ASHRAE Rocky Mountain Chapter

31st Annual Technical Conference:

Sponsored By:

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Securing Our Future

Friday April 28th, 2023

Register and pay at www.rockymtnashrae.com

Sheraton Denver West Hotel
360 Union Boulevard
Lakewood, CO 80228

Co-Sponsored by Rocky Mountain NEBB

GBCI Continuing Education Hours provided by:

ANNEXAIR

U.S. Green Building Council Chapter Colorado

31st Annual Technical Conference:

Securing Our Future

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 28, 2023, at the:

Sheraton Denver West Hotel
360 Union Blvd.
Lakewood, CO 80228

Professional Development Hours (PDH):

The 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 7th

$275 Member Full Day Ticket (Includes Lunch)
$325 Non-Member Full Day Ticket (Includes Lunch)
$255 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 7th

$295 Member Full Day Ticket (Includes Lunch)
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$75 Keynote Presentation and Lunch Only Ticket (Member / Non-Member)

Prices Day Of:

$345 Flat Fee for Full Day (Includes Lunch)
$75 Keynote Presentation and Lunch Only

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Luncheon Keynote Address:

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Securing Our Future

We are experiencing a time of accelerated change and an era of unpredictability that is unlikely to go away any time soon. Our success in navigating these changes will be based on problem solving, creativity, innovation, flexibility, and a willingness to adapt. "Securing Our Future" examines how the crucial personal and professional events of the past can help us leverage relationships, knowledge and change as the formula for making an impact and embracing our diverse world.

Speaker: Sarah E. Maston, P.E., BCxP is ASHRAE's Vice President for the 2022-23 term.

During the 2022-23 Society year, Sarah is serving as the chair of Technology Council, chair of the Board Streamlining Subcommittee, and a member of the Finance Committee, President-Elect Advisory Committee, and the Treasurer's Advisory Committee.

Maston has more than 20+ years of experience in mechanical/ HVAC systems evaluation, troubleshooting, design, startup, and commissioning for a variety of project types. She current serves as Director of Commissioning & Energy Services for Colliers Project Leaders in Boston, Massachusetts. Maston is a Registered Mechanical Engineer (PE), Building Commissioning Professional (BCxP), and LEEP Certified Professional, with facility experience in hospitals, laboratories, universities, schools and office space.

Maston graduated from Rensselaer Polytechnic Institute (RPI) with a Bachelor of Science degree in Mechanical Engineering and a concentration in Energy Systems.

Afternoon Technical Keynote and Open Bar:

Keynote Sponsored by: Western Mechanical Solutions

Western Mechanical Solutions

SUSTAINABLE HEATING COOLING

Open Bar Sponsored by: MotivAir & Trane

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Fort Collins Utilities – Challenges and Opportunities of an All-Electric Future

Fort Collins energy and climate goals for 2030 include reaching 100% renewable electricity and community-wide carbon emissions reduction of 80%. The implications for the electric utility are enormous, from planning through design and operations. The connected solutions of utility-scale renewables, distributed energy resources and electrified transportation all come together at BUILDINGS. Mr. Phelan will discuss how Fort Collins Utilities is working towards a vision of a robust and reliable electric system serving a clean all-electric future, including today's challenges and opportunities.

Speaker: John Phelan, P.E., John Phelan is the Senior Energy Advisor and Energy Services Manager for the City of Fort Collins Utilities, leading the team that provides energy efficiency, conservation, grid flexibility and renewable energy services. His responsibilitiesd include planning, implementation and evaluation the Utility's energy programs. He also leads strategic policy initiatives for Fort Collins community climate and energy goals.

Mr. Phelan has a long history of association with related fields of electric utility services, efficiency and renewable energy engineering and sustainable architecture. He has a Masters Degree in Engineering from the University of Colorado Boulder and a Bachelor of Science in Conservation of Natural Resources from the University of California Berkeley. Mr. Phelan is a registered professional engineer in the state of Colorado.

7:30 – 8:00: Check-In / Registration

Breakfast Sponsored by: AAON, EBTRON, Engineered Dynamics, MotivAir, Seeley International, Trane

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Afternoon Break Sponsored by: AnnexAir, MK Plastics

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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: 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 co-chair of the Denver Chapter of the YEA Committee.

10:25 – 11:30: 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.

1:15 – 2:10: 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).

2:30 – 3:25: Overview of ASHRAE 90.1

ASHRAE Standard 90.1 – 2019 was released in the fall of 2019 and will be referenced by IECC 2021. The Mechanical Chapter, Section 6 of 90.1 - 2019 includes significant changes to 90.1 – 2016. These changes help reduce energy consumption by changing the minimum HVAC requirements and further broadening the scope of the standard. This presentation will cover some of 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.

TRACK 2 – HVAC&R SYSTEMS & APPLICATIONS

Sponsored by: CFM Company

8:00 – 8:55: Large Water-Water Heat Pumps – Carbon Reduction with Great Economics

This session will discuss the application of water-to-water heat pump chillers. We will demonstrate how heat pumps can be phased into your existing facilities and, which configurations will achieve the greatest ROI. Two of the biggest fundamental questions we'll review and answer are: How a heat pump chiller will help you to achieve 3 to 4 times the efficiency of a traditional chiller + boiler and, what heat source will make the most sense for you, when you shift away from fossil fuels.

This session will help engineers, ESCOs, Central Plant Operators/Owners to understand the hidden benefits of utilizing water to water heat pump chillers to assist in short and long term decarbonization goals while best managing capital expenses and optimizing operational costs.

Speaker: Oscar Peraza is currently the Regional Product Manager for York Chillers at Johnson Controls, covering the Midwest and Western Regions. He brings an interesting perspective to the recent trends towards building electrification as he has been involved with the Western States "electrification" initiative and incremental shift to heating with all-electric heat pumps.

Oscar has been employed with York/JCI since 1988. In his current role as Regional Product Manager, he has been providing training, technical and marketing support for various chillers and heat pumps throughout the West half of the US. He has held various positions with York, Division of Johnson Controls as a Senior Account Executive in the Houston area, and Regional Sales Manager. Mr. Peraza holds a BSME degree from Texas A & M. He resides in Canyon Lake, Texas near York's San Antonio chiller manufacturing facility.

9:00 – 9:55: Adiabatic vs Evaporative Fluid Cooling Technologies. How to Choose

Fundamentals of Adiabatic Heat Rejection – This session will cover the fundamentals of adiabatic heat rejection and the different types of adiabatic fluid coolers available. It will review when adiabatic units may be best suited for projects when considering the operational benefits (water and energy), footprint, maintenance, cost, and impact of codes and standards related to the growing technology of adiabatic fluid cooler heat rejection.

Speaker: Steve Kline is the Product Applications Manager for Baltimore Aircoil Company (BAC). He is a registered Professional Engineer in the State of Maryland and is the chair of ASHRAE Technical Committee 8.6 - Cooling Towers & Evaporative Condensers. Steve has 27 years of experience with BAC, primarily focused on product applications, project management, and sales management. Prior to joining BAC, Steve was a consulting engineer in the Baltimore area for three years. Steve holds a BSME from Bucknell University, as well as an MSME and MBA from Johns Hopkins University.

10:25 – 11:20: Electrification Equipment and System Design

Electrification has challenged many of the assumptions that we have relied upon for design for years. This presentation examines the differences between traditional HVAC design and electrified design. The limitations of current technology, cost considerations, electrical capacity considerations, the difference between peak design and annual performance will all be discussed. Examples and applications of both partial and fully electrified designs will be presented for several different building types as well as the implications of broad scale electrification on our infrastructure.

Speaker: Jeff Elsner is a mechanical engineer and project manager with extensive experience with central utility plants, higher education campuses, healthcare facilities, laboratories, data centers, and office buildings. Sustainable, energy and emissions conscious design has been an emphasis throughout this broad practice and especially in planning for low carbon district energy. Jeff also has special expertise combined heat and power (CHP or cogeneration) systems and high

temperature hot water district plants. He is a LEED associate, member of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and the International District Energy Association (IDEA). Jeff is based in Denver Colorado and earned a B.S. degree in mechanical engineering from Colorado State University.

1:15 – 2:10: VRF Design & ASHRAE 15 Compliance

Variable refrigerant flow (VRF) systems have continued to flourish in the United States. While this technology has been utilized worldwide for 35+ years, it has only gained popularity in the US over the past decade. Understanding how to properly engineer and specify these systems can lead to improved performance, improved reliability and maximized heat recovery potential/energy savings. With the recent laws and push towards electrification, VRF systems will continue to be applied for their inherent all electric technology and efficiency. This presentation will review the components of VRF systems, low ambient VRF design, air source VRF design, water source VRF design and ASHRAE 15 compliance.

Speaker: Sam Heilbronner is the VRF Sales Manager and a Sales Engineer for Engineered Products. Sam has 13 years of experience in the HVAC industry working for multiple manufacturer's representative firms. He has worked in many different roles throughout his career, which include inside sales, estimating, application engineering, outside engineering sales and outside contractor sales. Over the years, Sam has developed an expertise on the intricacies of VRF systems with several different VRF manufacturers. While he does maintain a heightened concentration on VRF systems, he also prides himself on understanding and applying all types of HVAC systems such as condenser water systems, chilled/hot water systems and custom AHUs/RTUs/DOAS.

2:30 – 3:25: Don't Let this Happen to You

An unfortunate part of engineering and construction is learning lessons the hard way. Mike Fulton, PE and Larry Gelin will present lessons learned from an engineering, practical and financial standpoint to help engineers prevent problems as they start to tackle the design of complex equipment. Mike and Larry will present four to five topics each, including but not limited to: 1) Preventing the TOP 3 predicable problems with boiler water piping, gas piping, and venting 2) Taming those pesky clearance requirements for cooling towers and fluid coolers 3) Not misapplying "NC" values that come out of terminal selection and ruining the lives of building tenants 4) Sizing your heat correctly 5) Trusting your Rep – the magical chiller/AHU combination and 6) Really expensive Make-Up Air.

Speaker: Larry Gelin is Director of End User Sales at CFM Company. Larry has been working at CFM Company for 20 years. He holds a BSME from the University of Wisconsin at Madison and an MSME from the University of Texas at Austin, with extensive experience in acoustics, vibration, and noise control. Larry is a past Director of Rocky Mountain ASHRAE. He has delivered presentations to the ASHRAE community on pumping systems, vibration isolation, seismic and wind restraint, public speaking, and management.

Speaker: Michael Fulton, P.E. founded Western Mechanical Solutions to focus on minimizing the energy use of buildings through innovative applications 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.

Track 3 – SUSTAINABILITY

Sponsored by: McNevin Company

8:00 – 8:55: Prescriptive Path of the Denver Energy Code

Denver has significantly amended the 2021 international Energy Conservation Code (IECC) as the Denver Energy Code. There are 2 paths – prescriptive and performance (modeling). This presentation will highlight the requirements of the prescriptive path. The Denver Energy code has several restrictions on equipment type, enhanced efficiency and energy recovery requirements, and operation/control provisions above and beyond the base IECC. The prescriptive path is not a simple table-look-up code. There are multiple options and incentives/disincentives to guide a building design toward meeting Denver's greenhouse gas emission goals.

This session will be presented for a designer's perspective. While the plan review under these provisions is just beginning, it is planned to have interpretation and enforcement input where possible.

Speaker: Mark Jelinske, Chief 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 at least 20 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 served on the Denver Plumbing, Mechanical, and Fuel Gas committee, and on several task forces and stakeholder meetings for the Denver Energy Code and Energize Denver. He has been designated as the ASHE Code Advocacy Liaison for Colorado He has a Bachelor of Science degree from the University of Missouri-Rolla (Missouri University of Science and Technology).

Speaker: Chuck Bartel, PE., is a Denver native and graduated from Colorado State University with a BS in Mechanical Engineering. He moved to California and found his calling as a Mechanical Plan Check Engineer with the County of Los Angeles (5 years). After returning to Colorado, he has worked for the City of Denver as a plan review engineer for the last 15 years, including 3 years as Supervisor. Working as a code official has been a rewarding opportunity to collaborate with design teams and has provided avenues to be involved with all types of construction from single family homes to high-rise buildings. Chuck enjoys code development and interpretation to ensure safe and efficient construction in Denver.

9:00 – 9:55: Performance Path of the Denver Energy Code

Denver has significantly amended the 2021 international Energy Conservation Code (IECC) as the Denver Energy Code. There are 2 paths – Prescriptive and Performance (energy modeling). This presentation will highlight the requirements of the Performance path. There are 3 approaches that a designer can take under this path.

- Appendix PT –Modeling to a Performance Target (pEUI)
- C407 – Commercial Appendix G Energy Modeling Metric
- Appendix SE –Total Building Performance with Site Energy

Each approach has its own set of requirements under the Denver amendments. The most appropriate choice of which approach to take will depend on each project's unique goals and resources. This session will be presented for a commercial building designer's perspective. While the plan review under these provisions is just beginning, it is planned to have interpretation and enforcement input where possible.

Speaker: Linda Morrison, PE, BEMP leads the new energy code team for the City and County of Denver. She supports buildings that are highly efficient, all-electric, renewably powered, grid flexible and low carbon. Prior to joining Denver, her consulting focused on new and existing building performance including net zero buildings.

Speaker: Elizabeth Gillmor is president and founder of Energetics Consulting Engineers, a boutique energy consulting firm in Denver that specializing in providing pragmatic, cost-effective, and resilient building energy solutions through energy modeling and sustainability consulting. As a provider for multiple utility rebate programs and a building electrification

proponent, she has been the energy consultant for hundreds of local Colorado buildings of all sorts, and experiences a broad perspective of different project teams' goals, approaches, and priorities. She is also an expert in energy codes, and has served on the Denver Building Code adoption committee for the last two code cycles, Denver Net Zero Energy Advisory Group, the Denver Green Buildings Ordinance Technical Advisory Committee, and was recently appointed to the Colorado Energy Code Board to help develop Colorado's model energy code. She is a Professional Engineer in the field of Architectural Engineering.

10:25– 11:20: Optimizing Energy Performance for Laboratory HVAC Design with CFD

Conventional HVAC design approaches for laboratories often rely on industry recognized minimum outside air and exhaust ventilation rate targets expressed in air changes per hour (ACH). These benchmarks have a significant impact on HVAC infrastructure sizing, including laboratory exhaust fans and associated discharge stacks. While generally accepted, they are often not challenged and leave opportunities for improvement, particularly from an energy standpoint.

Computational flow dynamics (CFD) modeling can be used to validate many of the early assumptions that go into early infrastructure sizing. During the design of the Research and Innovation Laboratory (RAIL) on the NREL Golden campus, CFD modeling was implemented to optimize the air distribution throughout the laboratory, in an iterative process. Input parameters such as placement and sizing of the HVAC system were tested, to improve air quality within breathing zones, while minimizing flow rates. A similar process was followed during the design of the Front Range Community College Science Wing Renovation, where parameters such as diffuser type, placement, and air change rate were tested to predict airflow dynamics in a gross anatomy lab.

In tandem with CFD modeling, wind tunnel modeling was also performed for the RAIL project. While wind tunnel modeling is not a primary focus of this presentation, both of these modeling efforts enhanced the expected energy performance of the projects' respective HVAC systems.

Speaker: Ryan Lee joined Cator Ruma in 2017 and has thirteen years of experience in mechanical design. He has extensive experience in roles ranging from research to design and project management. He has designed HVAC and utility systems for complex facilities, including higher education, manufacturing, and laboratory projects. He is a LEED accredited professional with many sustainable design projects ranging from Certified to Gold and is regularly engaged in the sustainable design community.

Speaker: Philippe Gommé is a Senior Engineer for CPP Wind Engineering. He has spent the last 8 years focusing primarily on CFD modelling. He helped develop new tools designed to assess pedestrian level wind comfort, wind driven rain impacts, indoor air quality, pollutant dispersion, solar tracker and wind turbine performances. His consulting experience was mainly applied to projects located in Australia, southeast Asia and the US. He recently relocated to Colorado after spending nearly 10 years in Australia.

1:15 – 2:10: Sustainable Project Roundup – U.S. Engineering

How do the requirements around sustainability change our approach to larger commercial central plants? U.S. Engineering was pleased to recently complete construction on two non-traditional types of central plants: a sewage heat recovery central plant for the National Western Campus and a large geo-exchange central plant for Colorado State University. Each one presented specific challenges for the design, construction, commissioning, and operation teams. This presentation describes the operation of the two central plants and focuses on challenges and lessons learned that can be applied to future similar projects. The presentation will also provide performance metrics to demonstrate how non-traditional central plants are a critical element to achieving campus sustainability goals.

Speaker: Mike Brunson is a Senior Project Manager for U.S. Engineering Construction. He has extensive experience in a broad spectrum of project types and sizes, including Universities, K-12 Schools, Healthcare and Data Centers. He specializes in executing design/build projects within existing buildings, which requires flexibility, innovation, and a problem-solving mindset. He is a graduate of Colorado State University with a degree in Mechanical Engineering.

Speaker: Andy Wright is a Senior Project Manager for U.S. Engineering Construction on the commercial/industrial team. Andy has over 15 years' experience completing complex projects in critical working spaces including laboratories, data

centers, and healthcare. He is a graduate of Colorado State University with a degree in Construction Management.

Speaker: Taylor Heidman is a Project Engineer for U.S. Engineering Construction on the commercial/industrial team. Taylor has earned bachelor and master's degrees in architectural engineering at the Milwaukee School of Engineering. She has worked in both the engineering design and construction management field on a number of complex building types.

2:30 – 3:25: The Current and Future State of Refrigerants

As our industry works toward a more sustainable future, we are faced with another major refrigerant transition.

Since the Kigali Amendment in 2016 and the passing of the AIM Act in 2020, the focus is about reducing the global warming impact of the refrigerants. Through the EPA's Significant New Alternatives Policy (SNAP), Rules 20 and 21 will phase down the use of any refrigerant with a GWP higher than 700, starting January 1st, 2025. Along with a handful of other states, Colorado has decided to move faster and prohibit the manufacturing of comfort cooling chillers, using high GWP refrigerants, after January 1, 2024.

This transition presents an industry wide challenge and the flagship refrigerants we have been using for many years (R-410A and R-134A) will be replaced.

This session will cover the federal and state regulations governing this transition, as well as building code updates, and manufacturing lead times. Finally, we will discuss the implications these many factors have for how we design future projects and provide the best guidance to our customers.

Speaker: James Murphy is a Senior Sales Engineer with LONG Building Technologies, specializing in chillers, air handlers, and large DX equipment. He has over 25 years of experience working primarily with large consulting engineers and end users. James supports many different vertical markets including indoor agriculture, healthcare, and critical environments like data centers and laboratories.

Track 4 – DDC

Sponsored by: ATS

8:00 – 8:55: Comparing Electronic & Mechanical Pressure Independent Technology

There is more than one way to feed a cat (politically correct) and there is more than one way to achieve pressure independence in hydronic systems. But is one better than another? Which technology reacts quicker? Which technology costs more? But most importantly, which technology controls better?!?!? Well, like most complex things in life, there is no simple answer. Join for a discussion about these technologies and the pros and cons of each, including simple things like size and cost and more complex things like which technology can help with pump and water temperature reset strategies.

Speaker: David Kandel was one of the original development engineers in the Belimo control valve development group. He was an integral part of the group that developed the original CCV (Characterized Control Valve) and the PICCV (Pressure Independent Characterized Control Valve). Originally hired by Belimo in 1998, Mr. Kandel has held the roles of Manager of Valve Development, Product Manager for Control Valves and he currently works as an Application Consultant for the Rocky Mountain region.

9:00 – 9:55: Code and Controls – The intersection of IECC and BAS

Looking ahead to the 2021 Energy there are several opportunities to leverage building automation platforms to ensure compliance. We'll explore the language of the code and how the specifying engineer could scope the application of existing BAS platforms to meet the intent of the code. In parallel we'll explore the requirements of Energize Denver and Article XIV of Denver's Municipal code on existing building. We'll specifically explore the building performance dashboards, FDD and code required operating sequences.

Speaker: **Josh Harwood** is a Mechanical Principal at Cator Ruma and Associates. He began his HVAC career in the commissioning field in 2008 after a serving in the US Navy. Years spent commissioning and testing projects inform Josh's mechanical design approach. A graduate of the University of Colorado (Mechanical Engineering) and of the Naval Nuclear Power program and Denver University (MS Data Science), Josh combines technical expertise with practical application to deliver thoughtful and timely advice to his clients and guidance to his projects. His experience with big data acquisition, manipulation and visualization gives Josh a unique perspective on the role of automation in building performance.

10:25 – 11:20: Effectively Developing and Maintaining Building Automation Specifications

When developing a building automation specification there are many considerations that can have vast impacts across the entire project and facility. During this presentation we will take a deeper dive into the specification formats (MasterFormat, Uniformat, and UniClass), differences and advantages between Div.230900 and Div.25, and the value in creating a master specification. Additionally, we will discuss the importance of maintaining and updating the master specification, what and when updates should be implemented, and how best to implement updates.

Speaker: **Misty Givens**, Consultant Specialist, supports customers in the United States on Building Automation products, technology & services. As a Subject Matter Expert, she is well versed in Delta Controls products, specifications, custom project solutions, building automation education & general questions in the building automation sector. Misty has more than 20 years of experience in the construction industry, specializing in BAS (Building Automation Systems) for over a decade.

1:15 – 2:10: A New Wave of Integration: Smarter Buildings and Beyond

This presentation will focus on how new integration implementations are changing the way we interact with our buildings compared to those of past and present. Where we were, where we're at, and where we are heading!

Speaker: **Lance Patterson**, Regional Sales Manager at Distech Controls. Lance has almost 20 years of experience in the HVAC industry with the last 14 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.

2:30 – 3:25: Introduction to Building Automation

"What are those control folks even doing?" This presentation will help you understand 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 building automation which include interfaces, programming, and protocols.

Speaker: Corey Abro is the Sales Manager for ATS Rocky Mountain. Corey has over a decade of building automation industry specific experience working across various projects spanning the entire country, and within a multitude of segments including higher education, data centers, healthcare, and office/commercial. Corey is a graduate of Virginia Tech, and comes from a multigenerational legacy of building automation professionals.

Track 5 – Critical Environments

Sponsored by: Air Purification

8:00 – 8:55: Best Practice Guide: Energy Savings with Demand Based Control for Labs

Given the mega trends of carbon reduction and environmental, social, and governance (ESG) commitments, reducing energy and carbon emissions use in both new and existing laboratory facilities has become the most important carbon conservation measure (CCM) to pursue. The adoption of demand control ventilation (DCV) reduces significant energy use and carbon in labs which are notoriously the most energy-intensive spaces. This presentation will discuss DCV for labs and its benefits which include reducing Scope 1 emissions without the use of carbon offsets, enhanced indoor air quality (IAQ), and a strong payback.

This best practices guide describes the airflow optimization concept for laboratories, vivaria, and some cleanrooms. Case studies help demonstrate how this concept has been used successfully for more than 20 years.

Speaker: Tom Kolsun is a Vice President at Aircuity. Tom has over 25 years of experience in the building industry focused on developing innovative, sustainable solutions to make buildings smarter, safer, and more efficient. He has worked to deliver Smart Buildings through technical sales, system design, and project management. He has successfully deployed projects for energy savings, reduction of deferred maintenance and complete system upgrades through performance contracts, direct retrofits and new construction. Prior to joining Aircuity, he had over 15 years of wide-ranging entrepreneurial experience primarily in the commercial construction field as founder and president of two technology related companies. Tom holds a BA from the University of Maryland and an MBA from Pace University. He is the president and co-founder of the PA/NJ/DE chapter of the International Institute for Sustainable Labs and is active in the Association of Physical Plant Administrators of Universities and Colleges, The Building Owners and Managers Association, and the US Green Building Council.

9:00 – 9:55: Labs and Carbon: What's in Your Toolbox?

Companies and government entities alike are prioritizing decarbonization efforts with implementation plans, but struggle with defining technically sound implementation pathways. Navigating policy, technical, and end-user challenges regarding carbon emissions presents a significant challenge on any campus, especially for energy intensive mission critical facilities, such as research laboratories. Facility managers and design professionals in these spaces face the lion's share of the work, with many laboratories using 3 to 4 times more energy than a typical office building of similar size. Rather than shying away, the laboratory community is diving in and researching strategies for decarbonization of laboratory facilities.

Researchers working in critical facilities, such as laboratories, depend on proper design and operation of the building systems to provide safe and controlled workspaces to support their scientific endeavors. It is critical to get the laboratory airflow control systems right.

Not sure where to get started when approaching labs? This presentation gives guidance through the Smart Labs Toolkit, which describes a systematic process that helps laboratory owners and operators plan and cost-effectively achieve safe, efficient, and sustainable laboratories. Best practices are brought together into a resource for lab owners, managers, scientists, and operators to develop their plan to execute decarbonization in challenging ventilation driven facilities.

Speaker: Rachel Romero, PE, is a senior engineer and project leader at the National Renewable Energy Laboratory. Rachel obtained her Bachelor of Science in Mechanical Engineering from Hope College and then received her master's degree in Building Systems Engineering at the University of Colorado Boulder. Rachel is an active member of ASHRAE, currently serving on the Residential Buildings Committee.

At NREL, Rachel is the project manager for the U.S Department of Energy Solar Decathlon, which has inspired tens of thousands of students to be the next generation of zero energy buildings professionals. Rachel also leads the U.S. Department of Energy's Smart Labs program, providing technical assistance to laboratory partners across the US. She was a main author of the Smart Labs Toolkit, which describes a systematic process to achieve safe, efficient, and sustainable laboratories.

Speaker: Otto Van Geet is a Principal Engineer at NREL. Van Geet has been involved in the design, construction, and operation of energy-efficient research facilities such as laboratories and data centers, office and general use facilities, and low-energy-use campus and community design. Van Geet was one of the founding members of the Labs21 (Smart Labs) program and provides technical guidance for the program. His experience also includes renewables screening and assessment, PV system design for on- and off-grid applications, energy audits, and minimizing energy use. Van Geet has authored many technical reports and conference papers and been recognized with many awards from professional associations, including the 2007 Presidential Award for Leadership in Federal Energy Management and the 2011 GreenGov Green Innovation Presidential Award for the NREL Research Support Facility data center.

He lives with his family in a zero electrical energy off-grid passive solar house with a 2 kW PV/hybrid power system and solar water heating that he designed and built 25 years ago.

10:25 – 11:20: Sustainable Energy and Energy Equity as Drivers for Next Gen Energy Professionals

Electrification and decarbonization are the latest buzz words in our industry to solve climate change. ASHRAE members are developing new sustainable technologies and working on many projects designing and retrofitting buildings and communities to be more energy efficient and sustainable. However, fully decarbonizing our nation will require a new wave of young energy professionals motivated and ready to hit the road from day one. The question then is how do we encourage, attract and support next gen energy professionals? This presentation will describe efforts and projects at Colorado School of Mines to recruit, inspire and mentor young engineering students so they discover and call *home* the field of sustainable energy. Mines efforts and projects are mixing fundamental with practical knowledge tied to impactful projects and experiences so students can start their careers with knowledge and skills that will enable them to be productive and effective from first day of their professional careers. Strong partnership with industry and national labs is key to make this endeavor successful.

Speaker: Dr. Paulo Tabares is an Associate Professor of Mechanical Engineering at Mines where he leads the Advanced Multiscale Building Energy Research (AMBER) Group and the Sustainable Energy @ Mines distinction program and Co-directs the Rocky Mountain Industrial Assessment Center. He also has a joint appointment at NREL. Under his leadership, AMBER Group studies and simulates energy interactions at different scales, from heat transfer happening inside the building envelope to energy interactions in sustainable communities. AMBER combines laboratory, field, and numerical work with an emphasis on making buildings and low-income communities more energy efficient, low-carbon, and grid friendly. In collaboration with NREL, Dr. Tabares and AMBER Group have enabled accurate modeling of multiple thermal storage technologies in EnergyPlus, BEopt, OpenStudio and URBANopt in use by many researchers around the world. His award-winning multi-scale and multi-disciplinary projects range from heat transfer in envelopes to community-scale energy monitoring, analysis, and optimization in urban and rural communities, such as an 800-home community in Fort Berthold Indian Reservation, ND and is currently retrofitting and electrifying a community in Colorado in collaboration with Colorado Energy Office (CEO) and Energy Outreach Colorado (EOC). He is ASHRAE TC 6.9 (Thermal Storage) Research Subcommittee Chair and TC 4.4 (Building Envelope) Program Subcommittee Chair.

1:15 – 2:10: How to Reduce Cleanroom Energy Usage

Due to stringent environment requirements, which can include space air change rates up to 700 air changes per hour, cleanrooms are very energy intensive. There are energy saving strategies that can be implemented that provide attractive reductions in overall cleanroom energy usage. Seminar topics include review of historic cleanroom air change rates, implementing energy efficient cleanroom construction details, design cleanroom HVAC systems with the lowest total static pressure, and how to implement a variable air flow system in a cleanroom.

Speaker: Vincent Sakraida is a Vice President and Mechanical Engineer for WSP USA. He received a mechanical engineering degree from Georgia Institute of Technology. Mr. Sakraida has over 40 years of experience in the HVAC industry with extensive experience in design, project management, construction administration, and commissioning of high technology facilities (pharmaceutical manufacturing, biocontainment laboratories, satellite assembly facility, airplane manufacturing).

Mr. Sakraida is the Vice Chairman of the ASHRAE TC9.11 Clean Space Committee, a voting member of the NEBB Cleanroom Performance Testing Committee, and editorial advisory board member for Engineered Systems Magazine. His ASHRAE involvement includes Epidemic Task Force member, co-author of ASHRAE Cleanroom Design Book, co-author of Clean Space chapter for Applications Handbook, and Distinguished Lecturer. Mr. Sakraida has written many articles and presented numerous seminars nationally and internationally.

2:30 – 3:25: Application and Layout of Active Chilled Beams for Healthcare and Lab Buildings

The popularity of active chilled beam systems has grown rapidly since the first North American installations appeared around 2004. With hundreds of systems installed across the country, primarily in owner occupied buildings, considerable knowledge of the system operation and benefits/drawbacks has been gained across the industry. Active chilled beams have performed particularly well in high ventilation applications such as laboratories and healthcare buildings where when applied correctly, can reduce or eliminate parasitic reheat energy consumption. There are however a few design challenges to consider, especially when used with VAV primary air systems. This presentation covers best practice system design approaches and some of the pitfalls to avoid when designing active chilled beam systems.

Speaker: Nick Searle has 25 years HVAC application experience in a range of fields including noise control engineering, air distribution and air/water systems. Originally from the U.K. Nick has worked in the USA since 2006, supporting engineers, owners and architects with the design of chilled beam/sensible cooling fan terminal systems and has been involved with many of the first projects to be installed with these systems in North America including the first large scale healthcare facility to use active chilled beams, Yale University Health Service Center, NH.