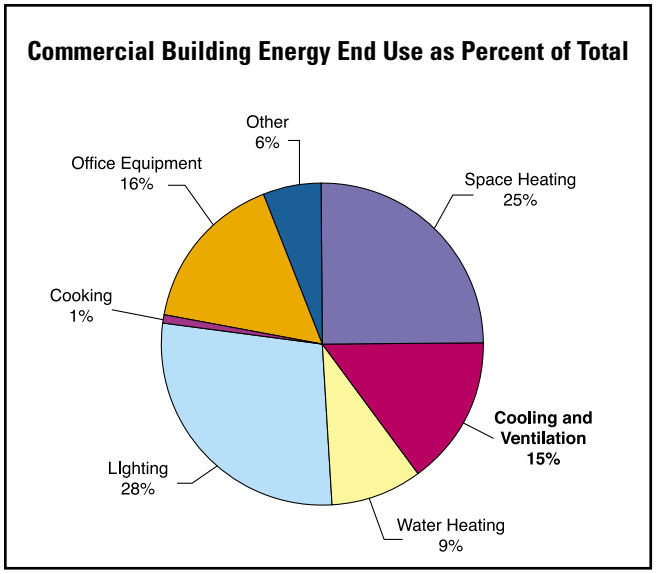
Buildings that incorporate these practices tend to be more sustainable buildings with reduced operating costs due to less energy use, and the inclusion of these design strategies.

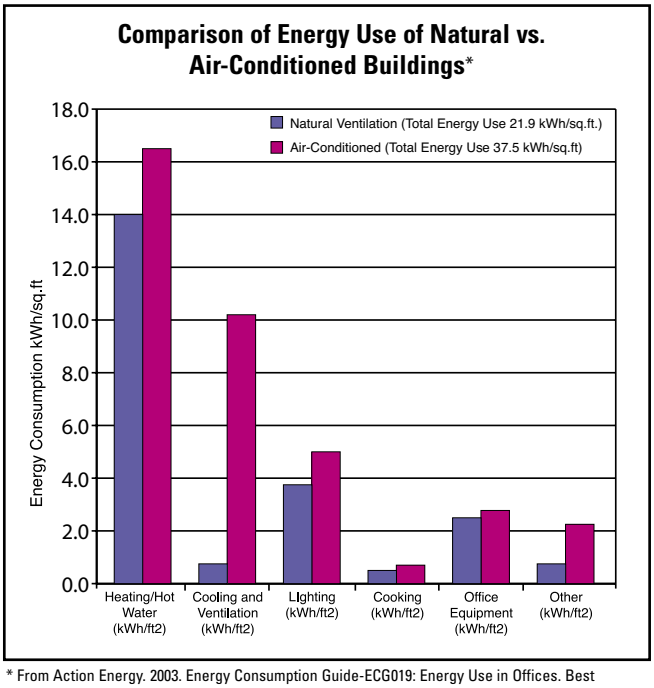
Current Evaluation Techniques

Several methods are used in evaluating and predicting the performance of natural and hybrid ventilated buildings. These methods range from simple empirical methods and algorithms to physical modeling and detailed computation fluid dynamic simulations. Each method has limitations and should be used with caution. The prediction and evaluation of natural ventilation is difficult, as the physical processes that are involved are complex and interdependent. Here several of these techniques are compared and their use in evaluating building performance discussed.

When predicting natural ventilation, various assumptions are made in order to simplify the problem of simulating the variability of airflow in and around buildings. Empirical models are used in calculating the airflow rate through a given zone based on the temperature difference, wind velocity, and potentially some amount of fluctuation of the wind. Network models estimate bulk airflow rate for a single zone or between multiple nodes or simulated zones within a building. There are prescribed equations for the contribution of wind and temperature difference to the pressure difference that drives the natural ventilation. Both the empirical and network models assume that the zone is well-mixed and does not allow for any temperature variation between the floor and ceiling of a zone. Zonal and computational fluid dynamics (CFD) both have the ability to model the temperature distribution and air velocity through a zone by dividing a zone into many small volumes and solving the governing equations for each volume. They are not able to readily evaluate changes in wind direction and wind speed in the external environment. Calculations can be made for specific directions and wind speeds and those results combined with a wind-rose of a given location to predict the ventilation performance. These models all require a set of assumptions in order to use the method and are limited by these assumptions and the output, but can provide a preliminary analysis into the predicted performance of a naturally ventilated or mixed-mode building.

Though prediction methods using mathematical models are useful, often with more complicated spaces it is considered more reliable to gather experimental data from physical models (Awbi, 2003). However, there are certain similarity requirements that need to be met in order to ensure that the data collected are significant. These requirements (geometric, thermal, and kinematic similarity) can be difficult to achieve, particularly with small scale modeling efforts. The use of reduced-scale models in wind tunnels is a common practice to evaluate the wind flow around and pressure differential across a building as a means to predict airflow through the building. Physical modeling can provide design information for passively ventilated buildings, but caution should be used when constructing these models, as slight variations in window openings and architectural details can





* From Action Energy. 2003. Energy Consumption Guide-ECG019: Energy Use in Offices. Best Practices Programme. London: Crown Publishing. March.

TABLE 1. SUMMARY OF EVALUATION METHODS

	# of Zones	Output	Cost
Empirical Modeling	Single Zone	Bulk Airflow	Inexpensive
Zonal Modeling	Multiple Zones	Bulk Airflow	Inexpensive-Moderately Expensive
Physical Modeling	Multiple Zones	Temperature and Airflow	Moderately Expensive
Monitoring	Multiple Zones	Temperature, Airflow, IAQ	Moderately Expensive-Expensive

affect the airflow in and around the building. These physical modeling methods also are not able to adequately model variations in wind direction and speed and the influence that has on the airflow rate though openings.

The monitoring of natural and hybrid ventilation as a means to evaluate performance and improve performance prediction techniques still remains a difficult task. Mechanically ventilated buildings provide an interior environment with a constant temperature and a controlled ventilation rate that is easily measurable. However when relying on the exterior environment to drive the ventilation in a building, it becomes increasingly difficult to consistently monitor the performance of a passively ventilated building. When the occupants have control over the operation of openings, such as windows, the measurement of ventilation performance is more difficult still. Building orientation, window geometry, interior obstructions, and wind direction and speed all contribute to the ventilation performance of a building. The temperature distribution, relative humidity and carbon dioxide levels, all used in evaluating the indoor environment, are readily measured with instrumentation that allows for data logging over long periods of time. Airflow rates (and flow patterns in multi-zoned buildings) are difficult to measure in buildings that rely on operable windows for fresh air for any amount of time. Research has been done at the Massachusetts Institute of Technology in assessing the performance of a naturally ventilated building, developing an apparatus to measure the airflow rate through an awning-type window (Walker, 2005).

Each method of assessing the performance of natural or hybrid ventilation in buildings has strengths and weaknesses in addition to limitations. A simple summary of the methods is presented in Table 1.

Next Steps

The current methods do not provide sufficient flexibility or detail to ensure the performance of natural or hybrid ventilated buildings. Though there are many benefits for these passively cooled buildings, several barriers must be passed before these strategies are readily considered for the building stock in the United States. The areas that require further research include advance integration of mechanical and natural ventilation strategies for a wider array of building types. This will require better, perhaps more advance control strategies that may tie into the building energy management system to optimize the operation of windows and mechanical equipment. Finally, performance criteria for natural and mixed-mode buildings needs to be developed to ensure a healthy indoor environment for the occupants of these buildings.

There is a lack of understanding of natural ventilation and the resulting temperatures and airflows for specific climates, and a lack of comprehensive tools to analyze design strategies effectively, quickly and in detail. Currently there are limited tools to predict or assess the performance of natural ventilation in buildings, pre or post occupancy. Tools for use in the design stage provide preliminary data on the performance of a single space when building characteristics, such as orientation, materials, and location, are entered through the user interface. However, modeling programs do not adequately model natural ventilation effects.

There needs to be a combination of theoretical, experimental, and applied research in order to quantify the benefits of natural and hybrid ventilation strategies in buildings. These passive ventilation strategies have the potential for reducing energy consumption in commercial office buildings, improving occupant comfort and lessening the environmental impact of buildings on the environment. The design tools need to be created and refined in conjunction with the development of guidelines for incorporating natural and hybrid ventilation into commercial office buildings. ■

References: 1. Spindler, H., L. Glicksman, and L. Norford. 2002. The Potential for Natural and Hybrid Cooling Strategies to Reduce Cooling Energy Consumption in the United States. 8th International Conference on Air Distribution in Rooms. RoomVent 2002. Copenhagen, Denmark. pp. 517-520. • **2.** Willmert, T. 2001. The Return of Natural Ventilation. Architectural Record. Vo. 189, No. 7.: 137-148. • **3.** Brager, G.S. and R. de Dear. 2000. A Standard for Natural Ventilation. ASHRAE Journal. Vol. 42, No. 10 (October): 21-28. • **4.** Brown, G. Z. and L. Huang. 2006. Natural Ventilation in Northwest Buildings. ASHRAE Journal. Vol. 48, No. 1 (January): 47-52. • **5.** Allard, F. 1998. Natural Ventilation in Buildings: A Design Handbook. James & James Ltd.: London, UK. • **6.** Awbi, H. 2003. Ventilation of Buildings, Second Edition. Spon Press: London, UK. • **7.** Walker, C. 2005. Methodology for the Evaluation of Natural Ventilation in Buildings Using a Reduced-Scale Air Model. Massachusetts Institute of Technology Doctoral Dissertation.

TABB® Conference 2006

SAN JOSE, CALIFORNIA • MAY 18-20,2006

The Testing, Adjusting and Balancing Bureau (TABB) has plans underway for the next TABB Conference, scheduled for May 2006. TABB is working with Bruce Word, SMWIA Local 104's business manager, to make this event better than ever. We've got plans in place, and a variety of guests speakers have been locked in. Each year we strive to make the Conference bigger and better than before. With this conference being our fifth, we promise something for everyone.

We will have more opportunities for you to earn CEUs and certifications while attending this conference. As you probably know, "certified" is one of the main reasons a customer will choose one company over another. We want to give you every opportunity to increase your marketability. Our tradeshow, tour and reception will showcase SMWIA Local 104's training facility. This impressive state-of-the-art facility has been recognized with the granting of access to an Associates of Arts degree upon completion of a Sheet Metal Workers' Local 104 apprenticeship. The host city offers museums, historic sites, golf, shopping and parks. We are holding our fees steady for 2006. Register more than one person from the same company and receive a discount!

Who is TABB?

TABB is an organization made up of heating, ventilating and air conditioning (HVAC) industry professionals, including:

Engineers with membership in the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE);

Contractors from the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA); and

Labor representatives and training facilities from the Sheet Metal Workers' International Association (SMWIA).

What is TABB Certification?

The aim of TABB's certification standards is to ensure that TABB Certified Technicians, Supervisors and Contractors are competent, reliable and qualified professionals.

Why TABB Certification?

TABB is the first certification program to synchronize all components of the complex HVAC industry and is recognized as a first-rate testing, adjusting, and balancing program that assures building owners and managers their HVAC systems meet the designs specifications, are energy efficient, and aid in providing good indoor air quality.

TABB technicians are trained through their Local JATC training programs with support from the International Training Institute of the SMWIA. TABB contractors are members of SMACNA and are held to the very highest and latest standards available to the HVAC industry. These two organizations bring unmatched resources to guarantee quality work.

One requirement of maintaining TABB certification is continuing compliance with the TABB Code of Conduct. The Code of Conduct includes the general standard which certification represents.

History of the TABB Conference

The International Certification Board (ICB) was developed to oversee the Testing, Adjusting and Balancing Bureau (TABB) in 2000. In July, 2001 a media event held in Philadelphia rolled out this new TAB program designed to certify both contractors and supervisors. It was also determined that TABB would also recognize the training and certification of other entities such as the International Training Institute (ITI), SMARTA and TABIC, who subscribed to a strict set of standards approved by TABB. This was a major event in the sheet metal industry - and the certification field. During TABB's first years, it grew. And as it did, new ideas came to the fore-

front. One such idea was the TABB Conference: an event for those certified professionals to meet and exchange ideas once a year.

2002

TABB decided to hold its first Conference. Held in Las Vegas at the Rio, the event was well received and attended. In fact, the local press was there to capture portions of the Conference.

2003

The Second Annual Conference was held in conjunction with the SMACNA convention in Washington DC. This event featured some fine guest speakers and included our first tradeshow. Held during the reception at the hotel on Friday night, the exhibitors were scattered throughout the perimeter of the room, allowing access for guests to talk to the representatives of equipment being used by the professionals on a daily basis. New ideas were exchanged and we proudly offered up our first Hall of Fame Award, to Mr. John Christie at our Saturday luncheon. Charlie Frazier received a service award for his help with the ICB as he retired.

2004

TABB's Third Annual Conference found us back in Las Vegas. With the Second and Third Annual Conferences only seven months apart, our goal was to have this event during the Sheet Metal Industry Week, which was a phenomenal success. We proudly award our own Jack Webster with the Hall of Fame Award to acknowledge his accomplishments and devotion to the industry during the year before his retirement. Mike Mamayek was given our now traditional, gold putter, as he retired from the ICB. Our tradeshow tradition continued on Friday along with a new concept - a 'pre-conference' workshop was offered on customer relations.

2005

The Chicago Conference in 2005 proved to be a more effective learning experience than those of the past. At this Conference, our "pre-conference" workshops included a workshop on Sound and Vibration followed up with the certification examination, as well as a customer training session. This information is handy not only for business, but can be used in daily life as well. The more you understand people, the better you can relate to them. During our Awards Luncheon, we saluted Tom Wilton as he was inducted into the Hall of Fame and also honored Bill Freese as he retired as a member of the ICB. Our tradeshow and reception was hosted by the gracious team of Chicagoland's SMWIA and SMACNA partners. Tony Adolphs and Stan Karczynski were kind enough to open the training center up for tours to the attendees.

2006

Building on what we have learned in the past, TABB is planning on more 'pre-conference' workshops. We hope to offer more certification programs and tests at this, our Fifth Annual Conference to be held in San Jose, California May 18-20, 2006. The San Jose Training Facility will be the host of the reception and tradeshow this year while the actual event will be held at the Fairmont San Jose. TABB will be awarding its first ever "TABB Contractor of the Year" during Saturday's Awards Luncheon. Keep looking as the agenda will be posted soon! ■

Conference Schedule

Thursday, May 18:

- Building Commissioning Workshop

Friday, May 19:

- Workshops
- Tradeshow
- Reception
- Tour of San Jose Training Facility and TABB Lab
- TABB Commissioning Certification Exam

Saturday, May 20:

- Conference Opening
- Affiliates Roundtable
- Awards Luncheon
- Natural Ventilation
- TAB/Commissioning
- Open Forum

Silicon Valley

With the meteoric growth of the computer industry, Silicon Valley has become one of the world's busiest hubs, and the capital of this high-tech Mecca is San Jose. The Fairmont San Jose combines technological innovation with timeless elegance. Meeting and conference rooms are equipped to handle functions from exquisite receptions to multimedia presentations. A short drive will take you to 30 wineries and the famous Monterey Peninsula golf courses. In the heart of northern California's largest city, The Fairmont San Jose blends historic grandeur with all the high-tech excitement of Silicon Valley.

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We hope you can join us at the TABB Conference and look forward to seeing you in May!