



## 30<sup>th</sup> Annual Technical Conference: Opportunities for a Clean Energy Economy

### For Whom:

Presentations for entry level and senior level engineers, architects, designers, students, salespersons, manufacturers, contractors, building officials, building owners, and building managers and operators.

### When & Where:

Friday, April 29, 2022, at the:  
Sheraton Denver West Hotel  
360 Union Blvd.  
Lakewood, CO 80228

### Professional Development Hours (PDH):

The 11 sessions eligible for GBCI credit are indicated on the Certificate of Attendance. If you would like GBCI credit, please sign the attendance sheet located in these sessions. In addition to signing in, credits must be self-reported to GBCI.

### *Thank-you:*

We would like to thank all our sponsors for this event. Sponsor names are listed below and will be on signage at the conference. Without everyone's support, this conference would not be possible.

### Your Cost:

#### Prices before April 8th

\$250 Member Full Day Ticket (Includes Lunch)  
\$230 Member 5 or More Tickets - Full Day (Includes Lunch) - Price is Per Ticket  
\$300 Non-Member Full Day Ticket (Includes Lunch)  
\$250 Non-Member 5 or More Tickets - Full Day (Includes Lunch) - Price is Per Ticket  
\$60 Keynote Presentation and Lunch Only Ticket (Member / Non-Member)

#### Prices After 11:59pm April 8th

\$270 Member Full Day Ticket (Includes Lunch)  
\$250 Member 5 or More Tickets - Full Day (Includes Lunch) - Price is Per Ticket  
\$320 Non-Member Full Day Ticket (Includes Lunch)  
\$270 Non-Member 5 or More Tickets - Full Day (Includes Lunch) - Price is Per Ticket  
\$75 Keynote Presentation and Lunch Only Ticket (Member / Non-Member)

#### Prices Day Of:

\$320 Flat Fee for Full Day (Includes Lunch)  
\$75 Keynote Presentation and Lunch Only

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Western Mechanical Solutions  
SUSTAINABLE HEATING COOLING



## Luncheon Keynote Address:

Sponsored by: LONG



### **2030 and Beyond – Opportunities for a Clean Energy**



**Economy**

Global climate change is arguably the most important issue today, especially in the design and engineering of the built environment. With buildings responsible for about 40% of carbon dioxide emissions, many policies are being developed that focus on the decarbonization of buildings. Many jurisdictions are now requiring new buildings to be low carbon or net-zero in the near-term and other policies are requiring retrofits of existing building stock in the medium to long term to decarbonize. As we transition to a clean energy economy, the built environment will undergo significant transformation to provide the resources needed to design and build zero carbon and resilient buildings.



**Speaker: Dunstan L. Macauley, P.E.** is a building systems practitioner with over twenty-five years of experience in the design of engineering systems for the built environment. He is currently a Director at Setty and Associates, specializing in the design of a variety of systems for commercial and institutional projects. Mr. Macauley is instrumental in the firm's High Performing Buildings practice.

Mr. Macauley is a graduate of the University of Maryland and is a registered professional engineer in New York State and the District of Columbia. Mr. Macauley is also an ASHRAE-certified, High-Performance Building Design Professional.

Mr. Macauley currently serves on the ASHRAE Board of Directors as a Vice-President. Founded in 1894, ASHRAE is a global leader in the advancement of human well-being through sustainable technology for the built environment. As an industry leader in research, standards writing, publishing, certification, and continuing education. ASHRAE and its members are committed to shaping tomorrow's-built environment today through strategic partnerships with organizations in the Heating, Ventilation, Air-Conditioning, and Refrigeration (HVAC&R) community and across related industries.

## Afternoon Technical Keynote and Open Bar:

Keynote Sponsored by: RMH Group



Open Bar Sponsored by: Energy Services of Colorado



**State of Colorado and City & County of Denver  
Building Performance Standards and Requirements**



The State of Colorado passed legislation in June 2021 that requires reduction of greenhouse gas emissions in all buildings in the state over 50,000 SF. This legislation will require

facilities to achieve these goals through a combination of energy and carbon benchmarking, energy efficiency improvements, implementation of renewable energy technologies, and electrification of heating systems. The City and County of Denver also just passed the Energize Denver Ordinance that requires building over 25,000 square feet to benchmark energy performance and meet certain building performance targets over time. The targets vary based on building type, but generally facilities are required to reduce energy consumption each year until that energy target is achieved. This can be done through energy efficiency measures, renewable energy generation, or other prescriptive compliance paths.

**Speaker: Bill Green, PE,** is Chairman of The RMH Group based in Lakewood, Colorado, a 75-person mechanical, electrical, and sustainable engineering firm. Bill holds a BS degree in mechanical engineering from the University of Colorado at Boulder and is a registered professional engineer. He currently serves as President of the American Council of Engineering Companies of Colorado and is the professional engineering representative on the Colorado Energy Office Task Force for Building Performance Standards formed with the passage of House Bill HB21-1286, Energy Performance for Buildings in Colorado.

**7:30 – 8:00: Check-In / Registration**

## **TRACK 1 – HVAC&R FUNDAMENTALS**

**Sponsored by: Western Mechanical Solutions**



**Western Mechanical Solutions**  
SUSTAINABLE HEATING COOLING

**8:00 – 8:55: Psychrometrics**

This presentation will cover the basics of psychrometrics and the psychrometric chart. Terminology, chart layout, and uses will be discussed. How to use a psychrometric chart for system design and formulas will also be discussed.

**Speaker: Michael Fulton, P.E.** founded Western Mechanical Solutions to focus on minimizing the energy use of buildings through innovative application of engineering. WMS represents various energy recovery products. Mike has 30 years of experience in equipment sales, consulting and construction. He graduated from the University of Maine with a degree in Mechanical Engineering. He is actively involved with ASHRAE, past president of the Rocky Mountain Chapter (2002-2003), has been involved with the local ASHRAE tech conference since 1996, and has been the north section (Fort Collins) chair since 2008.

**9:00 – 9:55: Altitude Effects on System Design**

This talk focuses on a range of system design topics where an awareness of high-altitude considerations is essential to good design. Given the current emphasis on “right-sizing”, proper consideration of high-altitude effects can make the difference between success and the other possibility. Subjects include airflow calculations, fan selection, ductwork, air-cooled equipment, cooling towers, motors, combustion equipment, pumps, evaporative coolers, shop drawing review to confirm compliance, and baseball. Even new types of equipment such as condensing boilers still require high altitude design consideration.

**Speaker: Michael Haughey, P.E.,** Principal of Silvertip Integrated Engineering Consultants, has 45 years of experience in HVAC & Mechanical consulting, facilities engineering, energy analysis, systems commissioning, systems troubleshooting, and sustainability consulting. His roles have included -Past President of the Rocky Mountain Chapter ASHRAE; CRES Board of Directors & Secretary, USGBC – Colorado Board of Directors, Education Director, Programs Coordinator, Greenbuild 2006 Host Committee Chair.; Keynote Speaker for the Rocky Mountain Chapter ASHRAE 2004 Annual Tech Conference, and past adjunct professor, HVAC Design, CU Denver and CU Boulder. He specializes in alternative and energy-conserving systems such as indirect-direct evaporative cooling, mass thermal storage, ice thermal storage, ground-source heat pumps, solar heating, energy audits, energy retrofits, natural ventilation, peer review, troubleshooting, sustainability consultation, net-zero energy systems. He has developed and presented over 65 seminars.

## 10:25 – 11:20: Pumping System Fundamentals

This presentation will discuss basic pipe sizing, expansion tanks, pumps, and other equipment. Hydronic/pumping design options such as constant flow, ride the curve, primary secondary, variable primary, etc... will also be discussed.

**Speaker:** Mark Jelinske, P.E., Chief Mechanical Engineer at the RMH Group, has over 35 years of engineering experience, primarily as a consulting engineer, as well as a project engineer for a large mechanical contractor. He has been providing training and mentoring in house and at technical conferences for over 15 years. He is a registered Professional Engineer in Mechanical Engineering and Fire Protection Engineering. He is active in the development process for several model codes, NFPA standards, and the FGI Guidelines. He has served as the ASHE Code Advocacy Liaison for Colorado, and served on the Denver Mechanical, Plumbing, and Fuel Gas Committee for the 2019 Denver Code Amendments. He has a Bachelor of Science degree from the University of Missouri- Rolla (Missouri University of Science and Technology).

## 1:15 – 2:10: Overview of ASHRAE 90.1



ASHRAE Standard 90.1 – 2019: This presentation will be an overview of the Standard and review some of the significant changes included in the 2019 version that was released last fall. The presentation will focus specifically on the major changes to the Mechanical Chapter of the standard that will affect mechanical engineers.

**Speaker:** Christian Taber is a Principal Engineer at Big Ass Fans focusing on codes and standards. He is an ASHRAE certified High-Performance Building Design Professional, a Certified Energy Manager, and a committee member of ASHRAE Standards 90.1 and 189.1. He was also a member of the USGBC Energy and Atmosphere Technical Advisory Group. He is a committee member for recent revisions to AMCA 230, AMCA 208, and AMCA 211. He holds an M.S. in mechanical engineering and B.S. in chemical engineering from Iowa State University, and an M.S. in biosystems engineering from the University of Kentucky.

## 2:30 – 3:25: Refrigeration Fundamentals

The Reverse Carnot or refrigeration cycle is a critical part of our day-to-day life here in Denver, Colorado. Refrigeration is not only important because it keeps your brews cold, but because it is the same mechanical process used to for air conditioning.

This will help you brush up on or introduce you to the refrigeration cycle as well as teach you what are the typical causes of refrigeration trips so you can better troubleshoot problems.

The Reverse Carnot Cycle extracts heat from one system and expel it into another system. To properly explain this process in detail our presentation will be diving into Thermodynamics, Pressure Enthalpy diagrams, Gas Compression Process, Conservation of Energy as we break down the refrigeration cycle. Whether specifying, installing, maintaining, or purchasing equipment it's important to know the principles that drive how air conditioning equipment operates.

**Speaker:** Nathan Ducey, P.E. is a Sales Engineer at Western Mechanical Solutions. Nathan has been active in the industry for nearly five years, having experience working in equipment sales and for an equipment manufacturer. He graduated from Gonzaga University in 2017 with a degree in Mechanical Engineering. Nathan is an active member in ASHRAE and is a member of the YEA Denver Chapter YEA Committee.

## TRACK 2 – HVAC&R SYSTEMS & APPLICATIONS

Sponsored by: CFM Company



## 8:00 – 8:55: Highly Efficient Boiler Systems

and Designs



High efficiency boilers have become the law of the land. Understanding how we get this efficiency and how we use this equipment is very important to proper performance and longevity of the system and equipment. This presentation will review how we are able to get ultra-high efficiencies and the best way to integrate into current and retrofit systems. This presentation will also review the system piping, pumping, venting and gas feed to the boiler.

**Speaker:** Ken Eggleston, Director of Sales for Mestek Boiler Group. Ken has over 16 years of experience in the HVAC industry working both at Mestek in a variety of roles and as a

National Sales Manager for SpacePack, a spatiality air conditioning and heat pump manufacturer. He has worked in various capacities of product development and sales and has played an instrumental role in the success of many Mestek divisions. His career began with Mestek as a development project manager. His career exposure to hydronic applications, including air-to water heat pumps and high efficiency boilers has given him a unique and thorough

### **9:00 – 9:55: Displacement Ventilation – Utilizing Chilled Beams to Deliver Effective IAQ, Reducing Space Contaminants While Considering Acoustics, Thermal Comfort and Energy Savings. Understanding the Whys and Hows.**

ASHRAE's 4/5/21 statement regarding Airborne Transmission Guidance: "Airborne transmission of SARS-CoV-2 is significant and should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures. "

With the heightened awareness of how the ventilation systems can affect the risk of shared contaminants, understanding the varying types of ventilation designs has gained increased importance for building designers and operators. Displacement ventilation techniques, as compared to more traditional mixed air systems, have shown to provide improved Indoor Air Quality (IAQ) for occupants as it effectively lifts contaminants away from the breathing spaces.

**Speaker:** Einar K. Frobom, PE, MBA; is the director of Sales and Marketing for Carson Solutions. With over twenty-five years of HVAC related experience, Einar's involvement ranges from custom air handler design incorporating concepts such as air-to-air energy recovery, moisture transfer media, complex custom refrigeration systems, and enhanced IAQ solutions and DOAS systems. In his current role, he's educating others on the system benefits of quiet, efficient displacement ventilation combined with active chilled beam technology. Einar holds the following degrees: Bachelor of Science in Mechanical Engineering and a Master of Business Administration, both from the University of Minnesota. He is also a licensed Professional Engineer within the state of Minnesota.

### **10:25 – 11:20: Vibration Isolation and Extreme Event Engineering**

Extreme Event Engineering and Vibration Isolation are important aspects to any project. Knowing and understanding how to apply, design and understand the requirements and components of these systems is critical. This presentation will cover the various codes and requirements that must be understood as well as reviewing the definitions of seismic, who is responsible for what and what types of equipment must be used. Upon completion of this presentation, the audience will understand how to incorporate the appropriate equipment into their designs, minimize risk and will be shown how to schedule seismic criteria and vibration isolation properly.

**Speaker:** Greg Schmelig, Leed AP, Regional Sales Manager for Vibro-Acoustics. Greg has over 28 years of experience in the industrial/commercial marketplace. He has spent his career with Vibro-Acoustics in the Noise Control division as a regional sales manager, a direct sales representative for the Vibration Isolation and Restrain Systems (VIRS) and most recently has taken the role of the regional sales manager for the VIRS division.

### **1:15 – 2:10: Designing DOAS Equipment for Electric Buildings in Cold Climates**

The Electrification Movement is here and with this movement electrical loads on buildings have become very critical. Specifically, the electrical impact from DOAS equipment with energy recovery in cold climates can be extreme. Understanding the available energy recovery technologies, the defrost strategies and the specific amount of heat required for neutral air for each technology is important. This presentation will review the application and performance of DOAS AHUs equipped with wheels, plates and regenerative energy recovery equipment as it effects the buildings electrical load. Each system has unique operating requirements for defrost strategies along with features, benefits and hurdles when operating in cold climates. The goal of the presentation is to provide operating performance during sub-zero design conditions for each technology to aid in the selection of an energy recovery system that is best suited for your application.

**Speaker:** Dean Scheurich, National Sales Manager for Tempeff. He has over 25 years of experience in the HVAC market supporting engineering and applications efforts for a multitude of technologies. These technologies include precision cooling, humidification, geothermal, WSHPs, DOAS



and commercial air handling equipment with wheels, plates, heat pipes and fixed bed regenerative technology energy recovery. Dean is a joint patent holder of the Dualcore Plus technology and is intimately familiar with energy recovery and proper applications.

## 2:30 – 3:25: Steam Distribution System Fundamentals, Applications and Design Considerations

Steam systems are encountered in many campus settings, and steam distribution systems offer challenges for design engineers and system operators. In addition, the high pressures associated with campus steam systems add significant risk, as catastrophic failures can result in loss of property and life. This talk will cover why steam systems are selected, steam distribution system fundamentals and important design considerations, including pipe expansion compensation and control, condensate management and terminal equipment connections and controls.

**Speaker:** Barry Stamp, P.E. Mr. Stamp is a Senior Engineering Specialist with the RMH Group. He has 36 years of engineering experience in Colorado, including 31 years in consulting engineering and 5 years with a major mechanical contractor. He earned his BSAE from the University of Colorado and has been extensively involved in steam system generation and distribution projects in higher education and healthcare campuses.

## Track 3 – SUSTAINABILITY

**Sponsored by: McNevin Company**



## 8:00 – 8:55: Electric Boiler Design



Electric boiler design

- A quick history of electric boilers
- Electric boilers and where they fit in to the world today
- Types of electric boilers
- The future of electric boilers

**Speaker:** Joshua Cagno, A graduate of Theil College. Josh has worked in the HVAC and Plumbing industry for over 15 years. Starting at Cemline as inside sales and working his way up to Eastern sales engineering manager. Josh is currently the national sales manager for Cemline.

**Speaker:** Kenneth DuBois, A graduate of Cal State Fullerton. Ken also has of 15 years of experience in the HVAC and Plumbing industry. Starting his career in Southern California working for a local Manufactures rep firm. Ken has since worked for a few different manufacturers as a regional sales manager. He is currently the Western regional sales manager for Cemline.

## 9:00 – 9:55: Optimizing Buildings for Zero

### Carbon Lifetime Operations



With the increasing push towards electrification many jurisdictions, including Denver, are attempting to create a path towards decarbonization. To evaluate the impact of these policies, it is critical to analyze buildings based on their projected GHG emissions. This session will expand upon the 2021 Winter Tech Conference session: Building Electrification and Decarbonization with 30-yr GHG Forecasts Using Marginal and Average Emissions, where we reviewed office buildings' lifetime emissions using NREL's hourly Cambium data for multiple cities. We will now attempt to minimize the buildings' operational carbon by employing various strategies including electrification, onsite renewables, and battery storage. Inevitably some regional electrical grids and buildings will have better alignment with 24/7 options for low carbon energy while others will struggle with limited onsite resources and a carbon intensive grid.

**Speaker:** Nasim Mirian, PhD, LEED AP BD+C - Nasim is an energy modeler at ME Engineers in Golden, CO. Having the Physics background and experience working on advanced energy modeling, optimization and performance analysis, she has earned high proficiency in providing detailed energy analysis for new and existing buildings for early design decisions, code compliance, and third-party certification (such as LEED). Her expertise includes daylighting analysis, CFD analysis, building energy audit, Performance Measurement and Verification (PM&V), high-performance building design, indoor environmental quality (IEQ), and performance monitoring. In addition, she has completed her PhD in Environmental Design

that was fueled by her passion for the design and development of sustainable built environment

**Speaker:** Caitlin Anderson, P.E., LEED AP BD+C - Caitlin Anderson is an associate within the building performance group at ME Engineers. She has experience with energy modeling for LEED, code, and design assistance on a wide range of building types. She is very involved with the Rocky Mountain ASHRAE chapter and currently serves as the Secretary for the 2021-2022 year. Caitlin obtained her bachelor's degree in mechanical engineering from the University of Santa Barbara and her master's in Building Systems at the University of Colorado Boulder. While at the University of Colorado she also obtained certificates in Renewable and Sustainable Energy as well as Engineering in Developing Communities. She is a LEED AP BD+C.

**Speaker:** Jamy Bacchus, P.E., LEED AP BD+C, BEMP - ME Engineers Senior Associate Jamy Bacchus is a mechanical engineer with over 25 years of experience ranging from designing net zero energy projects, energy modeling, conducting energy audits and advising energy policy. He has written and presented on diverse topics from alternative net zero definitions and policy ramifications of current metrics to cost effectiveness of urban infill using various construction methods to lifetime GHG assessments of the built environment at ACEEE, Greenbuild, ASHRAE and CTBUH. Jamy has lectured at Columbia University, SUNY and Stanford.

## 10:25– 11:20: Target EUI's and

### Electrification

The presentation will compare predicted EUI's with actual performance and discuss potential upgrades for meeting Energize Denver's 2030 target EUI's. We will use examples for an office building and a multifamily building, both of which are reporting energy consumption for Denver's benchmarking. Before addressing the upgrades, we will identify some of the modeling calibration efforts we have undertaken to obtain better agreement with actual EUI's. We will compare upgrade options, including electrification and considerations for power distribution systems, improving operations, replacing equipment, and installing PV.

**Speaker:** Taylor Roberts, P.E. - Taylor is a Professional Engineer with over nine years of experience in the building energy field. Taylor's focus is energy consulting with an

emphasis on energy analysis and optimization. He is proficient in whole building energy analysis using OpenStudio, EnergyPlus, and eQuest and leads our research and development projects for clients looking to streamline analysis, model new technology, or perform large-scale analyses across the country. Taylor manages our energy projects for higher education, healthcare and laboratories, as well as multifamily projects.

**Speaker:** Libby Coleman, P.E. - Libby is a Professional Engineer with over four years of experience in the building energy field. Libby works with design teams to evaluate cost-effective energy design solutions and validate energy code compliance using building energy models. Libby's modeling specialization is with OpenStudio and EnergyPlus for a wide array of building types. Libby provides training on the current energy codes and research on electrification and new technology. She also develops in-house tools to streamline energy modeling processes and enhance consulting services.

## 1:15 – 2:10: Ready for Prime Time: Zero Carbon past, present and future from a Zero

### Carbon pioneer

A longtime leader in Zero Energy and Zero Carbon buildings and communities will share the basic elements and philosophy behind Zero Carbon, its history over the last two decades, the current state of the Zero Carbon market, and how the concept will become mainstream. He will then provide highlights of McKinstry developed Catalyst, on track to become the world's largest Zero Energy and Zero Carbon building, located in Spokane, WA. Brad will wrap up with a discussion of how to integrate Zero Carbon thinking into the broader perspective of client needs and total organizational performance.

#### Learning Objectives

- Learn the fundamental principles of Zero Energy and Zero Carbon buildings
- Understand application of Zero Carbon principles within context of a specific case study
- Comprehend integration of Zero Carbon design into broader design needs and opportunities

**Speaker:** Brad Liljequist is Director of Zero Carbon Solutions at McKinstry, where he leads deep carbonization of existing buildings for public and institutional clients. He managed the

zero energy and carbon elements for Catalyst, and many other zero energy/carbon projects for McKinstry. Previously, he directed the energy, carbon and community programs for the International Living Future Institute, where he created the first international Zero Carbon building certification. He developed the first certified multifamily Zero Energy project in the United States, zHome, as well as Issaquah Fire Station 72, winner of the national ASHRAE Technology award. He is the author of The Power of Zero: Learning from the World's Leading Zero Energy Buildings. His work has been covered by The New York Times, the BBC, the Wall Street Journal, national NPR, The Seattle Times, Engineering News Record, Architectural Review, GreenBiz, and many other media. He was educated at Georgetown University, the University of St. Andrews, the University of Washington Evans School, and Seattle Central College.

### **2:30 – 3:25: Load Shifting using Commercial Heat Pump Water Heaters in Multifamily**



As the demand for all-electric multifamily construction continues to increase, so too comes the increased need for electrically powered devices to replace the gas-fired counterparts that have traditionally provided hot water for these buildings. Looking beyond simply electrifying these loads, electric utilities are seeing the unique benefit of electrically powered heat pump water heaters combined with storage. The thermal characteristics of DHW consumption of multifamily buildings in particular present unique options for electric utilities. to manage peak power requirements. This can be used to not only shift water heater loads to reduce peak loads, but it can also help to enable renewable generation. This presentation will discuss using commercial heat pump water heating systems as a readily deployable and cost-effective demand side management tool."

**Speaker:** Ryan Green has been in the HVAC and energy efficiency industry for over 12 years. Having been mentored early on his career by some of the nation's leading net-zero and geothermal heat exchange experts, all-electric HVAC system and plumbing systems utilizing heat pumps has been central in his development. From net-zero multifamily apartments to geothermal cannabis grow houses to low-carbon district energy systems utilizing wastewater heat recovery, Ryan has been fortunate to have been involved with some of the nation's largest and most influential projects – all with a central theme – heat

pumps. Today, he is a Director of Strategic Accounts for one of the nation's leading heat pump water heater manufacturers, Nyle Water Heating and works alongside their representative network to design and implement commercial and residential heat pump water heating systems.

## **Track 4 – DDC**

**Sponsored by: ATS**



### **8:00 – 8:55: DDC Basics: Building Automation 101**

This presentation will cover the basics of controls and DDC. It will include terminology, system types, and the evolution to DDC systems. Controllers and interface hardware as well as their types of inputs and outputs will be covered. We will also be learning about the software side of DDC which include interfaces, programming, and protocols.

**Speaker:** Ken Nekvasil MBA, General Manager for Energy Services of Colorado, has been in the HVAC industry for over 37 years. He has extensive experience in building automation controls from operational, engineering, sales and management perspectives. He also has a wide range experience with the integration of many low voltage building systems including the rapidly expanding IOT segment.

### **9:00 – 9:55: Safer, Smarter Building Occupancy in an “Almost Post-Pandemic” World**

Learn ways to alleviate occupant concerns like air quality, occupant density and clean, safe spaces.

This session will answer the following questions:

- Do smart buildings still matter?
- What are the major occupant concerns?
- What new technology is available to help resolve tenant concerns?



**Speaker:** Lucy Gedney, VP of Sales for ATS Automation, Lucy has been involved in the energy management and building automation industry for over 25 years. She has worked in all facets of the industry including operations, service and sales management and currently serves as VP of Sales for all (16) ATS office locations. Her current focus is the practical applications of IoT smart technology for all building vertical markets. Lucy originally attended Western Michigan University and majored in Mathematics and Education. After moving to Seattle, she attended North Seattle Community College's HVAC program and switched her emphasis from education to energy.

### **10:25 – 11:20: Securing Your Building Automation System**

This talk will focus on security principals related to the building automation system. With the controls industry moving into IP connected controllers, network security has never been more important. Cyber-attacks are on the rise but there are important steps you can take to make sure your system is protected.

**Speaker:** Lance Patterson, Regional Sales Manager at Distech Controls, Lance Patterson is a Regional Sales Manager for Distech Controls. Lance has almost 20 years of experience in the HVAC industry with the last 13 years focused on building automation and controls. During that time, he has designed numerous controls projects that include operational technology networks, focused on networking flat IP architectures for higher education, military as well as healthcare and other vertical markets. His role at Distech Controls allows him to work with the industry's top system integrators, end users and consulting engineers to help provide future proofed systems capable of upgrades as technology advances in the built space.

### **1:15 – 2:10: BAS Integration: Pitfalls, Realities, & A Path to Success**

Join us for a lively panel discussion to better understand the common concerns and suggested methods for a successful building automation integration. The panel will be represented by three unique perspectives: Mechanical Contractor, Equipment Provider, and Mechanical Engineer.

**Speaker:** Steve Siler - Mechanical engineer with 40 years of experience as a design-build-maintain, contractor in Colorado. Presently leading the MTech Performance Verification team which performs pre-construction engineering reviews and

supports project controls functional performance testing for each MTech project.

**Speaker:** Paul Ruffini - Paul is a licensed professional engineer in the State of Colorado and Wyoming and has over 20 years of experience in the HVAC industry. His roles have included consulting engineering, senior preconstruction manager, commissioning, and mechanical equipment sales on a wide variety of complex projects. Currently, Paul supports Air Purification in a Sales Engineer role.

**Speaker:** Matt Edwards - Matt has been in the HVAC industry for 15 years in both energy modeling and design engineering roles. He enjoys the challenges and opportunities of designing in the dry climate of the Front Range as well as the team interaction it takes to make a project successful. Matt has been with ME Engineers for 11 years.

### **2:30 – 3:25: ASHRAE Guideline 36:**

#### **Standardized HVAC Control Sequences**



In June 2018, ASHRAE released Guideline 36 to establish a set of standardized advanced sequences of operation for common HVAC systems. In this presentation, we will review what G36 is, why it was adopted, and focus on key sequences that have driven energy savings.

**Speaker:** Nicole Arana, Sales Engineer for ATS Rocky Mtn, has been in the energy management and building automation systems industry for 11 years. During this time, she has been involved with various projects including higher education and K-12 facilities that require these standards. Nicole received her BS in Mechanical Engineering from Gonzaga University and has continued her ASHRAE involvement as Junior Board member for the Rocky Mountain ASHRAE Chapter for this year.

## **Track 5 – Critical Environments**

**Sponsored by: Air Purification**



## 8:00 – 8:55: Designing for the Future of EV Batteries: A Case Study

Solid Power is under construction on a new 70,000 SF facility in Thornton, CO. They manufacture, develop, and test their proprietary all-solid-state battery cell technology, and are scaling up to meet the demands of the EV industry. This technology allows for higher energy capacity and safer cells with a longer life and cost savings by replacing liquid electrolytes with sulfide-based solid electrolytes. The technology is there, but the environment in which these processes take place require very specific and strict temperature and humidity requirements. This presentation will dive into the HVAC design of their new facility, touching on mitigation of hazardous conditions, dry rooms, fire suppression, energy considerations, and the collaboration between Owner, Architect, Engineer and Contractor to deliver the design and construction of a complex facility with a very aggressive timeline.

### Learning Objectives:

- Understand the value of early collaboration between the Owner, Engineer and Contractor on a project where speed to market is critical.
- Identify factors influencing the design of a -50°F dew point dry room.
- Consider the energy recovery opportunities for a high energy use lab-manufacturing facility.
- Understand the value of gaining an early understanding of a client's processes to provide a design that exactly fits their needs.

**Speaker:** Andy Geurts, P.E.; Andy is a Senior Mechanical Project Engineer at Affiliated Engineers in Denver, CO. He has experience in HVAC design, project management, and construction administration in a variety of market sectors and building types. He has led mechanical system designs for high-rise buildings, complex existing facility renovations, performing arts centers, campus steam and chilled water integration, building heating and cooling plants, and various air, hydronic, and refrigerant based distribution types. Most recently, Andy has focused his efforts on planning, engineering, and project management for science and technology facility design. He is a licensed professional engineer in Colorado and received a Bachelor of Science degree in mechanical engineering from the University of Wisconsin – Madison in 2006.

## 9:00 – 9:55: Air Distribution for Laboratories and Cleanrooms

The air distribution requirements in labs and clean rooms are unique space types. They require the use of specialized diffusers not commonly used in and other applications. The combination of specialized diffuser, code requirements, and how they interact with other equipment in the space can cause some challenges. In this presentation we'll cover basics of labs and cleanrooms, the specialized diffusers used, code requirements, and how to effectively select and layout the air distribution for successful operation.

**Speaker:** Matt McLaurin, ASHRAE HFDP; Matthew is a ASHRAE certified Healthcare Facility Design Professional and is highly involved with ASHRAE standards and technical committees. He participates in the continuous maintenance of ASHRAE standard 170 'Ventilation of Healthcare Facilities', updating standards 70 'Method of Testing for Rating the Performance of Air Outlets and Air Inlets' and 79 'Methods of Testing for Rating Fan-Coil Conditioners', as well as the development of ASHRAE standard 200 'Method of Testing Active Chilled Beams.' Matthew is a former mentee of the Young Engineers in ASHRAE Leadership U program.

## 10:25 – 11:20: Energy Efficient Lab Design for Pharmaceutical Research Facilities



Review of the design techniques and lessons learned surrounding a confidential pharmaceutical research client. This global biotechnology company recently constructed several research facilities around the United States along with a new 110,000 Sq.Ft. research lab in Colorado. The client's focus is with discovery research, clinical development, and regulatory affairs for oncology.

This presentation will highlight the Colorado facility and the efforts involved to convert a core/shell warehouse building to a single tenant life-sciences facility complete with wet chemistry, biology labs, nuclear magnetic resonance, mass spec, and tissue culture labs for pharmaceutical research of both open and closed lab configurations. The facility included a mix of fume hoods, biosafety cabinets, central lab gas systems and a need for space flexibility with frequent equipment changes.

WSP was responsible for lab planning, building technology systems, MEP services and building commissioning. As the primary focus of any lab is the health and safety of the scientists

and employees, this project also set out to incorporate consistent and dependable environmental conditions, strategies to reduce energy demands and to improve occupant thermal comfort. This presentation will identify the keys to designing variable air volume (VAV) lab exhaust control strategies, methods for maintaining indoor air quality, implementation of adiabatic cooling, humidification control, and intelligent energy recovery systems.

#### Learning Objectives

- Understand the constraints of lab environments
- Understanding of health and safety requirements
- Designing for system resiliency
- Lab HVAC distribution techniques
- Implementation of energy recovery

**Speaker:** James Stieg, P.E. is a Vice President and Mechanical Engineer for WSP USA. He received a mechanical engineering degree from Lawrence Tech University. Mr. Stieg has nearly 25 years of experience in the HVAC industry, complemented with a strong background in project management and design in Colorado along with a wide variety of national projects. He is responsible for design of mechanical systems, including producing drawings and specifications, building load analysis, energy estimating, and coordination with owners and design team members.

Mr. Stieg has experience in all levels of design from conceptual to the construction administration of hundreds of construction projects, including laboratories, healthcare, and critical environmental facilities

### **1:15 – 2:10: Challenges and Solutions for Humidifying Critical Environments**

This talk will cover application and design considerations and humidifier selection criteria for critical applications (e.g., healthcare, manufacturing, laboratory, etc.). The benefits and caveats to different humidifier technologies will be covered, as well as control strategies for demanding applications. Even when successfully designed, poor installation can prevent success, so we will look at common installation pitfalls. We will also discuss how water quality can impact humidifier performance.

**Speaker:** Josiah Strauss, PhD is a sales and product manager for Neptronic. Prior to transitioning to HVAC, he was a consultant and laboratory scientist in the oil and gas industry,

and research scientist at University of New South Wales and Duke University. He holds a PhD in Geology and Geophysics from Texas A&M University and an MBA from University of Colorado Boulder.

### **2:30 – 3:25: ASHRAE Epidemic Task Force**

In March of 2020 ASHRAE initiated an Epidemic Task Force to provide guidance to the industry on how to address the potential airborne transmission of the SARS-CoV-2 virus through building ventilation systems. Initially, the laboratory environment was considered low risk for aerosol transmission because these facilities are already designed with the safety of occupants as a key performance indicator; typically, through the use of 100% outside air, higher air change rates, and exhaust systems designed to minimize re-entrainment of contaminated air. However, these same systems provide unique operating conditions that require distinct mitigation strategies to minimize the risk of transmission of aerosolized particles. Several recommended mitigation strategies that may be prudent for other building types should not be employed in a lab environment because they may adversely impact the air flow patterns within the lab and/or the performance of existing containment devices.

Therefore, in June of 2020, a subcommittee was formed to assemble a guidance document for the laboratory environment. The objective of this document is to address the mitigation strategies that are unique to the laboratory environment and to define those strategies that may be applicable to non-lab environments that should not be implemented within a laboratory or to its HVAC systems. In addition to personnel from ASHRAE, members of the committee also included representatives from I2SL and SL-Can.

**Speaker:** Brad Cochran, P.E., has over 30 years of experience conducting wind-tunnel, analytical, and Computational Fluid Dynamic (CFD) dispersion modeling studies for laboratory, hospital, and data center ventilation design. He holds a BS and MS in Mechanical Engineering, an MBA, and is a licensed Professional Engineer in the State of Colorado.

In recent years, Brad has led the development of new design and control techniques to minimize the energy consumption for laboratory exhaust stacks through the implementation of VAV technologies. He has successfully designed and employed VAV exhaust systems for more than 100 laboratories throughout the US, Canada, and the United Kingdom.

Brad is the primary author of Chapter 9 "Laboratory Exhaust Stack Design," in the 2015 ASHRAE Laboratory Design Guide; the author of I2SL's Best Practices Guide "Modeling Exhaust Dispersion for Specifying Acceptable Exhaust/Intake Designs" and is responsible for Section 5.4.6 "Exhaust Stack Discharge" and Appendix 3 – Selecting Laboratory Stack Designs, in the upcoming version of the ASSE Z9.5 Standard for Laboratory Ventilation.

In 2011, Brad became one of the first recipients of I2SL's prestigious GO BEYOND Award for an individual for his outstanding contributions to the field of efficiency and sustainability in lab design. He is also a member of the I2SL international board of directors and a Distinguished Speaker for I2SL.

Brad is a current member of ASHRAE's Technical Activities Council (TAC) and serves as the head of Technical Session 9 - past chairman of ASHRAE's Technical Committee 9.10 - Laboratory Systems; and is a corresponding member of Technical Committee 4.3 Ventilation and Infiltration and Technical Committee 9.9 Mission Critical Facilities. He is also a member of the American Society of Mechanical Engineers, a member and Distinguished Speaker for I2SL.