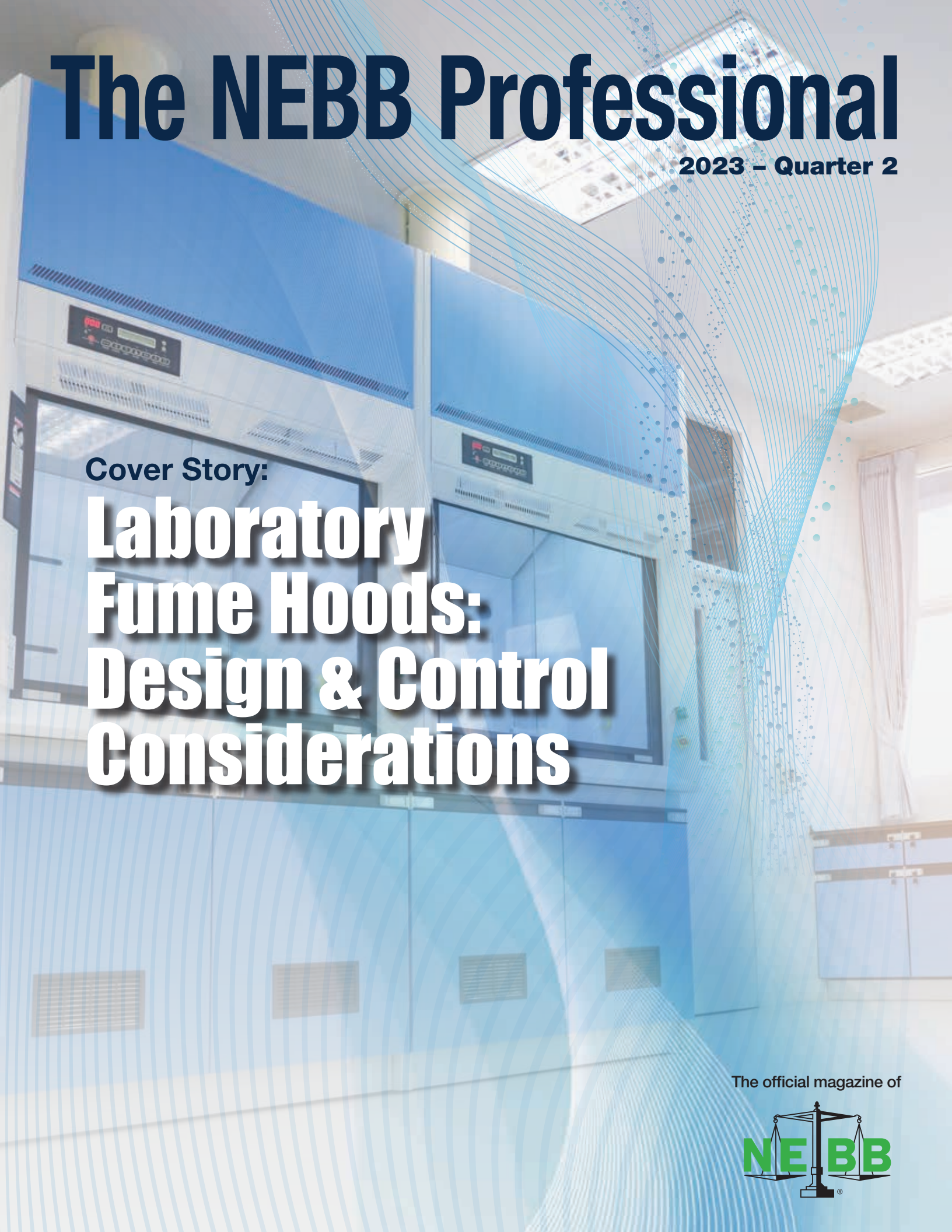
The NEBB Professional

2023 – Quarter 2



Cover Story:

Laboratory Fume Hoods: Design & Control Considerations

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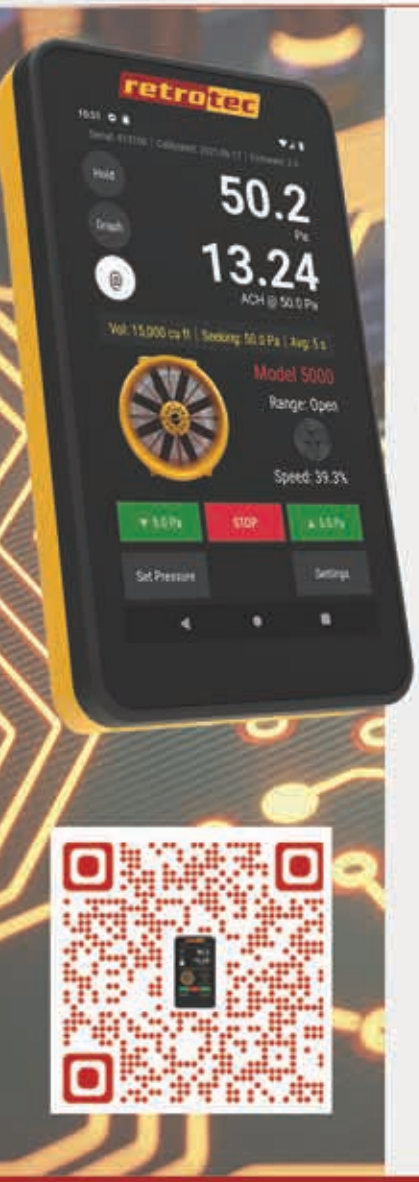

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Contents

Quarter 2 – 2023

Features

The NEBB Professional is a quarterly magazine published by NEBB. 8575 Grovemont Circle, Gaithersburg, MD 20877 Tel: 301.977.3698 Email: communications@nebb.org

President's Message

2023 is now underway and I'm excited for the events that have been taking place, as well as those scheduled in the next few months.

In March, I hosted the NEBB mid-year committee meeting in Washington State at the Skamania Lodge which sits over the Columbia River. The event allowed NEBB committees not only to get some face-to-face work done, but a chance for all the committees to meet and collaborate on improving NEBB and moving us further ahead, as well.

During the year, I'll be heading out to several of the chapter recertification meetings and I look forward to seeing everyone and getting a real-time view of the work being done at the chapter level.

The grand opening ceremony of the Robert B. Gawne Training and Education Center at NEBB Headquarters in Gaithersburg, MD will be taking place May 11. The facility is not only an exceptional venue for classroom instruction, but hands-on training for every discipline offered by NEBB. I would also hope the local chapters and select committees utilize the facility for practical exams. All NEBB headquarters staff will be on hand at the event along with the Board of Directors, and I invite you to join us at this event if possible.

As always, on a personal level I'm excited to have the opportunity to teach another Building Enclosure Testing (BET) Seminar later this summer at the Robert B. Gawne Training and Education Center. The new BET lab has been a great addition to the seminar, delivering a full day of hands-on training to the students.

And, of course, I cannot say enough for what is happening within the new NEBB Learning Center (NLC). Content is constantly being added and people are jumping in, utilizing the center for additional knowledge as well as collecting their continuing education credits. The NLC has been a very successful endeavor within NEBB and is continuing to grow.

NEBB has a strong position in our industry, and it is our focus this year to continue and expand that presence. We are strong and we are growing. Our 2023 NEBB Annual Conference which will be held October 26-28 in Monterey, CA will help illustrate that point. The conference theme of *Challenging the Next Generation* carries over from the 2022 theme of *Adapting NEBB for the Next Generation*. I want to focus on challenging the next generation to step up and begin taking NEBB to a new level. Between now and the conference that will be my focus, helping the NEBB YPN grow.

Phil Emory
NEBB President

Mensaje del presidente

El año 2023 ya va bien entrado y estoy emocionado por los eventos que se están llevando a cabo, así como los que están programados en los próximos meses.

En marzo, fui anfitrión de la reunión de comités de NEBB de medio año en el estado de Washington en el ¨Skamania Lodge¨, el cual se sitúa sobre el Río Columbia. El evento permitió a los comités de NEBB no solo trabajar cara a cara sino también una oportunidad para reunirse y colaborar en la mejora de NEBB impulsándonos aún más hacia adelante.

Durante el año, estaré presente en muchas de las reuniones de recertificación de los Capítulos y espero poder verlos a todos y obtener una vista en tiempo real del trabajo que está siendo realizado a nivel de cada uno de los Capítulos.

La gran ceremonia de apertura del Centro de Entrenamiento y Educación Robert B. Gawne en las oficinas centrales de NEBB en Gaithersburg, MD tendrá lugar el 11 de mayo. El sitio no es solo un recinto excepcional para brindar clases de entrenamiento, sino también un centro de capacitación práctica ¨*hands-on*¨ en cada una de las disciplinas ofrecidas por NEBB. Espero que los capítulos locales y los comités relevantes también hagan uso de este recinto para realizar exámenes prácticos. Todo el personal de las oficinas centrales de NEBB estará presente durante el evento al igual que la Junta Directiva, y lo invito a que se nos una en dicho evento de ser posible.

Como siempre, a nivel personal estoy emocionado de tener la oportunidad de ofrecer otro seminario de entrenamiento de ¨Building Enclosure Testing (BET)¨ al final del verano en el Centro de Entrenamiento y Educación Robert B. Gawne. El nuevo laboratorio BET ha sido una gran adición al seminario, permitiendo dar un día completo de entrenamiento práctico ¨*hands-on*¨ a todos los estudiantes.

Y por supuesto, no puedo expresar lo suficiente por lo que está sucediendo dentro del ¨NEBB Learning Center (NLC)¨. Se está agregando contenido de manera constante y las personas están ingresando al NLC, utilizando el centro para obtener conocimiento adicional, así como cumplir con sus créditos de educación continua. El NLC ha sido una iniciativa muy exitosa dentro de NEBB y continúa creciendo.

NEBB posee una posición de fortaleza en nuestra industria, y nuestro enfoque este año es continuar y expandir esa presencia. Somos fuertes y estamos creciendo. Nuestra Conferencia Anual 2023, la cual se llevará a cabo en octubre 26-28 en Monterrey, CA, nos va a ayudar a ilustrar este aspecto. El lema de la conferencia de *Retando a la Próxima Generación* es una continuación del lema del 2022 de *Adaptando a NEBB para la Próxima Generación*. Quiero enfocarme en retar a la próxima generación para que dé un paso al frente e inicie la transición de NEBB a un nuevo nivel. Entre el momento actual y la conferencia ese va a ser mi enfoque: ayudar al grupo de NEBB YPN a crecer.

Phil Emory
Presidente de NEBB

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Letter from the Editor

We're just about halfway into the year, meaning we are midway between last year's annual conference and the one approaching in October. Reflecting on NEBB President Phil Emory's selected theme for the upcoming conference this year, *Challenging the Next Generation*, a quote by actor Morgan Freeman comes to mind:

"Challenge yourself; it's the only path which leads to growth."

Whether we realize it or not, we all share an innate desire to grow. Although stagnancy often provides some illusion of comfort, it's pretty boring, wouldn't you say? We need to learn, to move, to overcome obstacles to truly live and uncover our talents and ourselves.

In that context, I'd venture to say anyone ready to take their involvement and learning with NEBB to the next level will find this issue to be a helpful guide. There are a variety of resources in this issue that I'm excited to share with the greater NEBB community.

Our cover story on laboratory fume hoods covers important design and control considerations for NEBB professionals on page 8. Both Chuck Kaupp's article on pneumatic VAVs on page 13, as well as our War Stories column on page 30, impart lessons from decades of experience in the field. Jonathen Lloyd shares his journey and suggestions for getting involved with NEBB on page 16. You will find a slew of options for obtaining continuing education credits and expanding your knowledge of NEBB disciplines in our article about the NEBB Learning Center on page 18. NEBB Technical Director Jeff Schools offers insight into how you can take advantage of the Robert B. Gawne Training and Education Center on page 27. And our overview of the 2023 NEBB Annual Conference location, Monterey, on page 21 may even inspire you to take flight to learn and mingle amongst industry peers in October.

Kerri Souilliard, Editor

CONTRIBUTORS

Chuck Kaupp, TAB CP, founded Southern Independent Testing Agency, Inc. in 1980. As a Certified NEBB Test and Balance Professional and Sr. Vice President, he is responsible for sales, marketing, management, and certification of projects of all types including large educational complexes, industrial buildings, hospitals, nursing homes and commercial facilities. Mr. Kaupp's vision, leadership and knowledge of the HVAC world has led Southern Independent Testing Agency, Inc. to being ranked as one of the leaders in properly delivered and maintained building environments.

Luke Bumgardner, BSC CP, TAB CP, is a Commissioning Engineer at Newcomb & Boyd specializing in MEP systems with a focus on fume hood and bio-safety cabinet certification testing. His professional passions are mission critical applications such as healthcare, laboratories, and compounding pharmacies. Luke enjoys anything outdoors, namely playing baseball, hiking, and climbing.

Jonathen Lloyd is a NEBB Certified Professional (TAB) serving as a voting member of the NEBB Young Professionals Network, NEBB TAB Committee and NEBB 2023 Board of Directors.

Samantha Hawa is the Online Learning Coordinator for NEBB and one of her primary roles is to manage NLC, the online learning platform. She has over 20 years of experience in managing various online training and education programs. Samantha resides in Northern Virginia.

Jeff Schools is the Past President of NEBB and currently works with the NEBB Headquarters team, NEBB committee chairs, and Chapter affairs members as NEBB Technical Director.

William Bailey has been a member of NEBB since 1997 and a member of ASHRAE since 2003. Hobbies are fishing for Largemouth and Smallmouth Bass on the Tennessee River/ Kentucky Lake. Loves teaching classes related to HVAC for Associated Builders and Contractors and Service Group at NMC.

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Laboratory Fume Hoods: Design & Control Considerations

By Luke Bumgardner

Overview

Fume hoods are commonplace in almost every laboratory and play an important role protecting the hood user by containing potentially harmful chemicals and associated vapors or odors. In research, medical, and education labs, fume hoods are typically used to handle and store chemicals. It is important to understand fume hoods are designed to protect the user, but not necessarily the products being used in the hood – thus the primary goal of a fume hood is containment. This differs from other lab equipment, such as bio-safety cabinets or isolation gloveboxes, which are designed to protect both the user and the product inside of the cabinet.

In the engineering world, fume hoods are typically referred to as a Primary Engineering Control, or PEC. They are the first line of protection to ensure laboratory air remains free of potential chemical toxins or contaminants. Because of the health risks associated with many chemicals, it is evident proper installation, maintenance, and control of fume hoods are imperative. Equally important to PECs, are Secondary Engineering Controls, or SECs. SEC refers to the environment the PEC, or hood, is located in. Typically, other HVAC equipment serving the room, but not directly associated with the fume hood, is considered part of the Secondary Engineering Control. The SEC can have a major impact on fume hood performance and user safety, therefore proper design, set-up, and commissioning of the SEC equipment is critical.

The risks associated with the improper installation and set-up of a fume hood can be high and jeopardize the health and safety of its users. It is best practice to have fume hoods tested and certified as they are manufactured, installed, and thereafter on an annual basis. These performance tests are typically referred to as 'as manufactured', 'as installed', and 'as used." Due to the critical nature of fume hoods and the associated SECs, owners and lab safety officers should always consult a

certified professional to perform NEBB or ASHRAE 110 Fume Hood Performance Testing.

Fume Hood Configurations & Control Schemes

There are a variety of ways to design and implement fume hood control systems. Control system selection heavily depends on the type of fume hood desired by the user, the processes being performed in the fume hood, and the overall requirements of the SECs. Safety is the most important consideration when selecting a fume hood control scheme. Secondary to user safety, other aspects such as environmental safety, comfort control, energy efficiency, maintainability, and cost should be considered. The following sections outline various fume hood control schemes and provide a broad overview of the benefits and drawbacks of each set-up. The outline is by no means comprehensive, but is intended to introduce popular industry practices for fume hood control and act as a springboard for further discussion.

Single Constant Volume Bypass Fume Hood with Dedicated Exhaust Fan

Perhaps the least complicated and most cost-effective set-up involves a single constant volume airflow (CV) bypass fume hood ducted to a dedicated CV roof-mounted exhaust fan. This fume hood configuration is commonly used in labs with a small number of hoods where control of the lab environment is not critical, and the hood can be turned off when not in use. The exhaust fan should be selected by a licensed engineer, and set-up by a TAB contractor, to deliver the airflow specified by the fume hood users based on the chemical processes performed in the hood. Typically, fans are belt driven and run at a constant speed without the need for a variable frequency drive (VFD). Commonly, the fume hood face is equipped with a switch to turn the hood off when not in use to conserve energy. As with most CV bypass fume hoods, as the sash is lowered below the sash operating height (typically 18" above the worksurface) air is bypassed into the fume hood at the top of the hood to maintain constant airflow. *ANSI/ASSP Z9.5-2022: Laboratory Ventilation* standard requires fume hoods to be equipped with a flow indicator, or airflow sensor, that alerts the user when fume hood airflow is reduced below a low limit threshold. These sensors are calibrated and set-up by the TAB contractor or fume hood certifier.

The most obvious benefits of this configuration are the low first cost, lifecycle cost, and simplicity of set-up. Once the fume hood is tested and certified, the hood operates with limited need for a control system or ancillary equipment. As with any belt-driven exhaust fan, proper periodic maintenance of the belts, bearings, motor, etc. are imperative to ensure proper operation of the fume hood.

Multiple Bypass Fume Hoods with Common Exhaust Fan(s)

Slightly more complex than a single bypass fume hood set-up, this configuration typically involves a dedicated roof-mounted exhaust fan, or set of fans, serving

multiple bypass fume hoods equipped with manual balancing dampers. The manual balancing dampers are used to balance exhaust airflow to each hood as specified by the design documents or manufacturer specifications. This fume hood configuration is most commonly used in labs with a small number of hoods where hoods remain on (no switch to turn fan off) for chemical storage, overnight processes, or pressurization requirements of the SEC. Overall, set-up and maintenance of fume hoods in this configuration is like that of a single bypass fume hood aside from the additional manual balancing performed during initial TAB. Some installations may be equipped with an adjustable bypass damper on the exhaust plenum used to induce additional airflow at the exhaust stack to maintain at least 3,000 FPM air velocity.

It is important to note if airflow to one hood is changed, typically via a manual balancing damper, it will affect flow to all other hoods and potentially jeopardize containment abilities and user safety. TAB contractors and fume hood certifiers should be aware that raising, lowering, or closing the fume hood sash can slightly affect airflow at that hood by 5-10% of the total airflow. Variations in fume hood airflow exceeding 10% when the sash position changes, may point to an issue with the hood's bypass air intake. The following configuration introduces a solution that eliminates the need for manual balancing dampers and limits variations in airflow as connected fume hood sashes are opened or closed.

Multiple Bypass Fume Hoods Equipped with Airflow Control Valves

Constant volume airflow control valves (AFCVs) are used to maintain constant exhaust airflow to the fume hood no matter the sash position of the hood or changes occurring at other devices connected to the exhaust system. For bypass fume hood applications, manual AFCVs are commonly selected, and come factory set at the airflow specified on the design documents or by the hood user. After installation, valve airflow should be confirmed and manually adjusted if required. It is important to note AFCVs must operate within a pressure drop range to maintain airflow, therefore the drop across the valves should be confirmed during set-up. Most valves can operate within a pressure drop range between 0.3"w.c. to 3"w.c., although some fast-acting valves can operate at a pressure drop up to 6"w.c. AFCVs that are electronically adjustable and equipped with valve position feedback, airflow readout, and low pressure drop/airflow alarms are available. However, the installation and controls cost required for these valves typically outweighs the benefits in bypass fume hood applications. The use of AFCVs is more expensive compared to previously discussed configurations, however these valves greatly improve controllability of the fume hoods. Because of this, AFCVs are common

in labs with a large number of fume hoods where hood sash positions, or other devices connected to the exhaust system, may vary consistently throughout the day. AFCVs are typically installed in research or medical labs where fume hood processes involve hazardous chemicals or are mission critical.

In this configuration, hoods are served by a dedicated roof-mounted exhaust fan typically equipped with a motorized bypass damper. For critical applications, it is best practice to specify multiple fans connected to a common exhaust plenum with each fan sized to handle the full exhaust flow of the hoods in the case that one fan fails. Fan(s) typically run at a fixed fan speed as the bypass damper(s) modulate to maintain a static pressure set point within the exhaust duct. Maintaining this set-point, determined by the TAB contractor, ensures the pressure drops across each AFCV remain within the recommended range.

Multiple Variable Volume Fume Hoods Equipped with Airflow Control Valves

As the name implies, variable air volume (or VAV) fume hoods are equipped with controls that vary the amount of airflow to the hood, typically as the sash position is changed. VAV fume hoods are common in labs, or lab buildings, that host a relatively large number of hoods and are best served by a dedicated set of roof-mounted, VFD-equipped, laboratory fans. The benefits of VAV fume hoods are realized in the energy saving potential. Ideally, when hoods are not in use the sash is lowered and exhaust airflow through the hood is reduced by the control system. This reduction in airflow allows the fan(s) serving the hoods to reduce operating speed, amp draw, and thus energy. The first cost and complexity of a VAV fume hood control configuration is much greater than that of the previously discussed configurations; however, the energy savings over time can be quite large relative to the first cost.

At the Primary Engineering Control (PEC) level, VAV fume hoods are typically served by AFCVs that modulate in response to changes in sash position or changes in hood face velocity. Sash position is sensed by sash position sensors mounted on, or integral, to the sash or sash track. Generally, a hotwire anemometer installed on the inner side wall of the hood is used to indirectly monitor face velocity. The operation and accuracy of both the sash position sensor(s) and hotwire should be confirmed during the certification process. High-end AFCVs are fast-acting, in the order of seconds, and are commonly equipped with feedback that outputs the estimated airflow (in CFM) exhausted through the valve. Additionally, these valves are typically provided with a differential pressure switch that is factory set to break and relay an alarm to the building management system (BMS) when the valve lacks sufficient duct static pressure to control airflow accurately and effectively. Most AFCV manufacturers now provide models that control accurately with only 0.3"w.c. of pressure drop across the valve – a small amount of pressure loss relative to the drop of the entire exhaust system. According to *ANSI/ASSP Z9.5-2022: Laboratory Ventilation*, Section 4.3.2., an in-depth risk assessment should be performed by the laboratory safety officer, in conjunction with the design engineer or fume hood certifier, to determine the appropriate minimum airflow for each VAV fume hood. The assessment team shall consider the overall containment and removal abilities of the hood at reduced flows, the chemicals used in the hood, and the potential for explosion in the hood, among other factors.

The Secondary Engineering Control (SEC) approach can vary drastically from lab to lab when specifying a configuration with multiple VAV fume hoods. Lab heat load, air exchange rate, pressure, and safety requirements should drive the SEC decision making process to determine the appropriate control scheme and necessary level of control. Although there are several SEC options, two common approaches are room pressure control and room airflow offset control. Depending on the application, size of the lab, number of hoods, etc., these two control approaches can be quite intricate. In the interest of brevity, an outline of these SEC schemes is provided below.

Room pressure control, as the name implies, utilizes digital room pressure monitors (PM) to monitor lab pressure. PMs are integrated into the BMS, and the control system responds to maintain the required room pressure setpoint(s). Commonly, the room is ei-

ther served by a supply air AFCV or general exhaust AFCV that modulates to maintain the pressure setpoint.

Room airflow offset control relies on the AFCVs and control system serving the lab to tabulate the total airflow into and out of a room. The control system then modulates either the supply or general exhaust valve(s) accordingly to maintain an airflow offset that satisfies the room pressure requirement.

Conclusion

The goal of a fume hood is simple, to protect the user from harm; but achieving the proper level of protection can be a challenge. There are several fume hood control configurations and seemingly even more Secondary Engineering Control possibilities for chemical lab spaces. A well-thought-out fume hood design will not only consider the type of fume hood desired by the user and the processes being performed in the fume hood, but also the overall requirements of the SEC. It cannot be overstated that safety is the most important consideration when determining the appropriate fume hood and lab control scheme. Secondary to user safety, environmental safety, comfort control, energy efficiency, maintainability, and cost should be considered. The various control approaches outlined above provide basic information for owners, hood users, designers, contractors, fume hood certifiers, and facility personnel to consider when selecting, setting up, and maintaining a laboratory control system.

The Experienced Approach to Pneumatic VAV (Terminal) Boxes

By Chuck Kaupp

Although direct digital controls (DDC) has been the preferred technology for some time, there are many older offices and other facilities that have yet to completely shift over from pneumatic VAV terminals. More and more younger testing, adjusting, and balancing (TAB) technicians are encountering these older projects with pneumatic VAVs–and odds are they may have never worked on them in their short careers.

While this article could be a shot from the past for older technicians, the intention is to share decades of experience with pneumatic VAV terminals for the benefit of our younger, up and coming technicians to help them troubleshoot faster and better help their customers. Combining my own 6 years of HVAC design and 53 years of test and balance experience (actual field testing 30 years) with that of article peer reviewers Brian Kaupp, Eric Jenison, John Kneiss and Curtis Smart, this article can be considered a quick reference guide stemming from over 150 years total experience.

Upon receiving that initial airflow or comfort complaint call, TAB technicians must get to work diagnosing the issue. When an area is too hot or too cold, it could be due to faulty control of the VAV box itself or the thermostat not being calibrated properly.

To start with, there are some important things to know related to pneumatic controlled systems in general. First, the technician should inspect the pneumatic compressor to ensure that it has been properly checked, tested, and started by the controls contractor. Most pneumatic control systems operate and control from 13 PSI to 20 PSI. And all pneumatic control systems should have a dryer installed to keep moisture out of the control lines. Because they are not as accurate as the digital control system to date, pneumatic VAVs require routine recalibration on an annual or biannual basis.

To determine whether the issue lies with the VAV terminal itself or the thermostat controls, there are a series of steps any experienced TAB technician will follow, taking into account the following information:

Pneumatic VAV boxes

a. Check and ensure that the pneumatic system thermostats, system static pressure controller, VAV boxes and all other controls are complete and have been initially checked, tested, and started by the Controls Contractor.

b. Check to ensure that pneumatic control system pressure is operating to produce 13 PSI to 20 PSI throughout the system.
c. Thermostat must be calibrated to control from roughly 8 PSI to 12 PSI.
d. Mechanical VAV boxes would require adjusting by a locking collar on the shaft, on the pneumatic operator (normally minimum) and adjusting of the arm on the shaft of the VAV box (normally maximum).
e. Adjustable pneumatic control boxes were installed on later VAV boxes, as the technology advanced, allowing adjustment of the min/max by a dial with a small flat edge screwdriver (see figure 25.8).

Pneumatic thermostat controls

a. Box controls can vary depending on the age of the system (see figure 25.4, 25.6 and 25.7).

Figure 25.4 Image of a direct-acting thermostat

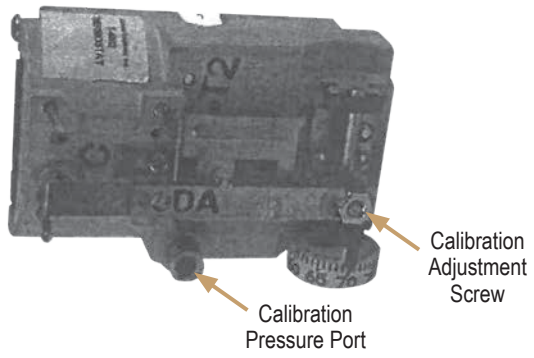
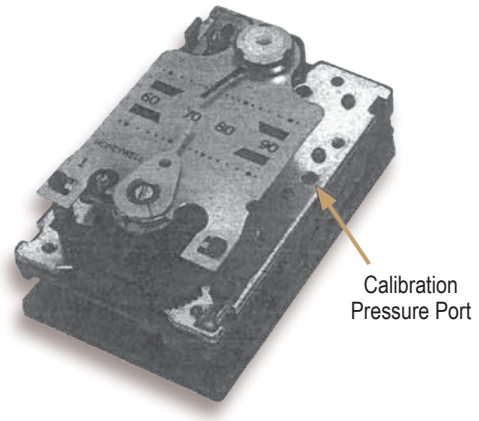


Figure 25.7 Image of a pneumatic thermostat



b. Thermostat (Direct/Reverse Acting) – The calibration will vary from 3 PSI to 15 PSI, depending on the throttling range (reference attached pictures). Calibration of the thermostat is required to allow proper testing and adjusting of a pneumatic controlled VAV box.

Typically, customers with facilities full of pneumatic VAV boxes are already aware of the pitfalls of these systems. Since the big shift in the 1990s, we started to see more DDC terminals both due to lower costs and higher accuracy standards. In most cases, customers left with pneumatic VAVs, such as many schools and hospital buildings, just do not have the funds or downtime to be able to execute a full remodel to change out the existing terminals. Upholding a higher standard and offering a more holistic solution than a singularly focused controls contractor, for example, a NEBB

Figure 25.6 Image of a reverse-activing thermostat

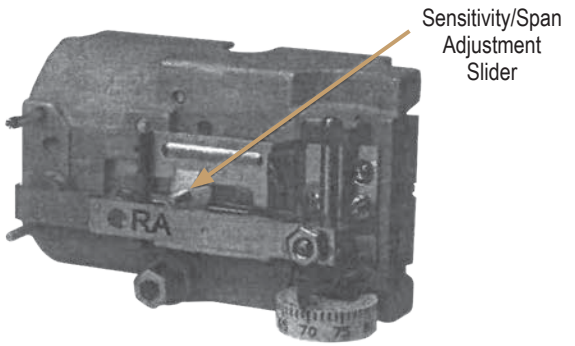
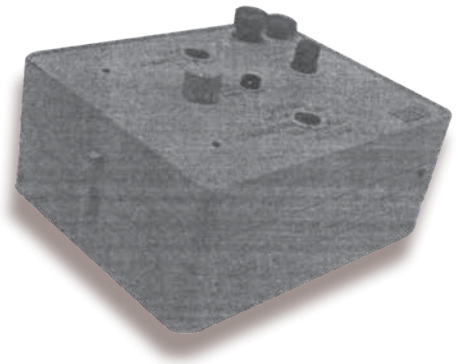


Figure 25.8 Titus pneumatic controller



Certified Firm can help these facilities overcome common pitfalls such as:

Pneumatic VAV boxes with electric or HW reheat coils
When setting the minimum air volume using the thermostat: First set min air flow and next about one degree less, the electric or HW coil is to activate. When the thermostat goes out of calibration, this sequence can go crazy, with reheat on first before min flow or reheat not coming on until a few degrees below set point.

Pneumatic system pressure not meeting a constant psi throughout
This problem could be due to a system dryer problem, allowing moisture into the tubing. Oil in the system due to an old compressor and/or leaks in the pneumatic piping or tubing. As systems get older, all of the above could be the issue.

Comfort issues
Comfort issues will require actually going to the problem area, checking the thermostat for calibration and/or going about the ceiling to the VAV box. With present DDC control systems, most adjustments and/or changes can be handled via site or off-site computer.

Pressure dependencies in older pneumatic VAV boxes
Early pneumatic VAV boxes were pressure dependent, therefore if system pressure changed from the original test and balance period, the box min/max CFM would change. Controlling consent system ductwork static pressure is a major item to always be checked first.

Later pneumatic VAV boxes came with flow sensing devices at the inlet, connected to a volume regulator. This allowed them to be system pressure independent. However, the main static pressure sensor still needs to maintain set pressure, requiring checking calibration, which normally controls fan inlet vanes.

In closing, TAB technicians of today faced with a pneumatic system can view pneumatic VAV boxes as opportunities rather than threats when armed with the right information and experience. Using the tips and tricks above, younger technicians can quickly become experts after working on about twenty pneumatic VAV boxes. Good luck to all who encounter old pneumatic VAV box systems! ●

Q&A

NEBB Across the Generations

Since 1971, NEBB has been serving firms and individuals that deliver high performance buildings and systems. As the premier international certifying association in the building industry today, NEBB thrives as a result of collaboration across various generations that all bring different experiences and perspectives to the table. We sat down with **NEBB Board of Directors' member Jonethen Lloyd** to discuss his personal journey with NEBB.

The NEBB Professional: Seeing that we are focused on the multigenerational aspect of NEBB, what generation do you personally identify with?

Jonathen Lloyd (JL): I'm a millennial.

NP: Briefly explain your journey with NEBB: How did you initially get involved?

JL: I got certified in 2015 to provide the best service and knowledge to my customers. I knew no one from NEBB except my local Chapter President Chris Wright, Technical Committee Chair Paul Chasteauneuf, and our forever cherished Chapter Coordinator Lyn Dyson. In fact, those three were the only people that talked to me for the first few years. So when Lyn asked for volunteers, I always did my best to help.

NP: What made you want to get more involved?

JL: I wanted to serve the organization that gave me purpose! No one ever believed in me before like Lyn did on the day of my exam. I wanted to quit, but Lyn convinced me to at least try. I was and always will be eternally grateful to her for that, which is why I put my hand up for everything she brought forward.

NP: What committees or positions have you been involved with?

JL: I am a founding member of the NEBB Young Professionals Network. I am also a member of the TAB Committee and serve on the NEBB board of directors.

NP: Was it difficult to find the time to volunteer with NEBB?

JL: It is definitely more challenging to find time when working for a business. However, being a steward to industry is something I take very seriously and I give this the highest level of professional importance. There is always time to volunteer, regardless of how busy you are.

NP: How do you feel your involvement with NEBB has been an investment in yourself and your career?

JL: I have been so fortunate to learn from the best in our business! Locally, I was able to learn from Paul Chasteauneuf. There is no one greater than Paul in the metric world. Then, there are my longest serving mentors Jon Sheppard, Don Pittser, and Andy Nolfo. Andy is the smartest man I know! He has shared his knowledge with the TAB Committee and seminar attendees for decades. To learn from guys like this is a once in a lifetime opportunity.

NP: What would you like to see included in the future of NEBB to help adapt the association for generations to come?

JL: A servant heart! How can a non-profit organization serve you best? That is the question we should be asking the industry. We are here to serve you–not the other way around!

Also, transparency. Let's keep it transparent. We are a by the members, for the members type of organization. Everything we do is for the members, so let's empower them with sufficient knowledge to equip them to sustain NEBB globally! I believe we are coming into a season where this will become the heart and soul of this organization.

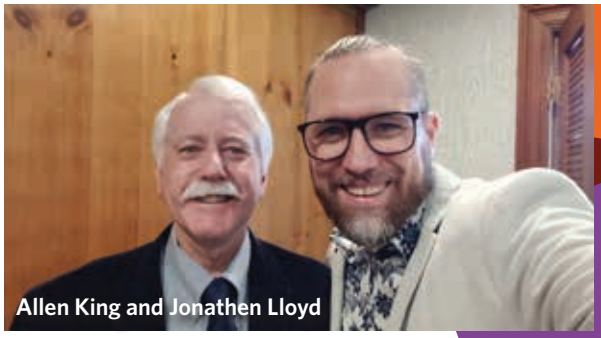
NP: What do you think could help get the next generation involved?

JL: A sense of purpose. People want to know, "Why should I be involved? What's in it for me?" The vision needs to be made clear. When this happens, younger professionals will understand what future they are helping to create. It will give them purpose and knowledge that they are creating a better future for themselves and their peers.

NP: What is the biggest challenge for attracting future generations to this industry?

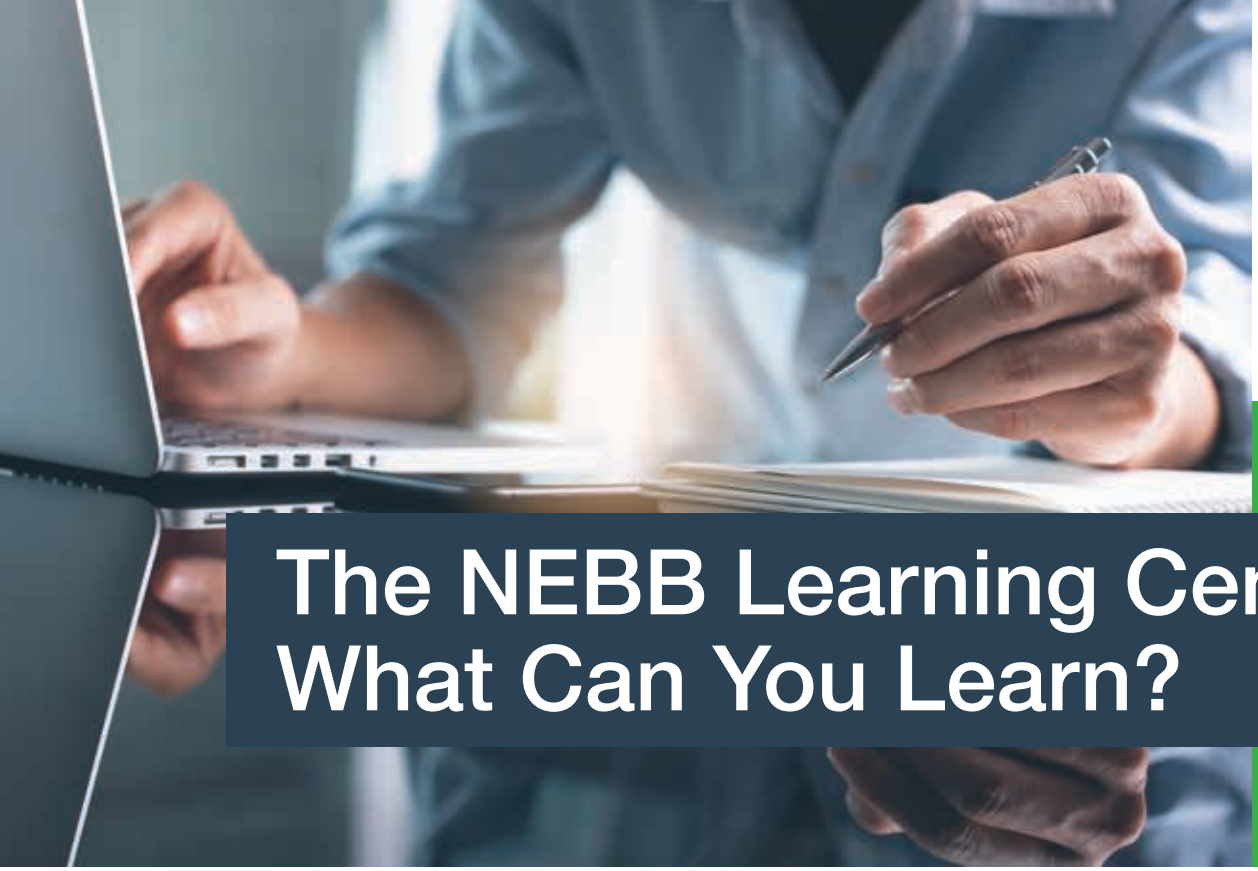
JL: Lack of knowledge of the industry. You can't join something you know nothing about.

If we can educate the industry and government, and even partner with both, they will become our recruiters. Once industry and government know 100% that NEBB is the best, they will HAVE to make sure that there is a steady line of new blood coming up into the organization. ●



Allen King and Jonathen Lloyd

Don Pittser and Jonathen Lloyd



The NEBB Learning Center: What Can You Learn?

By Samantha Hawa

In late 2021, NEBB launched the NEBB Learning Center online. Commonly referred to as the NLC, this online learning and training center includes all types of educational content including videos with presenters, PowerPoint presentations, quizzes, interactive content, and much more. Key features of the NLC include a courses page, a learner checklist, a media library, events, and a community section, as well as an editable profile.

NLC courses can consist of various resources such as PDF files, PowerPoint presentations, videos, and word documents. Each lesson in the NLC is also interactive, meaning users take quizzes or perform knowledge checks after watching a video or presentation.

One of the greatest aspects of the NLC is that learners can earn continuing education credits (CECs) right from the comfort of their home or office! There are currently 18 different courses that provide CECs.

With the NLC, all NEBB courses and content can be found in one location using one platform. The NEBB TAB Certified Professional Error Finding Review and the NEBB TAB Certified Professional Pre-Field Report Preparation Exercise Testing Module were previously on the HVAC.edu platform, but were moved over to the NLC in January. This provides a very user-friendly process for NEBB members to earn CECs, renew certifications, and advance learning in NEBB disciplines.

Content on the NLC includes both free resources, along with presentations that can be purchased for a minimal fee. Below is an overview of current courses on the NLC.

Free Courses on the NLC include:

NEW!! NEBB Fume Hood Procedural Standard for Fume Hood Performance Testing–VAV Response Time: This presentation details the test procedures for performing the VAV Speed of Response and Time to Steady State Testing in accordance with NEBB Procedural Standard for Fume Hood Performance Testing. (.5 CEC)

Designated Certified Professional Individual and Firm Recertification Attestation Tutorial: This tutorial is for the Designated Certified Professionals (DCP) completing their Individual Recertifications and must complete the Firm Recertifications

Certified Professional Recertification Tutorial: This tutorial is for Certified Professionals (CP) who need to complete their Individual Recertifications.

Certified Technician Recertification Tutorial: This tutorial is for Certified Technicians (CT) who need to complete their Individual Recertifications.

YPN Happy Hour (1 CEC): On October 19th, the NEBB Young Professional Network (YPN) organized a virtual happy hour and we are sharing that recording for you to watch. The NEBB YPN Happy Hour introduced the YPN Committee, gave attendees some lessons from the committee along with the sharing of some war stories.

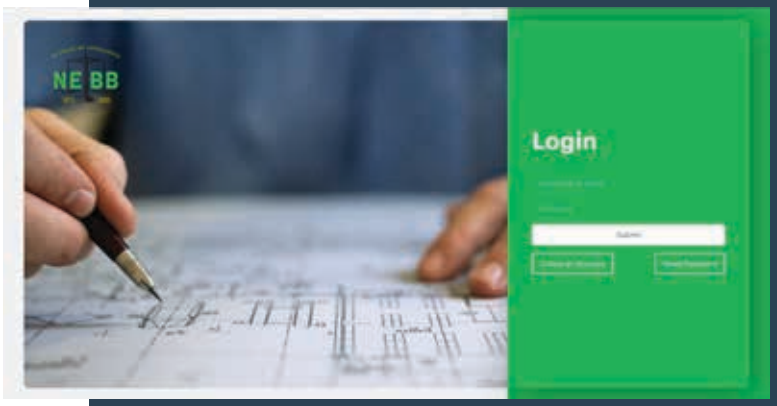
Cx Electrical Systems Technology (.5 CEC): In this presentation, learners will be introduced to the basics of electricity and its application in the construction industry. Electrical definitions and formulas are presented and applied to real-world examples that learners may encounter when working in the field. The presentation concludes by summarizing how electricity is distributed throughout the power grid and supplied to commercial buildings and residences.

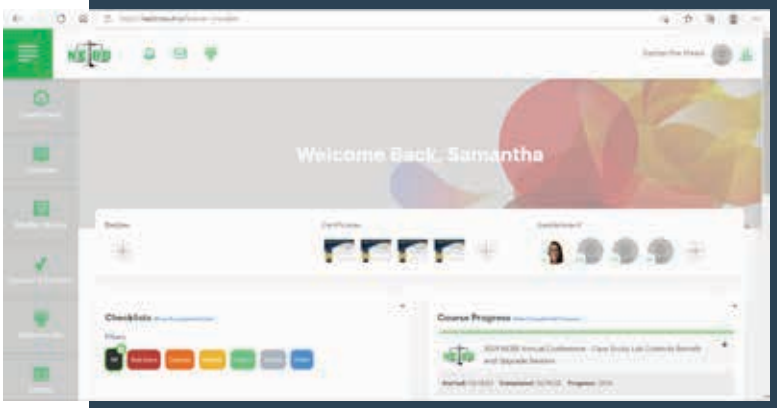
NEBB Standards for Reports and Forms (1 CEC): This presentation is intended for NEBB Certified Professionals and NEBB Certified Technicians and represents the format as well as required information necessary to produce a NEBB compliant report.

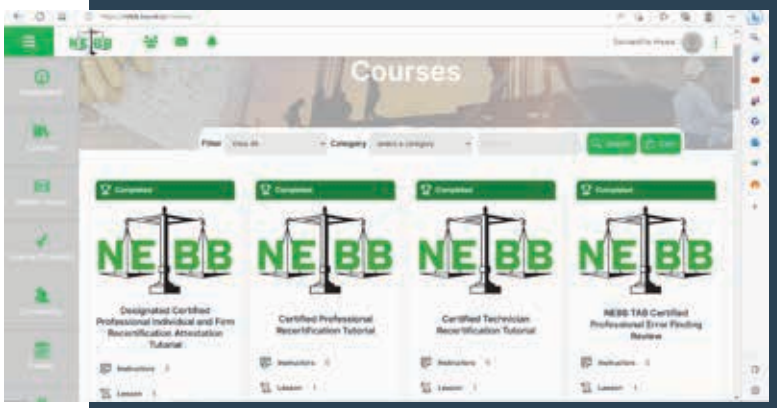
TAB Equations for Calculations and Study: From basic mathematics to TAB Formula Equations, this training covers it all. Every NEBB TAB Formula is covered including rearranging equations with step-by-step instructions. This TAB Mathematics is the first step in your NEBB training.

Courses with a fee on the NLC include:

NEW!! Testing, Adjusting and Balancing (TAB) Technician Seminar (12 CECs): Building owners and tenants are concerned that environmental performance of buildings must be optimal while operating costs should be minimal. These goals can only be accomplished when a building's HVAC and hydronic systems are properly balanced. Three major steps used to achieve the proper operation of the HVAC and hydronic systems and a desirable climate are testing, adjusting, and balancing (TAB). This Seminar is Designed for: Entry-level professionals who are interested in advancing their knowledge in HVAC and TAB work considering







an extensive review to enhance their technical education; Other Professionals interested in learning about TAB; Qualified Candidates for the NEBB TAB Certified Technician.

NEBB TAB Certified Professional Error Finding Review: It is the job of the TAB Certified Professional to control the quality of the TAB work and TAB reports. This course provides comprehensive instruction in the methods and procedures recommended by NEBB to ensure an accurate and error free Testing, Adjusting and Balancing (TAB) Report. NEBB Procedural Standards and the usage of NEBB Certified TAB Report forms and formats are discussed in detail. Successful completion of this course helps to prepare the student for NEBB Certification.

NEBB TAB Certified Professional Pre-Field Report Preparation Exercise Testing Module: This course provides comprehensive instruction concerning the requirements and formats needed to write a NEBB Certified Testing, Adjusting and Balancing (TAB) Report. NEBB Procedural Standards and the usage of NEBB Certified TAB Report forms and formats are discussed in detail. Successful completion of this course helps to prepare the student for NEBB Certification.

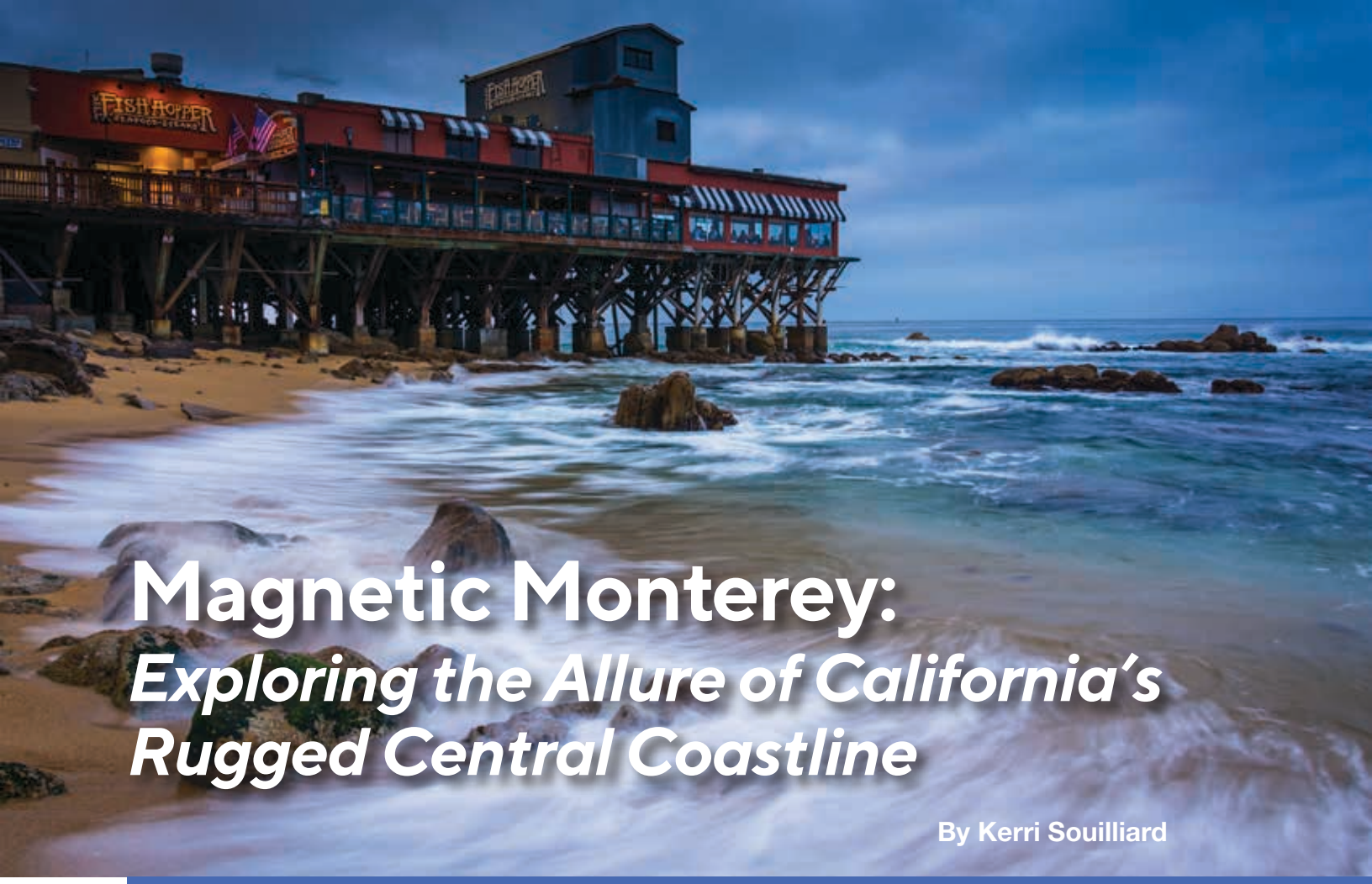
A Walk-Through BET Procedural Standards (1 CEC): This includes 4 modules: (1) Introduction to BET : This module provides a high-level review of building enclosure testing and its importance to the construction industry; (2) BET Equipment & Instrumentation: This module outlines typical instrumentation requirements for performing building enclosure testing.; (3) BET Project Team: This module highlights the key individuals and responsibilities that make up a successful project team for building envelope testing; (4)BET Testing Standards: This module outlies the following building enclosure testing standards: NEBB Procedural Standards for BET, USACE Protocol, ASTM E779, ASTM E1827, ASTM E1186 and ASTM C1060.

2022 Annual Conference Sessions (1 CEC each):

- 2022 NEBB Annual Conference - Flow Hydraulics and Their Effect on Ultrasonic Flow Meters
- 2022 NEBB Annual Conference - Commissioning of Grow Facilities (Part 1)
- 2022 NEBB Annual Conference - Commissioning of Grow Facilities (Part 2)
- 2022 NEBB Annual Conference - TABopts Reporting with NEBB Compliant Forms
- 2022 NEBB Annual Conference - Life Science Enclosures: A Review of Types, Operation, Requirements
- 2022 NEBB Annual Conference - Capture Hood Errors Associated with Commercial Diffusers
- 2022 NEBB Annual Conference - Sound & Vibration in the Building Commissioning Process

We hope you will find the NLC to be a valuable resource for your own needs regarding continuing education, recertification, and advanced learning in NEBB disciplines. Anyone with questions concerning the NEBB Learning Center can direct them to Samantha Hawa, NEBB Online Training Coordinator at samantha@nebb.org.

To access the NLC, please visit: https://nebb.tovuti.io/



Magnetic Monterey:
Exploring the Allure of California's Rugged Central Coastline

By Kerri Souilliard

Nestled on California's central coast, Monterey beckons you to explore its breathtaking beauty. Upon traveling its pristine coastline, this hidden gem attracts passerby with stunning shoreline views that go on for miles below bridges skimming mountain top peaks. The salty breeze coming off sparkling waters kisses your cheeks as the rhythmic calm of waves crashing against the shore seems to say, "slow down, stay awhile."

Making your way closer to the city, the view changes from endless vistas of shimmering blue Pacific to a lush green forest of Monterey cypress and pine trees. A rugged natural beauty, Monterey's panoramic views can quickly lull visitors into a dream-like state. More than just a paradise for nature lovers, Monterey effortlessly balances a rich history and culture. Boasting old-world charm along with posh modern-day amenities, past and present coexist just as harmoniously as land and sea.

From the phenomenal diversity of marine life that inhabits the surrounding waters to the numerous museums that offer a glimpse into the area's heritage, Monterey is home to world-class attractions that capture the heart of every visitor. And precisely where 2023 NEBB President Phil Emory knew this year's annual conference needed to be.

"First on my mind was selecting a venue that was accessible to a small town. I wanted people to walk out the front door and have shops and restaurants galore within a short walk," explains Emory. "I also lean towards smaller cities versus large. I wanted a city that reflected my personality--I like to ski, mountain bike, row on a rowing team, and spend a lot of my time on the water sailing. And then I had one more item that needed to be checked off: I'm a huge fan of microbreweries and there are three within a four-block radius of the hotel. While I'm not a California boy, Monterey became an easy selection. We hadn't been

to Monterey in quite a while, and I figured in October the weather should be cool but sunny, so let's go!"

Past to Present

Monterey's history is a tapestry woven with threads of diverse cultures, spanning centuries of innovation, exploration, and resilience.

In 1770, Spanish explorers founded the city, which became the capital of Alta California under both Spanish and Mexican rule. During this time, Monterey flourished, and many historic "firsts" occurred in the area, including the establishment of California's first theater, brick house, publicly funded school, public building, public library, and printing press. However, in the 1950s, the local fishery business–the region's economic backbone– collapsed due to overfishing. This led to the rise of tourism as the main economic driver in Monterey.

Today, Monterey is a place where people come to enjoy a laid back vibe, sandy beaches, outdoor parks and recreation. Curving coastline and majestic cliffs lead many young artists, musicians, and writers to flock to the area. From the Monterey Pop Festival to the works of John Steinbeck to the counterculture movement, countless creative souls have sought to distill the best of Monterey.

In terms of its current cultural milieu, Monterey thrives as a green, eco-friendly area welcoming everyone from those raising young families to professionals pursuing the tech sector or entertainment business. Both bustling yet quaint, residents and visitors alike can enjoy a host of local eateries, famed parks, natural attractions, and even a celebrity sighting here and there.

Landmarks, Attractions, and Adventure

Known for countless beautiful landmarks, this Californian coastal city makes it difficult to decide

what to explore first. With everything from outdoor appeal to architectural attractions to educational destinations, your trip to Monterey is truly what you make it.

For those seeking time in the great outdoors, activities to add to the agenda include hiking Point Lobos State Natural Reserve or Pfeiffer Big Sur State Park, taking in the sunset at Coast Guard Pier, or enjoying the views and passing through picturesque Pebble Beach along 17-mile drive. Local greens like Monterey Pines Golf Club, Pebble Beach, Bayonet & Black Horse, and Pacific Grove Golf Links are sure to please putting pros, while kayaking and stand-up paddleboarding offer an opportunity to explore the calm, glassy waters of Monterey Bay. Check out Monterey Bay Kayaks for rentals, classes, and guided tours right at the harbor.

Visitors can also explore the heritage of the California mission era at three historical missions or walk the Path of History to learn about the Mexican era and early literary history. Check out San Carlos Cathedral for its Mission-style architecture. Hail the history of the Point Pinos Lighthouse that has been in operation since 1855 on the northern tip of Pacific Grove. Or take in the Monterey Peninsula Recreational Trail, following the former Southern Pacific Railroad line, stretching from Pacific Grove at Lovers Point Park past Cannery Row.

Cannery Row and Fisherman's Wharf are two frequently toured mainstays of Monterey that led to its nickname as the "Sardine Capital of the World" during World War II. Stop by the Cannery Row Monument honoring the labor force of the past before strolling over to the world-renowned Monterey Bay Aquarium featuring a wide variety of marine life. From playful sea otters to majestic sharks, the aquarium experience lets visitors learn about the diverse ecosystems of the Pacific Ocean and participate in interactive exhibits. Meanwhile, Old Fisherman's Wharf continues the marine theme with tours by Monterey Whale Watch as well as the popular jetty location full of local sea lions. A short distance from the Wharf, the famed Monterey Museum of Art offers artistic interpretations of aquatic views as well as various rotating exhibitions, too.

Monterey Eats Cheat Sheet

- **Breakfast Bites:** Loulou's Griddle in the Middle, Wave Street Cafe, Old Monterey Cafe, Paris Bakery Cafe, First Awakenings
- **Lunch Bunch:** Rosine's Restaurant, Stokes Adobe Restaurant, Hula's Island Grill, Gianni's Pizza, Compagno's Market & Deli
- **Satisfying Seafood:** The Fish Hopper, Passionfish, Wild Fish Restaurant, Monterey's Fish House, Old Fisherman's Grotto, Sapporo Sushi & Steakhouse, Chart House, The Sardine Factory, Osteria Al Mare
- **Modern Mexican:** El Cantaro (vegan), Lalla Grill, Peppers Mexicali Cafe
- **Bar Scene:** Alvarado Street Brewery, Peter B's Brewpub, Turn 12 Bar & Grill, Pearl Hour

Food for Thought

Monterey boasts unparalleled restaurants offering diverse cuisines and dining experiences. Enjoy a memorable meal, sample local wines, take home the newest local artichokes and produce, and top it off with ice cream or drinks near designated local fire pits. Cannery Row and Fisherman's Wharf have a particular array of selections and many of the small eateries offer specialty catches.

Compagno's Market & Deli and Loulou's Griddle in the Middle are excellent options for casual lunches or snacks. Compagno's Market & Deli serves delicious

sandwiches, while Loulou's Griddle in the Middle serves breakfast dishes throughout the day.

Stokes Adobe Restaurant is an elegant, refined dining option for a nice dinner. The menu here features charcuterie and other classic dishes, with regular updates to keep things fresh.

Seafood highlights Monterey's culinary scene, and several restaurants specialize in fresh seafood dishes. Old Fisherman's Grotto is a well-known seafood spot, serving various items like crabmeat cocktails, grilled artichokes, and charbroiled tenderloin. Rosine's Restaurant, located near Old Fisherman's Wharf, is famous for breakfast all day, sandwiches, burgers, salads, and soups.

For fine dining, Jacks Monterey is a great choice. The restaurant's seasonal menu uses locally sourced ingredients to create unique dishes like roasted bone marrow and pan-seared duck breast. Italian cuisine focusing on seafood is the specialty at Domenico's on the Wharf, where diners can enjoy pasta dishes like linguine alle vongole and hearty entrees like cioppino.

For those looking for a dining experience with a view, Turn 12 Bar & Grill offers American cuisine and craft beers on tap. From casual lunch or a fine dining experience, Monterey has plenty of options to satisfy your culinary cravings.

Thirst-quenching Microbreweries

After taking in as much coastal scenery, rich history, and vibrant culture as you can handle, take a load off and enjoy a cold one. Home to several fantastic microbreweries, Monterey's local brews showcase a range of unique and flavorful combinations showcasing the diverse flavors of the region.

First on the list is Alvarado Street Brewery & Grill, located in the heart of downtown Monterey. This popular microbrewery features a wide selection of beers, from light and crisp pilsners to rich and complex stouts. They also offer a tasty selection of pub fare, including juicy burgers and hearty sandwiches, to pair with their delicious brews.

Another standout brewery in the area is Peter B's Brewpub, located in nearby Carmel-by-the-Sea. This cozy spot offers a rotating selection of craft beers brewed onsite in their state-of-the-art brewing facility. Peter B's also features a tasty menu of gastropub-style dishes, including wood-fired pizzas, savory appetizers, and fresh salads.

For those looking for a more laid-back vibe, The Cannery Row Brewing Company is a must. This waterfront brewery boasts dazzling views of Monterey Bay and features a relaxed, beachy atmosphere. Their brews range from light and refreshing pale ales to hoppy and robust IPAs that can be paired with a mouthwatering selection of appetizers and entrees.

Seaside Shopping and Souvenirs

As industries evolved, residents in Monterey began to replace the former canning, factory sites with other business venues to keep the town economy robust. Today, many shops, restaurants, and unique hobbyist or antique stores occupy Fisherman's Wharf or the Cannery Row area, which keeps this part of town distinct and perfect for collectors.

Located in the heart of the historic district of Cannery Row, the Cannery Row Antique Mall features over 100 dealers throughout 22,000 square feet of space. Known for its extensive collection of antiques and collectibles, visitors can find a variety of treasures within its two stories. A few minutes away on Lighthouse Avenue, Lilify offers carefully chosen homeware, a luxurious larder selection, and handmade bath products.

Converted into an indoor mall, Monterey Canning Company's red, resplendent space will pique shoppers' attention both for its history and current pieces. Near the aquarium, the American Tin Cannery Outlet is another indoor mall.

5 Things to Do in Monterey

1. **Visit the Monterey Bay Aquarium:** The Monterey Bay Aquarium is one of the top aquariums in the world with exhibits that showcase the rich diversity of marine life in the Pacific Ocean. Highlights include a kelp forest exhibit, a sea otter exhibit, and a touch pool where visitors can interact with starfish and sea anemones.
2. **Go Whale Watching:** Monterey is one of the best places in the world to see whales with humpback, blue, and gray whales frequently spotted off the coast. Whale watching tours depart from Fisherman's Wharf, and offer an unforgettable experience.
3. **Explore Cannery Row:** Cannery Row is a historic district that was once home to a bustling sardine canning industry. Today, it's a popular tourist destination with shops, restaurants, and galleries lining the streets. Be sure to visit the Cannery Row Antique Mall to discover its various vintage treasures.
4. **Walk or Bike Along the Monterey Bay Coastal Trail:** The Monterey Bay Coastal Trail is a scenic 18-mile trail that runs from Pacific Grove to Castroville. It offers splendid views of the coastline and is a great way to get some exercise and soak up the serenity of the area.
5. **Hike Point Lobos State Reserve:** Point Lobos State Reserve is a nature reserve that offers some of the most beautiful coastal scenery in California. It's a great place to get some steps in, marvel at the views and spot wildlife like sea lions, harbor seals, and sea otters.

In downtown Monterey, independent stores line Alvarado Street. The Farmers Market at Old Monterey Marketplace is also held downtown every Tuesday, October through April. The nearby boutiques and mom-and-pops shops, such as Pirate's Cove Gifts & Things, at Fisherman's Wharf are also worth visiting.

Whether you're interested in exploring the immaculate natural coastline, picking up a Steinbeck novel and visiting a coffee shop, or searching for trinkets at Fisherman's Wharf, Monterey's diverse offerings will surely delight you. From its rich marine environment and famous aquarium to its historical landmarks and vibrant arts scene, 2023 NEBB Annual Conference goers are in for a treat traveling to this heavenly haven of the central California coast. ●

2023 NEBB
Annual Conference
Monterey, California
October 26-28, 2023

SAVE THE DATE!

2023 NEBB Annual Conference

CHALLENGING THE NEXT GENERATION

Join us in beautiful Monterey, California!
October 26-28. 2023 | Monterey Marriot

The NEBB TOOLBOX

The Robert B. Gawne Technical Education Center Grand Opening

By Jeff Schools | NEBB Technical Director

I know it has been a long time coming, but it is finally here: The Robert B. Gawne Technical Education and Training Center is having its Grand Opening on Thursday, May 11, 2023 in Gaithersburg, Maryland.

The training and education center was named after a founding member of the National Environmental Balancing Bureau and NEBB's 17th President, Mr. Robert B. Gawne. Joining Stromberg Metal Works, Inc. in 1958 as an estimator, Gawne purchased Stromberg in 1987 and worked there as CEO until his death in 2018. He was a vital part of building this organization that recently celebrated its 50th Anniversary.

There is a long list of people and companies that helped and or contributed to this project. The first is Kathleen Bigelow from Stromberg Metal Works, responsible for donating all the sheet metal and labor for the project. This was a huge undertaking on their part, and we are grateful for all the time and materials Stromberg provided. IMI Hydronic Engineering's Amanda Salamone and Soham Neupane donated all the parts for the center's hydronic wall. Evergreen Telemetry's Pete Secor supplied Evergreen TAB test kits. Boland Trane and Allen King have donated air handling and condenser units. John Payne and W.E. Bowers supplied the piping and labor for the hydronic wall as well as the air handler hot and chilled water systems. Jack Duffy from Retrotec donated the building enclosure test kits. Mike Dolphin from Young Regulators donated remote balancing dampers used in the cleanroom. Mike Wieder, President of Air Filtration Management, donated the two fume hoods. Victor Gomez, NEBB Certified Professional from Miami with Mechanical Air Concepts Test and Balance provided the Automated Logic controls and labor that will run the building automation system. Ryan Kerns from Cummins-Wagner supplied the Bell and Gossett pumps for the hydronic board and the Bell and Gossett pumps and Circuit Setters for the hot and chilled water systems. Finally, I'd like to thank Mike Aleksich and the team at Dwyer Instruments for providing the Magnehelic gauges that will monitor our cleanroom pressures.

Robert B. Gawne Technical Education and Training Center Classroom during a TAB Seminar

NEBB is very thankful to have industry partners like those mentioned above. We appreciate you and we thank you for your generous contributions to this project!

The Robert B. Gawne Technical Education and Training Center will be able to support all the NEBB disciplines with the equipment and systems that we have installed. Now, when a seminar is held at the

Gaithersburg location, along with the classroom and theory instructions, there will be an opportunity to obtain hands-on practical experience. The VAV system consists of a Trane air handling unit that is equipped with hot and chilled coils. There are five terminal units, a series fan-powered, a parallel fan-powered, a hot water coil heating box, an electric coil heating box, and a cooling-only box. The building automated system will be run through Automated Logic.

The cleanroom space is also being served by a Trane air handling unit equipped with hot and chilled water coils. It has an anteroom surrounded by four cleanrooms. There are twelve fan filter units supplying the space, two are ducted and ten are ceiling plenum. They will be controlled by a SAMlink Control System that offers global, per zone, and individual fan speed adjustment and monitoring.

There are two fume hoods at the training and education center. One is constant volume and is being served by a Loren Cook inline fan equipped with a speed controller. The other fume hood is variable air volume and it's controlled by an Accutrol AVC Fume Hood Control System and a Loren Cook inline fan equipped with a speed controller.

VAV System at the Robert B. Gawne Training and Education Center

Cleanroom Anteroom at the Robert B. Gawne Training and Education Center

Robert B. Gawne Training and Education Center Constant Volume Fume Hood

The Robert B. Gawne Training and Education Center Building Enclosure Testing Lab

The Building Enclosure Testing (BET) Lab consists of two connecting rooms with a door between them. Each room also has a door to the adjacent space. There are three 14-inch round Young Regulator electronic balancing dampers with remote control cables to regulate the amount of leakage between each room.

We will also have a hydronic testing wall and the air handler hot and chilled water systems. Between both of these systems, we will have five pumps, many circuit setters, and a primary and secondary loop to be able to train students on water balancing.

The Robert B. Gawne Training and Education Center has really shaped into something that we can be very proud of. The ability to not only teach engineering principles, problem solving, and theory during a seminar, but to also be able to go out and put our hands on the systems and see firsthand how they operate and how we can manipulate them to run more effectively and efficiently is very beneficial to our attendees. ●

GRAND OPENING

The Robert B. Gawne NEBB
Training and Education Center

May 11, 2023 | 12:00 pm - 3:00 pm

8575 Grovemont Circle, Gaithersburg, MD 20877

WAR STORIES

Lessons Learned with Plate Frame Heat Exchangers

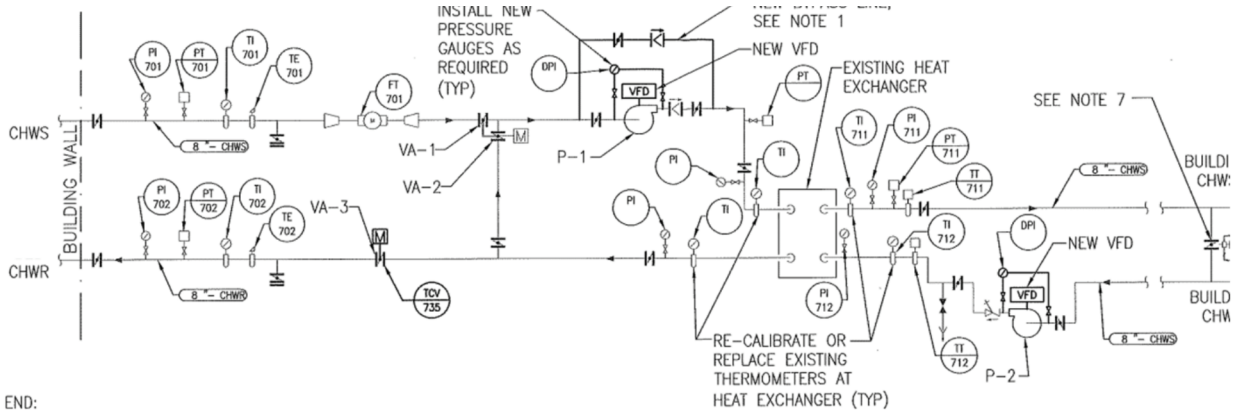
By William C. Bailey

A building located in the downtown area of a large city is where our war story begins. A central plant serving the building and several other buildings throughout the downtown area had monitors that read GPM flows and temperature differences to calculate the BTU loads and bill the customer for their usage. The steam system monitored the pounds per hour of steam requirements to bill the customers, as well.

With a total of 30 floors, the building contained a single heat exchanger and pumps that circulated water for the different chilled water piping risers. The customer reached out, stating that the current plate frame heat exchanger could not hold the facility temperatures at setpoint with the chilled water supply provided. The building had been experiencing problems with air handling units (AHUs) on the floors not holding the 55oF discharge air setpoint per the original mechanical design.

Upon my initial visit to the site, I reviewed the design documents to get an idea of the original design intent. Figure A illustrates the arrangement of the piping and heat exchanger orientation.

Figure A



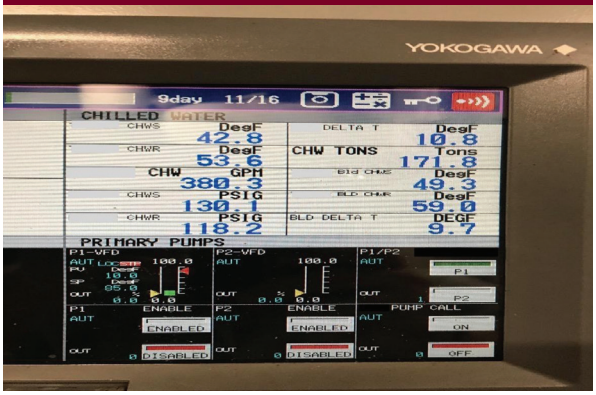
The facility manager asked me to review why the building could not maintain proper conditions for the tenants, resulting in areas being warm and humid. We reviewed the cut-sheets for equipment.

The plate frame heat exchanger has a certain approach or water difference for heat transfer. Typically, the required incoming inlet water from the central plant is 39°F to 42°F (sometimes referred to as cold-side) and the exiting side of the plate frame heat exchanger for the building is 42°F to 45°F (referred to as the hot-side). We refer to this as a 3°F approach.

Through past observations, I knew plate frame heat exchangers could get contaminated or contain film build-up on the plates, thereby reducing the heat transfer. This not only causes the system to be unable to perform as designed, but also reduces efficiency. We typically see the differential pressures exceed the original design pressures. The higher differential pressure can be misleading at times, assuming that the GPM flow is higher and not lesser flow. In this case, GPM flow stations showed otherwise. I made a point to take pictures showing before and after results.

As we can see with the Example 1, the system indicated a flow of 380 GPM and the entering water temperature was 42.8°F, while leaving temperature was 53.6°F. Notice the calculated tonnage of 171.8 tons. When we do the math, (the system has no glycol and is 100% water) 500 x 380.3 GPM x (53.6 - 42.8) delta T = 2,053,620 BTUH/12,000 (BTU per ton) =171 Tons. The meter showed 171.8 tons which is really close to the hydronic BTU equation.

Example 1



Readings of heat exchanger performance before cleaning of plate frame heat exchanger

On the other side, the leaving side of the plate frame heat exchanger to the building is at 49°F. This places the approach to as much as 6°F, helping me to determine that the plate frame heat exchanger was dirty and contaminated. Another good indicator was that the plant side of the system had pumps that would energize and modulate the VFD speed to accommodate the proper differential setpoint and maintain the 12°F delta temperature. The central plant's sequence of operation says water returning to the plant cannot be colder than 53°F. The booster pump VFDs would increase and decrease speeds to maintain the water on the plant side to be at 53°F. As Example 1 shows, the temperature was already at 53.6°F which had both booster pumps at 100% VFD speeds, yet still did not satisfy the tenant requirements.

The plate frame heat exchanger had over 746 plates. Trying to break down the plates and attempt to clean the plate frame heat exchanger would require a lot of labor hours and downtime for the facility, which they could not afford. The heat exchanger was also over 30 years old, so new gaskets for the assembly were not readily available.

I expressed concerns to the facility manager that I was not comfortable separating the heat exchanger for cleaning. Due to the age of the equipment and possibly not having been exercised for a great deal of time, I also mentioned concerns that the isolation valves for both the plant side and the building side would not isolate and hold.

At this point, we recommended chemical cleaning. I made sure that the customer understood I was not sure

Example 2

how well this would work, but we would do our best. We subcontracted a chemical cleaning contractor to do the cleaning, and provided the connection points for the portable pump assembly to circulate the exchanger with the necessary chemicals. Pipefitters exercised the isolation valves, drained the water off the plate frame assembly, and installed the hose connections for the chemical cleaning team. Example 2 shows two pictures of the chemicals utilizing catch basins to circulate the chemicals while ventilating the room to maintain a safe environment.

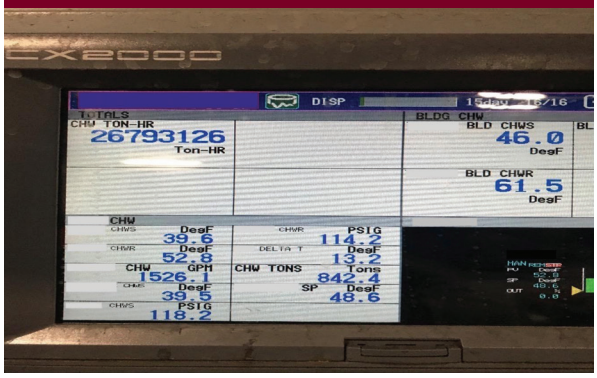
Per the chemical treatment company, we discovered that the heat exchanger was extremely contaminated with a bacteria type organism. The secondary side water quality was good, which had the proper chemical inhibitors.

Once the plate frame heat exchanger was cleaned, we flushed the heat exchanger thoroughly with fresh water to confirm the exchanger was chemical-free by taking water samples of water that was drained from the system. At this point, we filled with water and vented the heat exchanger to confirm the plates had fluid back in the system. The primary concern was that if the main isolation valves were opened to fill the plate frame heat exchanger, the inrush of water could cause issues with gaskets/seals and cause the heat exchanger to start leaking.

As the plate frame heat exchanger was filled, the main isolation valves were opened very slowly to allow water static head of the building and the plant loop pressures to come into the device at a very slow rate. Once everything was stabilized with no leaks, we placed the pumps back online for both the building side and central plant side. We had the building down for over 12 hours before returning the building back into an occupied state. Example 3 shows the great deal of load we observed once the system started.

With all equipment operational, we saw the entering water was 39.6°F and the leaving water was 52.8°F, which was less than the 53oF requirement from the central plant as the booster pumps remained off. We also saw the flow rate for the central plant side increase from the previous 380 GPM to 1526 GPM and the overall tonnage went from 171 to 842 tons. The heat exchanger was restricted with little to no heat transfer until cleaned. The approach was still near 6°F, but the actual chilled water setpoint of 53°F had the return value raised to 48.6°F.

Example 3



Final display after plate frame heat exchanger was chemically cleaned

With the cleaning of the plate frame heat exchanger, we accomplished the task at hand and made another customer very happy. The facility manager was very grateful that the plate frame heat exchanger was performing considerably better, and the occupants were grateful as well.

I feel blessed to not only have the ability to apply the theory, but also apply the practical aspect of things as well from being a NEBB Certified Professional. There is a certain amount of gratitude and accomplishment doing this work while applying TAB formulas. We are supporting our local communities with the information that NEBB offers in our TAB Procedural Standards. There are certain things that books can help teach us, but being in the field and applying the technical side of things is critical in troubleshooting and continuing to grow and learn every day. ●

Chapter News

Capital-MarVa International NEBB

Barbara Huber

Our 2023 Recertification Seminar was held in Annapolis, MD on April 21, 2023. The seminar included presentations on fan testing and system effect, understanding balancing and fundamental steps to balance and optimize hydronic systems, hydronic system performance optimizations with smart control valves as well as construction and performance testing of stairwells.

We are pleased to announce we will be presenting a two-day TAB Refresher on July 13 and 14 at the Capital-MarVa International NEBB Chapter office.

If you are interested in getting on our Certified Practical Exam waiting list or receiving more information on any of the above events,, please contact Chapter Coordinator Barbara Huber directly at capmarvainternationalchapter@nebb.org.

Florida EBB

Terry T. Wichlenski

Florida EBB's 42nd Recertification Seminar & Annual Chapter Meeting took place April 27 - 28, 2023 at The Brownwood Hotel and Spa located in The Villages, Florida. Participants enjoyed exciting sessions and events, including our annual Corn Hole Fundraiser and a round of golf the day benefiting Florida college students in the engineering field.

The Brentwood Hotel and Spa

We are starting to hold NEBB TAB Practical Exams in Florida as evidenced by our recent exam on April 1. As we continue to add future exam dates, please check the NEBB website and/or contact our office and speak with Terry, our FEBB Chapter Coordinator at 727-240-4254 or by email at FEBBchapter@nebb.org.

NEBB Canada

Beverly Girard

On the business side of things, NEBB Canada held its recertification seminar in October 2022. It was a virtual seminar with a great turn out! We would like to thank all our speakers for participating, including Luis Chinchilla from NEBB National for providing everyone with news and updates from NEBB's headquarters.

Our 2023 NEBB Recertification Seminar will be taking place at the AC Marriott in Montreal, QC this year. It's been a couple of years since we've done this in-person, so it will be nice to see everyone again! We are also offering a virtual option for the certified technicians who only require three hours to become recertified. If you are interested in attending and/or speaking or being a vendor at this seminar or any future seminars, please reach out to our Chapter Coordinator at info@nebb.ca.

NEBB Canada would also like to welcome a new certified firm: Matheson Air Balancing!

On the personal side of things, our thoughts and prayers go out to one of our Board Members, along with his family and friends, who endured a tragic accident. We are happy to report that he is now on the (long) road to recovery!

Sadly, we also lost one of our certified technicians, Frank Peragine from Air Audit, unexpectedly. Frank worked for Air Audit for 27 years before he passed. He will be greatly missed!

Southern California EBB

James Rosier

The Southern California EBB marketing committee has been advertising NEBB with tabletops at the Southern California, Orange Empire and San Diego ASHRAE chapter meetings. Additionally, Past President, Technical Committee Chair, and Board Member Erik Dlugajczyk gave a presentation to the Orange Empire ASHRAE group on air and hydronic balance forms. The presentation was well received and accompanied with discussions on bal-ancing and NEBB certifications and procedures.

Tennessee EBB

Andrew Tittle

The TEBB Chapter held its annual training seminar on Friday, April 28, 2023 at Nashville Machine Company located at 722 Rundle Avenue, Nashville, TN 37210. Presenters included Steve Pascuzzo with Testo, Inc., Soham Neupane with IMI Hydronic Engineering, Inc. and Rick Botto with Compass Commissioning and Design.

We would like to thank Rick Botto for his years of association with the TEBB chapter and presenting at our TEBB seminars. The vast experience in many aspects of the commissioning field and many others that he has contributed have been much appreciated.

In other news, William Bailey has been working with the local BOMA Chapter and held a Lunch and Learn about "Understanding VAV Systems and How They Work." The class went well and the BOMA members were very pleased with the topic and information.

TEBB. "It has been great working with everyone, but I felt it was time for other members to work these positions," he concluded.

Mid-South EBB

Ginger Slaick

MidSouth EBB is excited to announce the 2023 Recertification Seminar and Vendor Expo will be held at the Hotel Ballast in Wilmington, NC. The dates for the event are Saturday, September 23 – 24, 2023. Be on the lookout for more details about registration, hotel accommodations, and CECs for certified professionals and cer-

Hotel Ballast

tified technicians. For now, mark your calendar and plan to join us in Wilmington!


Allen King and Ginger Slaick

MidSouth EBB Chapter Coordinator Ginger Slaick and Administrative Assistant Kelly Jackson attended the 2023 AHR Expo February 6-8, 2023 at the Georgia World Congress Center. The NEBB booth was well represented by NEBB Technical Director Jeffrey Schools, Executive Coordinator Christina Spence, and NEBB Marketing Committee Chair Allen King.

Rocky Mountain NEBB Chapter

Shandre Guy

Rocky Mountain NEBB (RMNEBB) held its 48th Annual Recertification Seminar and Chapter Business Meeting on November 18, 2022 at the Colorado Sheet Metal Workers' Joint Apprenticeship and Training Center in Denver.

RMNEBB would like to congratulate its elected 2023 officers and Board of Directors:

- Kevin Shaw, President (Elite Balancing)
- Joshua Uncapher, Vice President (TAB Services)
- Brian Sharkey, Secretary/Treasurer (Airadigm Solutions)

- Tim McLean, Technical Committee Chair (Precision Test & Balance)
- Stuart McGregor, Immediate Past President (Engineering Dynamics)
- Larry Bartley, Director (Past President) (B & B Balancing)
- Ron Matthews, Director (Precision Test & Balance)
- Donald Pittser, Director (Past President) (JEDI Balancing)
- Joe Marshall, Director (new 2023) (Lawrence H. Finn & Associates)

RMNEBB President Kevin Shaw gave a special thank you to Stuart McGregor, 2022 RMNEBB President, RMNEBB Chapter Coordinator (2016-2022) and NEBB Sound and Vibration Committee Chairman, for his many years of continued service to NEBB and RMNEBB. He also thanked outgoing RMNEBB Board of Director Rich Benge (Design Mechanical) for his many years of volunteering and welcomed new RMNEBB Chapter Coordinator Shandre Guy.

RMNEBB Vice President Josh Uncapher (TAB Services) discussed the completed 2022 practical exams held at the RMNEBB Practical Lab and the TAB Lab updating. Longtime RMNEBB member Anthony Kocurek (Energy Balance & Integration) and current National SMACNA President was introduced to NEBB Marketing Committee Chairman and Board member Allen King. Mr. King provided a great presentation on behalf of the NEBB Board of Directors and enjoyed our Mile High hospitality.

RMNEBB conducted the annual seminar refresher courses for the continuing education of NEBB Certified Professionals and NEBB Certified Technicians. NEBB TAB Committee Member and NEBB Certified Professional Seminar Instructor Brian Sharkey (Airadigm Solutions) presented the TAB Certified Technician Technical Training. Mr. Sharkey covered hydronic systems basics, pumps basics, and trouble-shooting hydronics.

NEBB Board of Director, TAB Committee Chairman and NEBB Certified Professional Seminar Instructor Donald Pittser (JEDI Balancing) presented the TAB Certified Professional Training on hydronic TAB report forms compliant to the NEBB Procedural Standard for Testing, Adjusting, and Balancing of Environmental Systems 2019 - 9th Edition.

NEBB's policy requiring a NEBB Certified Professional or NEBB Certified Technician onsite each day TAB is being performed on NEBB Certified Report projects has been in place since January 1, 2012. RMNEBB continues to provide the needed technical training for continuing education credits (CECs) for annual recertifications. The Recertification Seminar attendees earned 6.5 NEBB approved CECs.

Finally, RMNEBB is sad to announce the passing of Charles (Chuck) Madison. Mr. Madison was the original Colorado EBB (now RMNEBB) Chapter Coordinator from the Articles of Incorporation December 21,1973 until his retirement on June 17, 2016. His many decades of involvement with RMNEBB will forever be honored.

2023 NEBB Annual Conference

Monterey, California
October 26-28, 2023

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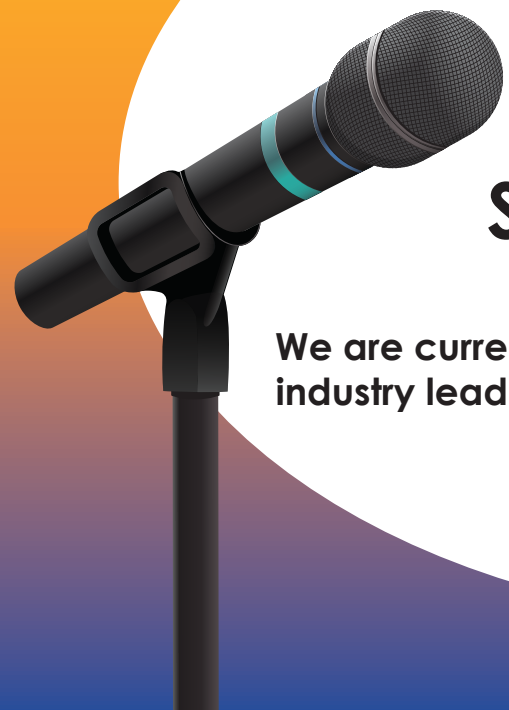

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