The NEBB Professional

2024 – Quarter 1

Cover Story:

The Benefits of Enclosure Testing for Pressure Sensitive Areas within Hospitals and Laboratories

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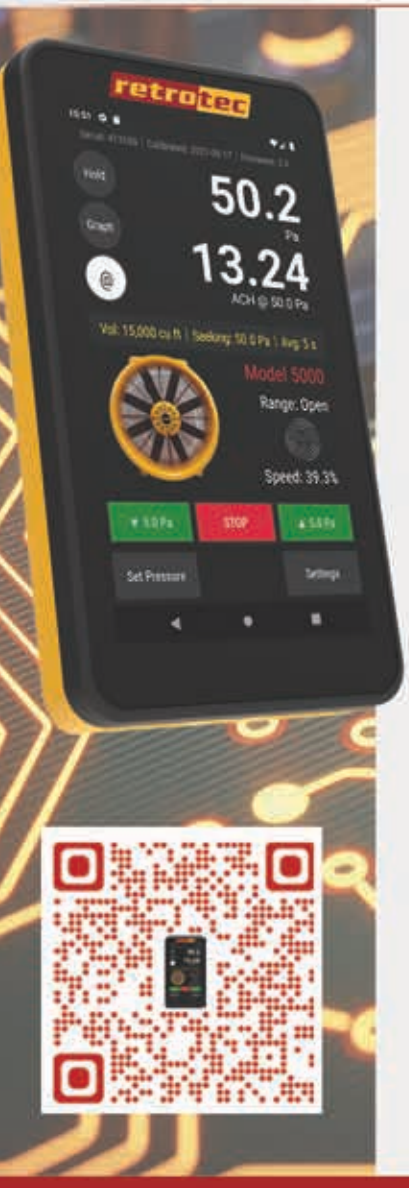

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The NEBB Professional is a quarterly magazine published by NEBB. 8575 Grovemont Circle, Gaithersburg, MD 20877 Tel: 301.977.3698 Email: communications@nebb.org

President's Message

I would like to begin by thanking our exiting past president, Jon Sheppard, for all his hard work and service, as well as welcoming our two newest members of the Board, Tiffany Russell and Joel Shannon.

Moving forward with our plans for 2024, all we aim to do at the board level will be aligned with our strategic plan. I would like to share some elements outlined in the NEBB´s current strategic plan that frame our work at the Board, staff, and committee levels.

The goals of this plan are centered around leadership and organizational direction, organizational structure, and the direction of NEBB's training and education offerings as well as that of the NEBB brand.

The various elements of these overarching goals will impact everyone within NEBB. Let's recap with some of the examples mentioned previously combined with recent actions:

- In order to uphold NEBB's organizational direction, during the last quarter of 2023 all Oceania firms were assigned to the Pacific Southwest Chapter. This process was well managed by the chapter and NEBB staff to ensure firms in this region have access to the solutions and support needed.
- At the board level, the staff is supporting our work by implementing top-notch software applications.
- The market conditions changed during and after the pandemic, leading to the successful launch of the NEBB Learning Center (NLC) to ensure NEBB remains current with the market.
- Our tests on disciplines like TAB, BET and Cx have been considerably improved by the hard work of our committees and the exam development committee with a robust improvement plan across disciplines. Additional actions such as the ¨metrification¨ of our TAB CP test, which combined with our newest NEBB Training Center, synergized perfectly to ensure we keep our training and education programs the best out there.
- The program launched by the beginning of Q1 2023 to support all the marketing initiatives is starting to deliver results, with the most visual change being the refresh of our NEBB website as well as other key performance indicators tracked by the team working on it.

For Q1 2024, the board had a face-to-face meeting at the NEBB Training Center to allow all of us to stay updated on the progress of the remaining items and remain connected to the staff. This quarter also signaled the start-up of chapter recertification seminars, which will be covered by our Board members. I should have had the opportunity to attend a few of these seminars, keeping myself energized by the great people honoring the NEBB brand.

Next quarter, we will have our Mid-Year session for the Board, staff, and committees, to ensure alignment of the plans for each organization. A lot of work is carried out to ensure each one delivers on the goals established for the benefit of NEBB.

I´ll continue sharing more with all of the NEBB community about our work to keep you up to speed with respect to what is planned for your benefit.

Pura Vida!!!

Luis Chinchilla
NEBB President

Mensaje del presidente

Me gustaría comenzar agradeciendo a nuestro presidente anterior saliente, Jon Sheppard, por todo el trabajo realizado y servicio prestado y dar la bienvenida a nuestros dos nuevos miembros de la junta directiva: Tiffany Russell y Joel Shannon.

Avanzando con nuestros planes para 2024, todo lo que esperamos hacer al nivel de la junta directiva está enfocado en mantener el alineamiento con nuestro plan estratégico, por lo que me gustaría compartir algunos de los elementos descritos en el plan estratégico actual de NEBB donde se enmarca nuestro trabajo a nivel de junta directiva, personal administrativo y de comités.

Las metas de nuestro plan están centradas alrededor de la dirección de la organización y el liderazgo, estructura organizacional, dirección para la educación y entrenamiento de NEBB y la marca de NEBB.

Estas metas tienen diferentes elementos que impactarán a cada uno de nosotros. Permítanme resumir algunos de los ejemplos mencionados previamente con algunas acciones recientes:

- Para mantener la dirección organizacional, durante el último trimestre de 2023, todas las firmas de Oceanía fueron reasignadas el Capítulo Pacific Southwest, un proceso bien administrado por el Capítulo y el personal administrativo que garantiza que las firmas en esta región tengan acceso a las soluciones y el soporte que requieren.
- A nivel de la junta directiva, el personal administrativo apoyó nuestro trabajo implementando aplicaciones de software de primer nivel.
- Las condiciones del mercado cambiaron durante y después de la pandemia, lo que llevó al lanzamiento exitoso del NEBB Learning Center (NLC) para garantizar que NEBB se mantenga actualizado en el mercado.
- Nuestros exámenes en las disciplinas de TAB, BET y Cx, se han mejorado considerablemente gracias al arduo trabajo de nuestros Comités y EDC, con un robusto plan de mejorar en todas las disciplinas. Acciones adicionales como la conversión al sistema métrico internacional para la disciplina de TAB combinada con nuestro nuevo Centro de Capacitación representaron una sinergia perfecta para garantizar que mantengamos nuestros programas de capacitación y educación como los mejores del mercado.
- El programa lanzado a principios del primer trimestre de 2023 para mejorar todas las iniciativas de mercadeo está comenzando a dar resultados, siendo el cambio más visual la actualización del sitio web de NEBB, así como otros indicadores clave de rendimiento rastreados por el equipo que trabaja en él.

Para el primer trimestre de 2024, la junta directiva mantuvo una reunión presencial en el Centro de Capacitación de NEBB para mantenernos actualizados sobre el progreso de los elementos restantes y mantenerse conectada con el personal administrativo. Además, este trimestre marcó el inicio de los seminarios de recertificación para los diferentes Capítulos, los cuales serán cubiertos por los miembros de la Junta. Espero tener la oportunidad de atender personalmente algunos de estos seminarios, y mantenerme así energizado por las grandes personas que honran la marca NEBB.

Durante el segundo trimestre de 2024, tendremos nuestra sesión de Medio Año para la Junta Directiva, personal administrativo y Comités, en la que se realizará la alineación de los planes de cada organización y se trabajará arduamente para asegurar que se cumplan con las metas establecidas en beneficio de NEBB.

Continuaré compartiendo más con toda la comunidad NEBB sobre nuestro trabajo que todos ustedes se mantengan actualizados con respecto a lo que está planeado para su beneficio.

¡Pura vida!

Luis Chinchilla
Presidente de NEBB

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Letter from the Editor

Happy 2024!

As we move further into another exciting year, NEBB has been hard at work behind the scenes, advancing a variety of initiatives that you will note sprinkled throughout this issue.

For those who were unable to attend the 2023 NEBB Annual Conference (and for anyone who would like to simply reminisce!), we have included a special highlight with different perspectives of the conference in Monterey beginning on page XX.

Overall, this carefully curated issue contains a NEBB-concentrated mix of industry tips, expertise, and lessons learned in an effort to maintain the goals of our magazine. Dedicated to fostering knowledge exchange and professional development across those working in the architectural, engineering, and construction fields, The NEBB Professional is a platform that intends to help advance the building industry as a whole.

We ask that anyone with a desire to contribute to a future issue of *The NEBB Professional* (either as an author or interviewee) please reach out to the magazine's editorial team to determine the right content fit. The editorial team is well-versed in offering ideas on how to showcase your experience and expertise in a way that best appeals to our readers. We are here to help!

If you wish to become an advertiser, please email editor@nebb.org to inquire about current and future opportunities.

Kerri Souilliard,
Editor

CONTRIBUTORS

Mike Peak has been a NEBB Certified Professional since 2002 for TAB and 2013 for BET. He is part of the NEBB Board of Directors and the current chair of the BET Committee. Mike has been employed with TestComm of Spokane, WA since 1997 where he is the TAB/BET Supervisor.

Quinton Smith has worked in the TAB and Cx industry for 8 years, and is a NEBB Certified Cx Professional and TAB Technician. He is currently serving as a voting member of the NEBB YPN Committee, and is co-chair of the committee for 2024.

Phil Emory is the Immediate Past President of NEBB and currently serves on the Board of Directors. As a Lead Engineer for Neudorfer Engineers in Seattle, he specializes in building enclosure testing and thermal imaging services, overseeing all aspects of such activities at the firm.

George E. Martin is a commissioning agent at Loring Consulting Engineers. He is currently a NEBB TAB CP and serves as a corresponding member of the NEBB TAB, YPN, and Marketing Committees.

Chip Albright is the founder and President of Fume Hood Certified. He has 40 years of experience with fume hoods and lab ventilation. He operates under the motto of Making Labs Safer one fume hood at a time.

Don Hill is president of AccuTec Services, Inc. and served as NEBB President in 2018. He has a BSME from the University of Missouri and is a registered professional engineer. He began his career as a design engineer and has leveraged that experience into providing TAB-, Commissioning-, and Cleanroom-related services.

Bob Letterman has worked in the HVAC industry for 40 years, working in the test and balance trade for 30 years. After working for York International as a controls specialist for 5 years and becoming partner at FLO-TECH in 2002. He acquired FLO-TECH in 2013.

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

Executive Vice President's Message

In the fast-paced world of building environmental systems, adaptation and collaboration are key to thriving. In a move that exemplifies this spirit, the Pacific Southwest NEBB Chapter recently embarked on a journey that would not only reshape its landscape, but also elevate industry standards and foster greater unity within the NEBB community.

The decision to merge two established NEBB chapters—the Southern California Chapter and the Northern California and Hawaii NEBB Chapter—into the Pacific Southwest Chapter was met with enthusiasm and anticipation from chapter members and industry stakeholders alike. As the dust settled and the newly merged chapter began to take shape, it became clear that this strategic move would pave the way for unprecedented success and future growth. And, future growth happened quicker than anticipated!

Effective January 1, 2024, NEBB leadership increased Pacific Southwest NEBB's geographical area by assigning Australia, New Zealand, Singapore, Malaysia, Thailand, Taiwan and Hong Kong to the chapter. One of the primary benefits of the reassignment allows for enhanced collaboration and knowledge exchange. By integrating NEBB firms from Oceania into the Pacific Southwest Chapter, firms and individuals gain access to a more expansive network of industry professionals. This broader pool of expertise fosters increased collaboration, encourages knowledge exchange, and promotes the sharing of best practices. Through joint projects, technical seminars, and networking events, members can leverage diverse perspectives and experiences to drive innovation and excellence in building environmental systems.

I'd like to extend my sincerest gratitude to the Pacific Southwest Chapter Leadership and Coordinator, Jim Rosier. Navigating a chapter merger and integrating new regions is no small feat and yet, under his guidance, the transition has been remarkably smooth and seamless. I am continually inspired by his unwavering passion for advancing both the chapter and the NEBB mission.

As NEBB chapters continue to thrive and grow, there's never been a more opportune moment to harness the collective power of our community to promote the value of NEBB certification. By championing NEBB certification within our chapters, we can elevate industry standards, foster professional development, and showcase the expertise of our certified firms to clients and stakeholders.

NEBB certification stands as a hallmark of excellence in the field of building environmental systems. It signifies a commitment to upholding the highest standards of quality, efficiency, and environmental responsibility—a commitment that resonates deeply with both professionals, technicians and clients, alike. By promoting NEBB certification, NEBB chapters can empower their certified firms to distinguish themselves as leaders in the industry and drive positive change in their communities.

As we look to the future, let us seize the opportunity to champion NEBB certification within our NEBB chapters and the industry. By promoting the value of certification, we can empower our certified individuals and firms to elevate industry standards, and drive innovation and sustainability in the built environment. Together, we can build a brighter future for the industry and make a lasting impact on the world around us.

From the desk of:
Tiffany J. Meyers

The Benefits of Enclosure Testing for Pressure Sensitive Areas within Hospitals and Laboratories

By Mike Peak

During the 2023 NEBB Annual Conference in Monterey, California last year, I sat in on a panel discussion about how all of the NEBB disciplines interact with one another. As the chair of the BET committee, I was asked which discipline I interact with the most. After thinking about this for a minute, I settled on testing, adjusting, and balancing, as well as commissioning. This led to the follow-up question of "how?"

NEBB prides itself on certifying firms and individuals for the purpose of optimizing overall building performance, and building enclosure testing plays a significant role.

As the conversation progressed, I began discussing other ways I have provided services beyond whole building air tightness testing and recounted the many times I have been asked to evaluate individual rooms or zones within a building. Hospitals and laboratories are critical environments where the utmost focus is placed on safety and infection control. Within these facilities, there are specific areas known as

pressure-sensitive areas, such as isolation rooms, operating theaters, and cleanrooms, where maintaining the appropriate air pressure differentials is crucial. To ensure the integrity of these pressure differentials, enclosure testing can be a valuable tool.

In this article, we will explore the benefits of enclosure testing for pressure-sensitive areas within hospitals and laboratories.

What is Enclosure Testing?

Enclosure testing, also known as room integrity testing, is a process that assesses the air tightness of a room, zone, or facility. It involves measuring the air leakage rate through doors, windows, penetrations, and other potential pathways. By evaluating the air tightness, enclosure testing helps maintain the desired pressure differentials necessary for the safety and functionality of pressure-sensitive areas within the parameters of the HVAC design. This testing is conducted using a blower door assembly to control pressure and quantify leakage within a given zone or room. The mechanical systems are then sealed off and leaks are identified during testing.

What is Passing?

One of the questions I have been asked time and again is, "What would the acceptance criteria look like?" Distinct types of rooms have different pressure gradient requirements. For example, isolation rooms typically require a negative pressure of 0.01 in. w.c. (2.5 Pa). Overall supply flow is dictated by thermal load expectations for the purpose of cooling and the required fresh air changes per hour need to meet the code requirements. Engineers have a difficult time determining what the overall exhaust should be designed for because they don't know how leaky a room will potentially be. So, in this scenario, the acceptance criteria may be "*leakage must not exceed 150 CFM at a test pressure of 0.02 in. w.c.*" This gives the design team a clear and definable flow differential with a safety factor for space pressure.

Without reliable enclosure testing in advance, mechanical engineers are left to make assumptions as to the integrity of the room or zone for which they are designing the HVAC system. If those assumptions are wrong, and additional fan flow is needed, what is to be done? Maybe the fan will need to be upsized, and perhaps the duct, as well, to mitigate noise issues. The electrical service may need to be modified to accommodate a larger motor. These change orders can be costly and are completely avoidable.

What are the Benefits of Enclosure Testing?

1. Ensuring Proper Airflow Management

In pressure-sensitive areas, such as isolation rooms, operating rooms, decontamination spaces, treatment rooms, compound pharmacies, and other cleanrooms, the facility relies on precise airflow management to prevent the spread of contaminants, maintain ste-

rility, and protect patients and healthcare workers. Enclosure testing ensures that the air pressure differentials between adjacent spaces are maintained within the specified range. By identifying and rectifying any leaks, enclosure testing helps ensure that the airflow management systems function optimally, thereby mitigating the risk of contamination and enhancing overall safety.

2. Enhancing Infection Control

In healthcare settings, preventing the transmission of infectious diseases is of paramount importance. Enclosure testing plays a critical role in infection control by helping to maintain the required pressure differentials. Negative pressure rooms, for example, are designed to prevent the spread of airborne contaminants by ensuring that air flows into the room from surrounding areas. Enclosure testing verifies that these rooms maintain the necessary negative pressure, minimizing the risk of infectious particles escaping into the adjacent areas.

3. Regulatory Compliance

Hospitals and laboratories must adhere to stringent regulatory standards and guidelines to ensure patient safety and quality of care. Enclosure testing helps organizations meet these requirements by providing documented evidence of compliance. By conducting regular enclosure testing, healthcare facilities demonstrate their commitment to maintaining the integrity of pressure-sensitive areas, fostering trust among patients, staff, and regulatory bodies.

4. Energy Efficiency

Enclosure testing not only contributes to safety and compliance, but also promotes greater energy efficiency. By identifying and sealing air leaks, facilities can reduce energy losses associated with heating, ventilation, and air conditioning (HVAC) systems. Improved energy efficiency not only reduces opera-

tional costs, but also supports sustainability efforts, making enclosure testing a valuable tool for healthcare organizations striving to minimize their environmental footprint.

5. Preventing Equipment Malfunction

In addition to its impact on air pressure differentials, enclosure testing can help identify potential issues with critical equipment, such as HVAC systems. Leaks in the building enclosure can lead to uneven pressure distribution, forcing HVAC systems to work harder to maintain the desired conditions. By detecting and rectifying these leaks, enclosure testing helps prevent unnecessary strain on equipment, reducing the risk of malfunctions and extending the lifespan of HVAC systems.

When it comes to building enclosure testing, we tend to think in terms of whole building air tightness, but with specific buildings there are individual rooms or zones where enclosure testing can be even more important.

Enclosure testing is a crucial process for maintaining the integrity of pressure sensitive areas within hospitals and laboratories. By ensuring proper airflow management, enhancing infection control, promoting regulatory compliance, improving energy efficiency, and preventing equipment malfunctions, enclosure testing plays a vital role in safeguarding the safety of patients, and healthcare workers, along with reducing overall operating costs. ●

The **Next** Generation of **NEBB**

By George E. Martin

At the NEBB Annual Conference in 2023, I was drawn to the presentation put on by the YPN Committee. Despite being well beyond the acceptable age to join the "Young Professional's Network," I decided to attend the session as a way of getting acquainted with the next generation of industry leaders and potentially determining where NEBB as an organization would be heading in the coming years. What I saw at the YPN session left me surprised in two ways.

First, there were far more people in attendance than I expected. It was encouraging to see just how many younger men and women were present to support the organization and genuinely interested in learning more about their specific trades. The YPN Committee was fully staffed with professionals representing all the NEBB trades (TAB, Cx, BET, S&V, and CPT). I was impressed by the breadth of their knowledge, but more so by their admiration and appreciation for their mentors. There was a deep sense of acknowledgment from the YPN Committee that none of them had arrived where they were on their own. This led to the second reason for my surprise.

There were fewer young professionals present than I had hoped to see. Almost inevitably, I found myself feeling a little envious of those sitting on stage who were able to speak of the support they had received from their mentors. Their employers had encouraged them to network, to grow, and to actively participate in NEBB. Why hadn't more employers done the same for their younger team members? What's the rationale behind what effectively amounts to holding these young professionals back? And how might an employ-

er best address their company's needs for a stable and increasingly productive workforce?

Fear

At the core of a business owner's reluctance to push younger professionals towards growth seems to be a fear that the investment they are being asked to make may not bear fruit. Worse yet, it may be an investment made in a professional who eventually decides to take that increased knowledge and training elsewhere. This concern is not without merit. Everyone has a right to expect a return on any investment made. So it makes sense to limit a person's growth since any progress they inevitably make will only go towards benefitting a possible competitor, right?

If what concerns an employer is employee retention, then it follows that the cure to this concern is making your place of employment as attractive as possible to current and prospective employees. Many of us have heard about the way Google attracted and retained top talent back in the early 2010s. Google built an engaging work environment where the employees chose to stay rather than return to their own homes. Of course, it was public knowledge, even at that time, that the true objective behind that tactic was to keep workers in the office to have them working longer hours. Still, it worked. Despite being fully aware of the ploy, people flooded into their corporate structure and Google managed to retain and grow top talent for years.
Please note this is not a case for installing ping pong tables or massage chairs in your local office, nor is this a call to find other means of having people work longer hours than they ought. The principle behind this story is that a company can create an environment where people want to stay. The power to do so remains in the hands of the employers, as does the onus of responsibility. How, then, does a company create such an environment?

The Investment

Where does an employer spend their money, then, to maximize their chances of a return? The counter-intuitive response in most cases seems to be: they don't.

In research reported by both the Harvard Business Review and the Corporate Governance Institute, a key means of retaining top talent revolves around building a personal relationship with them, keeping your top performers engaged, and recognizing exceptional performance when it is demonstrated. In practical terms, all of this translates principally to an investment of an employer's time and energy. The truth of these reports is highlighted by the comments made by NEBB's YPN Committee.

Most of the young professionals chairing the discussion made mention of the mentoring they received at the hands of their employers as well as the growth and learning they have been able to achieve through NEBB. Rather than pushing them into the arms of other companies, the support they found where they work has allowed them to grow professionally and has motivated them to continue working with their employees. They openly acknowledged that they would likely not have been able to serve on the YPN Committee or even attend the NEBB Annual Conference without the support of their employers. It was inspiring to see their appreciation.

They further discussed the value they had found in having a network they can rely on when they encounter problems on the job. Being able to reach out to a colleague when faced with an issue allows them to share experiences and improve the strength of NEBB

as a whole. As an additional benefit, asking a colleague rather than your boss also tends to save the boss's time.

Can employers, then, follow the example set by these firms and invest time and energy toward creating an environment where young professionals feel encouraged to grow? Can they create a means of acknowledging when an employee goes "above and beyond" to do an extraordinary job? Can they take a personal interest in the professional development of the next generation? Clearly, based on the experiences shared by the YPN Committee about their companies, this is possible.

Personal Responsibility

If you are a young professional reading this article, you may have the privilege of already belonging to a company that encourages your professional growth, has training and advancement opportunities, and invests time into making you a more competent, capable person. Are you taking full advantage of this opportunity? It should come as no surprise that each individual will only advance as far as the effort they put into their own advancement. Acquiring a NEBB Certification, for example, may require an investment of some of your personal time. Standing out as an exceptional employee, by definition, requires that you do more than what is minimally required. None of this is easy, but the benefits are abundant for those willing to put the work in. Hopefully, this article will at the very least motivate conversations between employers and employees. The world continues to change, and technology refuses to slow in its frantic pace toward greater advancement. Consequently, our industry will require that growth and continual progress. Young professionals – you are needed.

Let this be your clarion call towards signing up for a local YPN event put on by your chapter. Ask your boss about becoming a NEBB Certified Technician, or even a Certified Professional. You will need to put in the work to accomplish that goal, but once you do, you will find yourself among a select group of highly qualified professionals setting the standard for technical expertise worldwide. And who knows, maybe I will have the privilege of hearing you tell your story to the YPN Committee at NEBB's next conference. I hope to see you in Arizona! ●

Empowering the Next Generation: Highlights from the 2023 NEBB Annual Conference

by Quinton Smith

The 2023 NEBB Annual Conference recently took place in picturesque Monterey, California, and the event was an astounding success. Attendees from across the industry came together to experience an array of opportunities for networking and fostering growth while learning from our peers and mentors within NEBB.

One of the conference's standout features was a series of technical and business development sessions. This year, the Young Professionals Network (YPN) Committee took the stage as the hosts of a thought-provoking Q&A Panel. The discussions revolved around five essential topics, thoughtfully selected to ignite discussions and deliberations among both the YPNers and OPNers (Older Professionals Network) in attendance. The five topics were as follows:

1. Career Development

Career development is a pivotal aspect of any professional's journey. The panel delved into strategies, advice, and personal experiences shared by seasoned

professionals to empower young professionals in their career growth. The insights offered spanned from educational pursuits to practical industry know-how.

2. Networking

Networking, often considered the lifeblood of professional success, was another focal point. Panelists stressed the importance of creating meaningful connections and offered tips on nurturing these relationships, both within and outside the industry. The power of collaboration and knowledge sharing was paramount in these discussions.

3. Mentorship

Mentorship has always been a vital component in nurturing talent, especially within NEBB. The Q&A Panel explored the benefits of mentorship and discussed strategies for building strong mentor-mentee relationships. Participants were eager to share their experiences with mentors who had significantly influenced their careers, and discuss what they wished they had found in a mentor-mentee relationship when beginning in the industry.

4. Challenges Facing Young Professionals

The challenges faced by young professionals are unique, and these challenges were openly discussed during the conference. Issues such as work-life balance, navigating industry changes, and overcoming imposter syndrome were all part of the conversation. The panel encouraged an open dialogue to address and mitigate these challenges. One such topic of discussion revolved around the new YPN Honors Program, and what opportunities this program may afford as it evolves for younger professionals who may not receive the support they need to truly shine within NEBB.

5. NEBB's Role in Supporting Young Professionals

The NEBB community and its role in supporting young professionals were also at the center of the discussion. The YPN Committee highlighted the existing support systems and encouraged attendees to provide feedback and suggestions for improvement. One significant idea that gained traction during the panel was the concept of pairing YPNers with more experienced mentors during conferences and chapter events. This mentorship program aims to provide young professionals with context for industry events and facilitating networking opportunities. The concept received widespread approval, and the YPN Committee is already working on strategies to bring it to life.

The Q&A Panel generated a vibrant and constructive discussion that resonated with both young and experienced professionals. Attendees were eager to share their thoughts, experiences, and insights, making the session an invaluable platform for learning and growth.

The 2023 NEBB Annual Conference was an undeniable success, driven by the enthusiasm of young professionals and the wisdom of experienced industry veterans. The YPN Committee's Q&A Panel provided a platform for discussions on crucial topics, from career development and networking to mentorship and addressing the unique challenges faced by young professionals. These conversations are instrumental in fostering growth and unity within the NEBB community, and we look forward to having more of them!

As the YPN Committee actively incorporates the feedback and ideas generated during the conference, the future continues to look promising for NEBB's young professionals. With innovative initiatives on the horizon, the organization is set to continue nurturing the next generation of leaders in NEBB. The 2023 NEBB Annual Conference serves as a testament to the commitment of NEBB's community to empower and support its young professionals as they embark on their journey toward excellence. ●

NEBB® YPN
Young Professionals Network
ypn@nebb.org

Reflections on the 2023 NEBB Annual Conference

by Phil Emory

After returning home in early November, I started reflecting on the 2023 NEBB Annual Conference in Monterey, California and all I'd been through in the past year.

The conference, from my perspective, could not have gone better. The staff did a remarkable job getting ready and executing such a grand event for all those who attended.

The highlight of the event was incredibly emotional, but bringing Andy Nolfo up on stage to accept the 2023 Hightower Award was such an honor. We were able to arrange his receipt of the award with his three sons in attendance all as a complete surprise to Mr. Nolfo. His standing ovation from those in attendance was just a remarkable thing to see as he made his way to the stage.

Just prior to the presentation of the Hightower Award, the NEBB Chapter Coordinators presented their first-ever Chapter Coordinator of the Year award. The first recipient of the award and now, and who the award is now named after, was Lynn Dyason. Again, having Jonathen Lloyd from Australia come the stage to receive the award in her honor was emotional to say the least.

During the event, I received compliment after compliment on how outstanding the event was. From the location to the whale watching event, to the golf tournament, to the hotel staff, and the accessibility of all the shops and restaurants Monterey has to offer, the conference was a hit with attendees. I'm happy to have selected Monterey, but what made it truly special for me was to see all those who attended having such a wonderful time. The conference is so much more than just banking your annual CECs; it goes much further than that. I just want to express a warm thank you to all who attended. You all made my year!

Our guest keynote speaker, US Naval Captain Jennifer Donahue, gave a truly inspiring speech. She delivered the exact message I was hoping for her to convey and her life experiences were so spot on. I truly hope her talk resonated with everyone in the audience whether you were a young technician just starting your career or a seasoned professional.

2023 was a tough year for me, which made the success of the conference that much better. In the quarters leading up to it, however, I think we all saw some major hurdles accomplished.

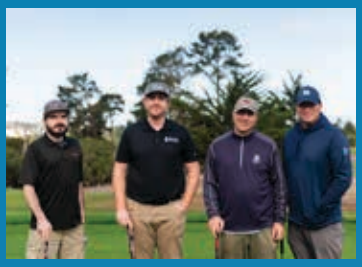
In May, as you all know, we opened the training center in Gaithersburg, Maryland and have named the center after NEBB legend Robert B. Gawne. Please make a point to someday visit the center and/or participate in future training sessions offered in the coming months.

Our 2023 mid-year meeting was held at the Skamania Resort on the Columbia River separating Washington from Oregon. I think all of the committee chairs along with the Board of Directors can agree that such a face-to-face meeting was very beneficial to our operation.

My time with NEBB, the BET Committee, the Board of Directors, the EFC, to serving as your President has been the pinnacle of my career. And now as my career is coming to an end, I just want to say I hope I served you well, and thank you so very much for letting me serve such a wonderful body known as NEBB.

I leave you in good hands as Luis Chinchilla takes over the reigns as your 2024 President. He is truly an incredible man and deserves as much support as you can give him. I know he will serve NEBB very well. ●

The 2023 NEBB Annual

















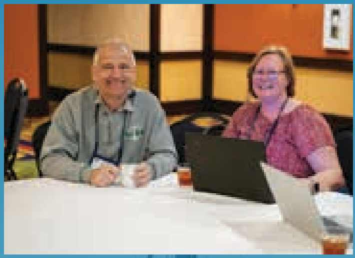

Conference in Pictures






















The Myth of Face Velocity Reloaded

2nd. Part

By Chip Albright

The first part of this article appeared in The NEBB Professional 2023 Quarter 4 issue.

Somewhere along the way, we seem to have lost sight of the fact that fume hood performance is a factor of containment and not face velocity. Many hoods that have poor containment have acceptable face velocities. We need to change the conversation from face velocity to containment.

I became involved with fume hoods in 1980 while working for a major manufacturer. Being naturally curious, I asked a lot of questions and I was often told the subject was too complex for most people to understand. Unfortunately, the nature of manufacturing and selling fume hoods involves a lot of smoke and mirrors.. Now 40 years later, little has changed.

Smoke and Mirrors? All may not be as it appears.
This is often what the airflow inside the hood looks like.

The real challenge is that fume hood performance is very dynamic. Based on so many variables, the fume hood may well be containing one minute and losing containment another. Room conditions, and other conditions, have a significant impact on fume hood performance.

"We don't design hoods to provide robust containment, we design them to perform well on a ASHRAE 110 AM test," was a comment I once heard from a well-known fume hood expert at a committee meeting.

We can debate the percentage of installed hoods that are functioning safely, but when looking at hoods that fail to safely perform as indicated by an ASHRAE 110 Tracer Gas containment test, over 80% of those had the prescribed face velocity. This quickly debunks the idea that there is a direct relationship between face velocity and containment.

Why do these hoods fail a containment test?

- **25% of the failures are caused by the design of the actual hood or lab layout issues**
- **50% of the failures are caused by room conditions. Room conditions are controlled by the laboratory ventilation system which not only includes the hood, but also the balance of the exhaust and supply air**

- **25% are caused by user work practices, which involve the fume hood setup or actions the user takes in or around the hood**

There is some history behind how we got here. In the 1960s and 1970s, it was common to install each hood with its own exhaust fan. These hoods had a switch to turn the exhaust fan off and on. Short of being able to hear the fan running, there was no indication of whether the exhaust fan was running or not. Until the OSHA 29 CFR 1910.1450 went into effect, it was common not to see any type of velocity-indicating device on a fume hood.

OSHA changed that. After OSHA got involved in the 1990s, we began seeing various velocity reading devices added to fume hoods. This is where the concept of face velocity and containment being related really took off. Users were told that if the velocity alarm didn't go into an alarm state, the hood was safe. There was a lot of smoke and mirrors used to sell this philosophy.

In the original article, *The Myth of Face Velocities in Fume Hoods*, author Caoimhín Connell claims that the hood velocity alarm is sales trickery. In reality, there are no products or testing procedures on the market that can reliably predict containment in real time. Even ASHRAE 110 is only a snapshot of performance.

If we could see the airflow, managing a fume hood's performance would be common sense. But because air is invisible, it is very hard to visualize what is really happening in and around a hood.

If not face velocity, what is a good indication of containment? That is the root problem; there has been no easy way to know. Even ASHRAE 110 Tracer Gas testing is just a snapshot. The test has no realistic dynamic challenges that would highlight weaknesses in the hood. Furthermore, sulfur hexafluoride or SF6 is six times heavier than air, which means when released, it quickly falls to the work surface. This characteristic means that we are stressing the lower portion of the hood and not the upper portion where the vortex is.

Many people don't realize that ASHRAE 110 is not a pass/fail standard, but rather a testing protocol. The 110 standard suggests that the testing procedures should be modified to fit the specific requirements of the lab. Many people refer to the ANSI Z9.5 (Laboratory Ventilation) standard for guidance on what is a pass/fail when using ASHRAE 110.

If someone is certifying the safety of your fume hoods and the testing is mostly based on face velocity, those certifications are pretty much worthless.

But my hood has a Safety Certification sticker

While the standard ASHRAE 110 is a great testing platform, it has a number of shortcomings. Let's look at ASHRAE 110 in more detail.

There are big differences in the ASHRAE 110 AM, AI and AU tests. So, if we are going to use ASHRAE 110 correctly, we have to look at each of these variations.

As Manufactured (AM) is conducted in a specified test room that has perfect room conditions. The purpose of this test is to isolate the fume hood from the room to see exactly how the hood design is performed. Given the fact that AM tests are conducted under highly standardized conditions, we are able to compare the performance of various hoods. AM is really testing the hood's design.

As we move on to the As Installed (AI) version of ASHRAE 110, we are now seeing how the hood interacts with the room. A hood could perform well in an AM test and then perform poorly in an AI test because of the room conditions. Most failures are at least partially caused by room conditions. If a hood performs well in the AM and AI, we know the hood and the room are working well together. The more robust the hood, the better it will perform under a wide range of hood conditions.

The As Used (AU) focuses on testing the impact of the equipment setup and user actions. The AU test is the closest thing to the real-world conditions in a lab. This test takes a far more holistic view since the hood, the room conditions, and the user are taken into account. Each version of ASHRAE 110 is testing something different.

You have had a Face Velocity Profile (ASHRAE 110) performed on your hood. What does that data tell you?

Many people think that the airflow in a fume hood is mostly laminar. In reality, fume hoods are very turbulent devices.

What if you could visualize the airflow in real-time?

With the **Tri-Color Airflow Visualizer**, you can begin to see the ever-present turbulence. By adding laser light and cool haze to the airflow, we can then illuminate the airflow.

Whatever is happening across the sash opening is very dynamic and this turbulence influences the face velocity. Outside of a test room, it is almost impossible to get a flat profile reading across the sash opening.

Fume hood velocity alarms are very misleading. There is actual footage where we have a legitimate face velocity reading, yet the hood was failing miserably in containing the smoke. Most of the hood velocity alarms are mounted in the hood sidewall just above the sash opening. It is taking an average reading from a single point that isn't even in the plane of the sash.

When you consider that the function of a fume hood is to capture, contain, dilute and exhaust, a lot has to happen for that to work correctly. The laboratory ventilation system is a very complex mechanical system. For the hood to contain and exhaust, the hood has to be a lower pressure area than the room. Even within the fume chamber, the baffles are the major component that moves the air towards the exhaust plenum in the rear.

The fume hood's ability to dilute is another key factor of containment. The amount of internal air changes and the baffle's ability to evacuate the hood effectively

will determine concentration buildup within the hood. Face velocity is a factor in determining how well a hood captures, but capture and containment are two separate concepts.

The only way to know how a fume hood is performing is to regularly test.

It is time to upgrade your testing to something that is more reliable than simple velocity readings. At a minimum, you should conduct a Face Velocity Profile. A well performed Face Velocity Profile is a good predictor of containment, but even that leaves a lot of questions. If we place a recording velocity probe in a single position and record once per second for 24 hours, you would see a wide array of values.

Let's say the alarm is showing 100 fpm; your single point readings could vary as much as 40%. You would also notice that the value is ever changing. This variation is caused by two things: turbulence in and around the hood, and the balance of the room (differential pressure).

Actual testing of thousands of hoods in many situations has confirmed the insignificance of face velocity as the exclusive factor or even the primary factor in predicting fume hood efficacy.

While ASHRAE 110 has a procedure for doing a Face Velocity Profile, the method leaves a lot of room to achieve a less-than-accurate dataset. While ASHRAE 110 -2016 requires a datalogger and no longer allows hand holding of the probe(s), it doesn't give much guidance for the tester to determine what the test data means. As such, for most testers and recipients of the report, the data is not actionable.

Hoods often have "face velocity" alarms affixed to the front of the hood. What is the device actually measuring? Most alarms have a single side wall sensor that collects data and displays an average face velocity. Thus, the benefit of the alarm is that it measures a certain amount of air passing through the hood at an average speed of X. Remember, airflow is not an indication of containment. The quantity of air (flow) passing through the hood, per a unit of time, is no longer considered to be the only criteria necessary to determine how well the hood will function.

The general myth that face velocities somehow equate to a hood's performance level, simply by specifying a minimum face velocity, actually lulls the user into believing that the hood is performing adequately solely because an arbitrary face velocity has been achieved. In reality, the face velocities will tell a tester nothing about how well the hood is working or whether the hood is providing adequate protection to the user.

It's time to break the Face Velocity Myth - We need to shift the conversation from face velocity to containment. ●

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 2018 Past President Don Hill to discuss his personal journey with NEBB below:

The NEBB Professional (NP): What generation do you identify with?
Don Hill (DH): Booommerrrr.

NP: How did you initially get involved with NEBB?
DH: I wanted to get certified to start a TAB group for a company to allow me to do my own thing and not be handcuffed by only doing design work. I also knew that I did not want to sit behind a desk and wanted to be out in the field where we had to make what engineers put on paper work.

NP: What made you want to get more involved? What committees or positions have you been involved with?

DH: In 1986, I got certified in TAB. Jerry Bauers recruited me to get involved with the board at a chapter level in 2002, and later asked me to get involved with the cleanroom committee in 2004. In 2011, I was asked to join the Board of Directors at the National level and then served as NEBB President in 2018.

NP: Was it difficult to find the time to volunteer with NEBB?
DH: I had no difficulties with finding time to volunteer with NEBB. I was in college until 2000 and taking a break from night classes allowed time to volunteer for NEBB.

NP: How do you feel your involvement with NEBB has been an investment in yourself and your career?
DH: NEBB has been a worthwhile investment to me in the ways it's facilitated collaboration with peers and competitors, and provides value every step of the way.

NP: What would you like to see for the future of NEBB? How do you see NEBB transforming in years to come?
DH: The development of ANSI standards makes us a stronger organization by bringing in experts from outside our organization, which is critical to our success. I'd like to see more involvement and participation with outside organizations. This is the only way we will continue to grow and develop new programs.

We also need to engage more women and younger people in the organization–they are our future.

NP: As a business owner, you've led others through transformation and adaptation before. What do you think helped facilitate any changes that led to a brighter future?
DH: It is obvious from looking at the industry overall that Boomers, in most cases, have failed to pass along knowledge and share experiences. We, as an industry, need to engage the younger people, get them involved, and let them take risks.

When I started in this industry, I was given a pile of books and a stack of forms and told that everything I needed to know to complete the forms was in the books, figure it out! That was cooling load calculations and psychrometrics—a little overwhelming for someone that was 18 years old. It was a great way to learn, but difficult to do today. I took that same approach with a couple of people who still work for me and it has worked well. They have developed skills that allow them to troubleshoot issues and resolve problems. One has been with me since 1987 and one since 1999. ●

NEBB Reports and Instrument Calibration Certificates

By Jeff Schools

While talking to various Firms during the 2024 Recertification Cycle, I noticed that a lot of them didn't realize that NEBB issued an Errata to all Procedural Standards on July 1, 2022 that states: *The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.*

This is true for all disciplines except for Cleanroom Performance Testing. Cleanroom Performance Testing has always had a section in the Procedural Standard stating that calibration certificates are required in all NEBB issued reports. This can be found in Section-5, Sub-Section – 5.2.6, Instrument Calibration Certificates.

Below you will find a listing of all Erratas issued on July 1, 2022, concerning Instrument Calibration for each discipline.

Building Enclosure Testing

Erratum #1

Page 9, Sub Section 5.2.5 Instrument Calibration states:

5.2.5 Instrument Calibration
This is an overall listing of the instruments used to verify reported data.

a. *Instrument type*
b. *Instrument manufacturer*
c. *Instrument model number*
d. *Instrument serial number*
e. *Date of instrument calibration*

Page 9, subsection 5.2.5., Instrument Calibration was changed to the following:

5.2.5 Instrument Calibration
The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.

Whole Building Technical Commissioning

Erratum #1

Page 210, Test Instrument Calibration Records states:

Test Instrument Calibration Records
"Insert instrument calibration records for any instrumentation utilized in the commissioning process by the provider."

Page 210, Test Instrument Calibration Records was changed to the following:

Test Instrument Calibration Records
The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.

Technical Retro-Commissioning of Existing Buildings

Erratum #1

Page 27, Section 20.2, RCx Report states:

20.2. RCx Report
The report shall include the following:

a. *Title page,*
b. *Certification Page*
c. *Executive summary,*
d. *Details of each recommendation,*
e. *RCx plan,*
f. *Preliminary energy analysis,*
g. *CFR,*
h. *Quick fix and deferred maintenance improvement report,*
i. *Assessment reports,*
j. *Facility operating guide,*
k. *Training records, and*
l. *Testing documentation.*

Page 27, Section 20.2, RCx Report, add the following:

m. The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.

Fume Hood Performance Testing

Erratum #1

Page 14, Sub Section 5.2.6 Instrument Calibration states:

5.2.6 Instrument Calibration
This is a listing of the instruments that will be used to verify the reported data including instrument type, manufacturer, model number, serial number, and calibration date.

Page 14, subsection 5.2.6., Instrument Calibration is revised to the following verbiage:

5.2.6 Instrument Calibration
The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.

Sound and Vibration

Erratum #1

Page 9, Sub Section 4.2.4 Instrument Calibration (Page) states:

4.2.4 INSTRUMENT CALIBRATION (PAGE)
This is a listing of the instruments that were used to measure and verify the reported data:

Instrument Type	*Instrument Manufacturer*	*Instrument Model Number*	*Instrument Serial Number*	*Date of Instrument Calibration*	*Due Date of Instrument Calibration*	*Dates of Use*

Page 9, Sub Section 4.2.4 Instrument Calibration (Page) was changed to the following:

4.2.4 Instrument Calibration (Page)
The Final Report must contain a summary list of all instrumentation and equipment used on the project accompanied by copies of the current calibration certificates.

Testing, Adjusting, and Balancing

Erratum #1

Page 14, subsection 5.2.6, Instrument calibration states:

5.2.6 Instrument Calibration
This is a listing of the instruments that were used on the project or will be used to verify the reported data including instrument type, manufacturer, model number, serial number, and calibration data.

Page 14, subsection 5.2.6., Instrument Calibration was changed to the following:

5.2.6 Instrument Calibration
The Final Report must contain a summary list of all instrumentation and equipment used on the project or will be used to verify reported data, accompanied by copies of the current calibration certificates.

In order to issue a complete NEBB Report, you must include copies of current calibration certificates for each instrument used on the project.

NEBB Certified Technicians

Also, something that is overlooked is the fact that the TAB Procedural Standard states that at the least, a NEBB Certified Technician must be continually present while TAB work is being performed on every NEBB project.

This verbiage can be found in the 2019, *Ninth Edition, Procedural Standard for Testing Adjusting and Balancing of Environmental Systems* in Section 2, NEBB Programs, Quality Control & Compliance, Sub-Section 2.4.3 Coordination/Supervision:

2.4.3 Coordination/Supervision

The NEBB Certified Professional is responsible for ensuring either a NEBB CP or NEBB CT is continually present while TAB work is being performed on every NEBB certified project and directing those technicians in performing the work. The NEBB CP is ultimately responsible for the accuracy of any field measurements and certified reports generated.

In order to be in compliance with the NEBB TAB Procedural Standard, all Firms must ensure that either a NEBB Certified Professional or NEBB Certified Technician is continually present while TAB work is being performed. ●

Introducing the NEBB YPN Honors Program

Do you know a young professional between the age of 20-39 whose achievements deserve recognition?

The NEBB YPN Honors Program is more than an accolade; it celebrates those who have left an indelible mark on the NEBB industry. This program is crafted to acknowledge and honor young professionals who embody exceptional leadership, paving the way for a brighter future.

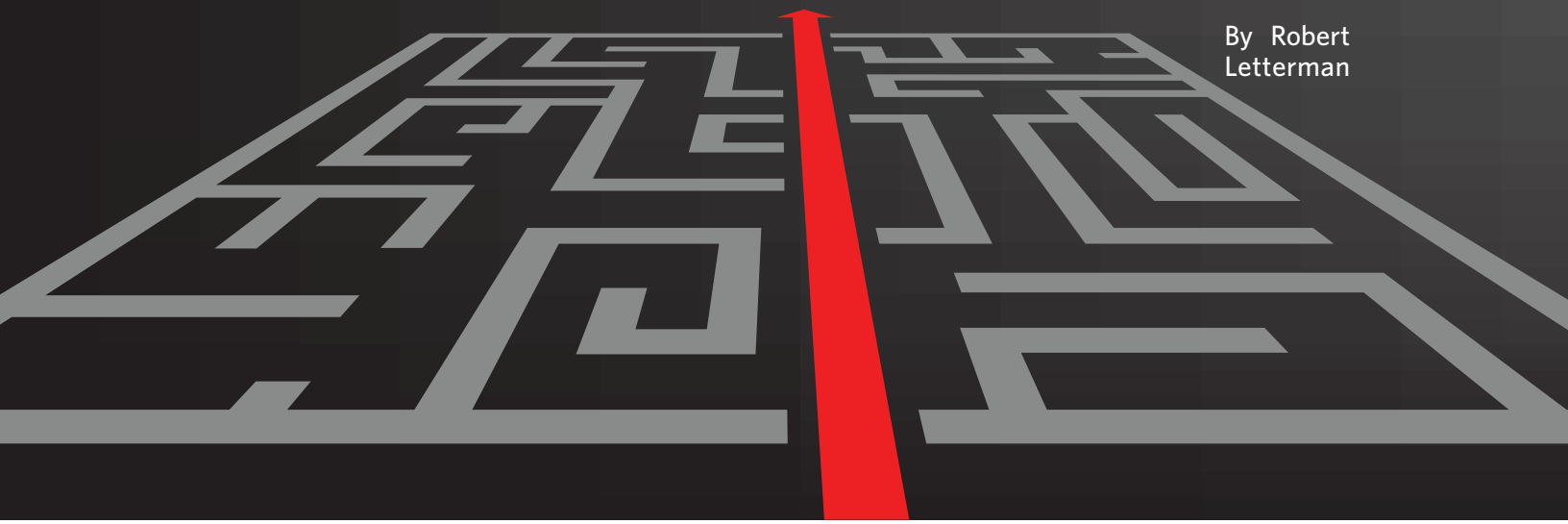
Nominate a young professional and learn more at:
https://www.nebb.org/nebb-ypn-honros-program/

NEBB® YPN
Young Professionals Network
ypn@nebb.org

WAR STORIES

Coil Misinformation

By Robert Letterman



In the world we live in today it seems there is misinformation everywhere. You hear about it all the time, whether it be political, medical, or sports related. It doesn't seem to matter what the subject is, it's everywhere. Some of this misinformation is done for gain, while other situations are just mistakes. I believe this war story is the latter.

This war story begins at a small local college in southern Indiana that had just completed a conference center overlooking a lake. We had been methodically working through the test and balance of this two-story, very open building. Right at the front entrance, there was a large staircase leading to a lower level overlooking a 30-foot-tall glass wall with a view of the lake. At the top of this staircase, in a hard ceiling, was a large terminal box with hot water reheat serving an adjacent room with a two-story ceiling.

This terminal box was located as the last device in the hot water system, making it the reference for the differential pressure setup with the pumping system being located on the lower floor at the far end of the building.

The real trouble began when we found that we could not reach the design water flow for the terminal box in question. Of course, the first actions taken included checking all strainers to see if anything was in the system obstructing our water flow. After finding that our system was clean, we began to suspect something was up with the terminal box reheat coil and began to look into it.

We had been relying on the balance valve to provide an accurate water flow measurement. To verify its accuracy, a coil pressure drop was taken along with the pressure drop of the control valve. The coil pressure drop was very high, but the control valve CV calculation indicated that the balance valve was spot on. We had now determined the coil must have some kind of blockage.

Being that this was a difficult place to replace a coil and the finishes for the building were all but complete, we decided the best approach would be to have the mechanical contractor and the engineer meet us onsite to see for themselves the measurements we had already

seen. This worked out well, as all agreed the coil would have to be replaced.

The coil manufacturer was notified and agreed to replace the coil, but doubted there was truly anything wrong with the existing coil and asked that the mechanical contractor return it. We also had our suspicions about the coil.

When the new coil arrived, we voiced our concerns about the coil to the mechanical contractor, believing the new coil was going to perform the same way the original had. Now this is when you know you are a good mechanical contractor...Our contractor offered to pipe this coil in the shop with a pump and a balance valve! Again, this was a difficult replacement and no one wanted to have to do this twice.

After the contractor had piped the coil, we measured the coil pressure drop and the balance valve with the same conflicting results. The coil had a higher than design pressure drop, but a low water flow. We then videotaped the process of taking these measurements and sent it to the manufacturer.

After many conversations with the engineer and the mechanical contractor, the manufacturer sent a different coil than the one originally specified and installed. When we asked the engineer what the issue was with the original coil, he indicated that they had published incorrect information.

The new coil was installed and the system operated as it was intended. The pumping system now had enough head to provide the designed hot water flow to all equipment.

This is just another story about how the due diligence of our trade can make a huge difference in the operation of a building. ●

Chapter News

Florida EBB Chapter

Terry Wichlenski

Florida EBB (FEBB) is celebrating 43 years as a chapter with NEBB. Join us at our 2024 Recertification Seminars and Vendor Expo from April 25-26, 2024 at the Rosen Shingle Creek Orlando. Come join in the educational sessions, as well as a Corn Hole Tournament and/or Golf Tournament. NEBB President Luis Chinchilla will hold a session on NEBB & AI: Can they beat the odds together?

The chapter will also be offering the TAB Practical Exam once two or more candidates apply and an exam site is available.

Please contact Terry Wichlenski, FEBB Chapter Coordinator, at 727-240-4254 or Febbchapter@nebb.org for additional information or registration.

Bonneville EBB Chapter

Shelley Lester

Bonneville EBB is hosting a Technician Training Seminar from February 22 - 23 in Salt Lake City, Utah. Contact Shelley Lester at bonnevillechapter@nebb.org for details.

The Bonneville EBB Chapter meeting and recertification seminar is scheduled to take place on Friday, April 19, 2024 at the Hilton Garden Inn located in Sandy, Utah.

Great Plains NEBB Chapter

Meredith Carr

Wrapping up 2023, the Great Plains NEBB Chapter held a networking event at J. Rieger & Co. We had about 50 attendees who participated in networking, took a distillery tour, and had dinner together the evening before the recertification seminar. The chapter's annual recertification seminar had a total of 93 partic-

ipants. Additionally, a TAB training course for 35 professionals took place.

2024 Great Plains NEBB goals include:

- Two TAB training courses (Spring/Fall)
- Annual recertification seminar (Fall)
- Launch of eCommerce platform on website

Please contact Chapter Coordinator Meredith Carr at greatplainschapter@nebb.org for further details on the chapter's upcoming 2024 events. ●

2024 NEBB Technical Seminars Schedule

- **Building Enclosure Testing Seminar**
  June 10-12, 2024 at NEBB TEC in Gaithersburg, MD

- **Clean Performance Testing Seminar**
  August 26-28, 2024 at NEBB TEC in Gaithersburg, MD

- **Commissioning CxCT Seminar**
  July 15-17, 2024 at NEBB TEC in Gaithersburg, MD

- **Fume Hood Performance Testing**
  May 6-9, 2024 at NEBB TEC in Gaithersburg, MD
  September 17-20, 2024 at Labconco, Kansas City, MO

- **Retro-Commissioning for Existing Buildings Seminar**
  August 12-14, 2024 at NEBB TEC in Gaithersburg, MD

- **Sound & Vibration Seminar**
  September 9-13, 2024 at Texas EBB

- **Testing Adjusting and Balancing Seminar**
  May 16-19, 2024 at NEBB TEC in Gaithersburg, MD
  September 19-22, 2024 at IMI Training Center, Irving, TX

- **Testing Adjusting and Balancing CT**
  October 28-30, 2024 at NEBB Annual Conference, Phoenix, AZ

Visit https://nebb.org/events/ to register or learn more

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