

27TH

ANNUAL

TECHNICAL

CONFERENCE



Rocky Mountain Chapter

LOCATION:
SHERATON DENVER WEST
360 UNION BOULEVARD
LAKEWOOD, CO 80228

1
TC-0

BUILDING OUR NEW ENERGY FUTURE

SCALING: GLOBALLY & TECHNOLOGICALLY,
AND ADDING VALUE TO MEMBERS

KEY NOTES:

1 ATTENDEES SHALL REGISTER AT: WWW.ROCKYMTNASHRAE.COM

DATE:
10 MAY 2019

SPONSORS:



SHEET:
TECH CONFERENCE
COVER SHEET

SHEET NUMBER:
TC-0

This year's Technical Conference theme is "Building Our New Energy Future". Our Keynote Speaker this year is ASHRAE Society Vice President Julia Keen, PH.D, Fellow ASHRAE. We are very thankful that Julia could join us and speak on "Building Our New Energy Future", which is the Presidential theme for 2019.

The committee would like to sincerely thank our sponsors for this year's Technical Conference. This is the 27th year for the Technical Conference and the support of our sponsors truly make this event special, and one of a kind throughout the Country.

The Chapter prides itself on providing quality speakers and presentations to the HVAC&R community. Per prior years, this years conference will include the Fundamentals Track, Systems and Applications Track, Sustainability Track, Building Automation Track and a Critical Environments Track. The chapter will be providing PDHs and CEUs as usual, as well as GBCI credits for many of the sessions.

We would like to welcome Greg Cunniff as this year's afternoon keynote speaker. Greg is the Director of Application Solutions for Williams Comfort Products. Greg has industry experience as a consulting engineer, a temperature controls contractor, a manufacturer's representative and a design build contractor. Greg will be presenting on the BEST Building Efficiency System Tool, in which he designed. The presentation discusses a method to compare the Energy and Life Cycle Cost of HVAC systems at the early design stage of a project.

Lastly, I would like to Thank the Tech Conference Committee for their hard work and time commitment for this year's Tech Conference. This Conference takes a countless number of hours and dedication to pull off! Without the ongoing support of the Committee this event would not exist. The committee meets monthly to discuss logistics, presenters, topics, etc. I cannot express how grateful I am to have had their support during the planning stages of this event! Again, Thanks!

Technical Conference Committee:

Trevor Bromberg – McGrath
Kate DuMez – Group 14
Laura Dyas – Group 14
Sara Frame – Western Mechanical Solutions
Mike Fulton – Western Mechanical Solutions
Ira Goldschmidt – Goldschmidt Engineering
Aaron Nusbaum – Air Purification Company
Brian Lynch – Western Mechanical Solutions
Scott McQuoid - -Western Mechanical Solutions
Corey Abro – ATS Rocky Mountain

Cara Main – CFM Company
Bill Mele – Chemistry & Industrial Hygiene
Eugene Mitchell – McNevin Co.
Erica Moser – RMH Group
Ken Nekvasil – ATS Rocky Mountain
Nathan Ralphe – Western Mechanical Solutions
Taylor Reese – 360 Engineering
Matt Ryon – CFM Company
Cara Main – CFM Company
Kaitlyn Sporleder – Air Purification Company

Sincerely,



Committee Chair

2019 Rocky Mountain Chapter ASHRAE Technical Conference “Building our new energy future”

7:30-8:00	Registration				
Tracks	HVAC&R Fundamentals	HVAC&R Systems & Applications	Sustainability	Building Automation	Critical Environments
Sponsor:	Western Mechanical Solutions	CFM Company	McNevin Company	ATS	Air Purification
8:00-8:55	<i>Pumping System</i> Mark Jelinske PE, The RMH Group	<i>Mechanical cooling for Modern Data Centers</i> Brooke Gummere, PE, Swanson Rink	<i>The Value of Building Commissioning Study</i> Tom Poeling, PE, US Engineering	<i>The Evolution of the Control Valve?</i> David Kandel, Belimo	<i>Myths and Misapplications You Need to Know For Your HVAC Indoor Grow Design</i> Al Grosskurth, Agronomic IQ
9:00-9:55	<i>ASHRAE Standard 90.1</i> Sean Beilman, PE, BCER Engineering	<i>Net Energy Water Loops: A Clear Path to Net Zero Energy Buildings</i> Alan Niles, WaterFurnace International	<i>Power Factor and Energy Efficiency</i> Paul Hutton, Cunningham Group Architecture Adil H. Khan, TransPower Company	<i>Closing out a Controls Project</i> Ken Nekvasil, ATS Rocky Mtn.	<i>Sterile and Hazardous Compounding: What to Know, What to Avoid</i> William D Mele, Chemistry & Industrial Hygiene, Inc.
9:55-10:25	Morning Break & Vendor Exhibits				
10:25-11:20	<i>ASHRAE Standard 62.1</i> Hal Yoder, PE, Western Mechanical Solutions	<i>Don't Let This Happen to You</i> Kyle Manske, PE, 20/20 Engineering Inc. Barry Stamp, PE, The RMH Group	<i>Zero Over Time: A cost-effective pathway to net-zero energy for buildings and portfolios</i> Matt Jungclaus, PE, Rocky Mountain Institute	<i>Occupant-Centric Metrics for Occupant Aware Buildings</i> Cory Morisman, WSP	<i>Skeptics Guide to Sustainability in Critical Environments</i> Mark Jelinske PE, The RMH Group
11:25-12:50	Lunch Break and Keynote Address: <i>ASHRAE's Role in the Industry - Past, Present, and Future</i> Address: Julia Keen, P.E., Ph.D., ASHRAE Fellow				
12:50-1:15	Vendor Exhibits				
1:15-2:10	<i>Psychrometrics</i> Michael Fulton PE, Western Mechanical Solutions	<i>Everybody Loves a DOAS</i> Sean Beilman, PE, BCER Engineering	<i>Optimal Dispatch of Distributed Energy Resources for both behind-the-meter benefits and quantifying grid impacts</i> Dylan Cutler, National Renewable Energy Lab	<i>Programmable</i> Mike Harrington, CFM Company	<i>Energy Saving Strategies for Laboratory Exhaust Systems</i> Jim Meats PE, Loren Cook Company
2:10-2:30	Afternoon Break & Vendor Exhibits				
2:30-3:25	<i>Altitude Effects on System Design</i> Michael Haughey, PE, Silvertip Integrated Engineering Consultants	<i>Prevent Vibration Issues so Owners Don't Get Angry With You</i> Larry Gelin, CFM Company	<i>How ASHRAE 62.1 IAQP air cleaning can reduce equipment cost and save energy</i> Ted Vergis, enVerid	<i>Air Flow Measuring Stations</i> Andrew Tenhundfeld, Western Mechanical Solutions	<i>Cannabis Cultivation and Extraction: Challenges for HVAC Design and Operation</i> Bruce Straughan PE, Straughan Forensics, LLC.
3:30-5:00	Afternoon Technical Keynote Address And Open Bar <i>Best Efficiency</i> Greg Cunniff, PE, Director Application Solutions, Williams Comfort Products				

Please note - Speakers and Topics Subject to Change – Some titles on this sheet are condensed for space purposes.



ADAPT TODAY TO SHAPE TOMORROW

For Whom:

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

When & Where:

Friday, May 10th, 8am to 5pm at the:
Sheraton Denver West Hotel
360 Union Blvd.
Lakewood, CO 80228

Professional Development Hours (PDH):

Twenty-Seven PDH sessions to choose from and the fourteen 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 each session. In addition to signing in, credits must be self-reported to GBCI.

Your Cost:

Prices before April 29th @ 8a

Member ½ day: \$ 200 (lunch included)
Member Full day: \$ 245 (lunch included)
Non-Member ½ day: \$ 245 (lunch included)
Non-Member Full day: \$ 290 (lunch included)
Keynote Presentation: \$ 60 (lunch included)
(10% discount to companies sending 5 or more)

Prices After April 29th @ 8a

Member ½ day: \$ 225 (lunch included)
Member Full day: \$ 265 (lunch included)
Non-Member ½ day: \$ 265 (lunch included)
Non-Member Full day: \$ 310 (lunch included)
Keynote Presentation: \$ 75 (lunch included)
(10% discount to companies sending 5 or more)

Register at www.rockymtnashrae.com

Prices Day of Event

½ day: \$ 275 (lunch included)
Full day: \$ 325 (lunch included)
Keynote Presentation: \$ 75 (lunch included)

Thank-you.

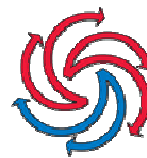
We would like to thank all of our sponsors for this event. Sponsor names are listed below and will be on signage at the conference. Without everyone's support, this conference would not be possible.



Rocky Mountain



Western Mechanical Solutions
SUSTAINABLE HEATING COOLING



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more than product alone..



GBCI Credits
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Luncheon Keynote Address:

ASHRAE's Role in the Industry - Past, Present, and Future

ASHRAE's influence in the HVAC&R industry has been important. The many areas in which ASHRAE has had an impact in the past will be reviewed as this history provides perspective as we plan for the future. The current direction of ASHRAE and its objectives in the very near future will be introduced. ASHRAE is evolving to best meet the needs of its members and industry. As we all recognize, there is a need for continual improve and change to remain relevant and maintain a prominent position within the industry. This presentation will discuss some of the opportunities being explored.



Julia Keen, P.E., Ph.D., ASHRAE Fellow, BEAP, HBDP Professor, Dept. of Architectural Engineering and Construction Science, Kansas State University, Owner, Keen Designs, P.A. Julia Keen is a Professor of Architectural Engineering and Construction Science at Kansas State University holding the Bob and Betty Tointon Engineering endowed chair. She also owns her own consulting company, Keen Designs, PA. Her specific areas of interest include HVAC design, energy codes, high performance design, HVAC education, and the advancement of women in the building design and construction industry.

Julia Keen received her Bachelor's and Master's Degree in Architectural Engineering and her Doctorate in Education from Kansas State University. She worked as a Mechanical/Electrical Project Engineer in Iowa before accepting a position at Kansas State University. She is a Licensed Mechanical Professional Engineer in Kansas and Iowa and holds two ASHRAE

Certifications - High-Performance Building Design Professional (HBDP) and Building Energy Audit Professional (BEAP).

In addition to her 9-month faculty appointment at K-State, Julia has the opportunity to stay current with the HVAC industry in a consulting capacity. Her consulting endeavors include performing as HVAC professional education consultant, engineering design, plan check and quality review, and acting as an owner's representative in facility planning and project implementation.

Julia currently serves in the elected position of ASHRAE Society Vice President. She was promoted to the grade of ASHRAE Fellow in 2016, received the 2018 ASHRAE E. K. Campbell Teaching Award, and was named '20 to Watch: Women in HVAC' by Engineered Systems Magazine January 2019.

Afternoon Technical Keynote and Open Bar:

Best Efficiency

The presentation discusses a method to compare the Energy and Life Cycle Cost of HVAC systems at the early design stage of a project. The method uses a single Building Energy Efficiency Ratio (BEER) number to compare the performance of systems using modified AHRI data for equipment only. AHRI ratings do not include all the components of an HVAC system and do not always represent real world operating conditions. The BEER rating adjusts the AHRI ratings to account for any missing components and real world operating conditions. The BEER rating has been incorporated into a computerized Building Efficiency System Tool™(BEST).

The tool uses 30 preconfigured HVAC systems to quickly configure up to 4 systems to compare the annual energy consumption and cost, first cost, maintenance cost, annual and cumulative life cycle cost, system payback time, pump and fan horsepower and cooling system Building Energy Efficiency Ratio (BEER). The cost data are based on industry averages for first cost and maintenance costs collected from more than 50 contractors around the U.S.



Greg Cunniff, PE, Director Application Solutions, Williams Comfort Products Greg has published a number of technical articles in HVAC publications and authored white papers. He is also coauthor of a textbook, "Modern Geothermal HVAC Engineering and Control Applications," published by McGraw-Hill Education. Greg previously was a consulting engineer, a temperature controls contractor, a manufacturer's representative and a design build contractor. He has developed engineering software, continuing education programs and award winning new products. He has spoken at numerous industry events and webinars. He is the recipient of a Lifetime Achievement Award from the Hydronics Industry Alliance.

He can be reached at greg_cunniff@wfc-fc.com

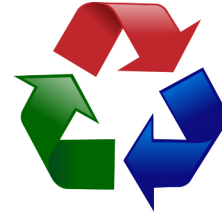
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7:30 – 8:00: Check-In / Registration

TRACK 1 – HVAC&R FUNDAMENTALS

Sponsored by: Western Mechanical Solutions



Western Mechanical Solutions
SUSTAINABLE HEATING COOLING

8:00 –8:55: Pumping Systems

This presentation will discuss basics of pumping systems: energy impacts of pumps; basic pump types; pump selection including typical pump curves, NPSH and cavitation, pipe sizing; pump operation including parallel pumps and variable speed pumps; and effects of glycol.

Speaker: Mark Jelinske, P.E., Chief Engineer @ The RMH Group; 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 at least 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 been designated as the ASHRAE Code Advocacy Liaison for Colorado, and serves 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).

9:00 – 9:55: ASHRAE Standard 90.1

ASHRAE Standard 90.1 – 2016 was released in the fall of 2016 and is referenced by IECC 2018. The Mechanical Chapter, Section 6 of 90.1 - 2016 includes significant changes to 90.1 – 2013. 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: Sean Beilman, PE, Associate Principal and Manager of Energy Services @ BCER Engineering; Sean Beilman, P.E., serves as an Associate Principal and Manager of Energy Services at BCER Engineering, a full service Mechanical, Electrical, Plumbing, Energy, Life Safety, and Technology consulting firm. Mr. Beilman has over 15 years of experience in the design of HVAC and plumbing systems for governmental and educational facilities, office buildings, resorts, healthcare, and data centers. Mr. Beilman's area of expertise is high performance buildings, energy efficiency, and sustainable building design. Beilman served as the Rocky Mountain ASHRAE Sustainable Engineering Committee Chairman from 2009 to 2010 and is one of the co-founders of the Rocky Mountain Energy Simulation Engineers group. Currently he is a Voting Member of the ASHRAE Standard 90.1 Project Committee, a member of the ASHRAE Advanced Energy Standards working group, and served as the Technical Editor of the ASHRAE Standard 90.1, 2013 User's Manual.

10:25 – 11:20: ASHRAE 62.1

This presentation will cover the latest changes in ASHRAE Standard 62.1 and examine how they affect HVAC design.

Speaker: Hal Yoder, PE, Western Mechanical Solutions; Hal Yoder has 24 years of engineering experience. 20 years of that was as a consulting engineer and 4 years as a technical support with a focus on packaged rooftop unit controls and their integration with building automation systems with Western Mechanical Solutions. He has a Bachelor of Science degree in mechanical engineering from Iowa State University. He also has a passion for using his experience to educate others and a passion for improving control system simplicity, reliability, and energy efficiency.

1:15 – 2:10: 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 will also be discussed.

Speaker: Michael Fulton, P.E., Western Mechanical Solutions; 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 29 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.

2:30 – 3:25: 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, psychrometrics, dehumidification, 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 D. Haughey, P.E., HBDP, CEM, LEED AP; Michael Haughey, Principal of Silvertip Integrated Engineering Consultants, has 44 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.

TRACK 2 – HVAC&R SYSTEMS & APPLICATIONS

Sponsored by: CFM Company



8:00 – 8:55: Mechanical cooling for Modern Data Centers

Data center environments have evolved from the precision cooling of the past. As servers can accommodate higher inlet temperatures, the options for mechanical cooling continue to expand. There are many factors to understand when making decisions of data center cooling and these can be a large driver in system selection. This presentation will discuss the latest trends in cooling for the modern data center in air and water side economizers.

Speaker: Brook Gummere, P.E., Senior Mechanical Engineer at Swanson Rink: Brook Gummere is a Senior Mechanical Engineer at Swanson Rink, a leading consulting engineering firm specializing in mission critical facilities. She is actively involved with the firm's private sector, institutional, and governmental clients, and has extensive experience in the study and design of energy efficient mechanical systems. Brook is a Professional Engineer, LEED AP, and Accredited Tier Designer (ATD). She received her degree in Architectural Engineering from Kansas State University

9:00 – 9:55: Net Energy Water Loops: A Clear Path to Net Zero Energy Buildings

As efficient building design continue to grow in popularity and code changes push engineers and architects to create buildings closer and closer to net zero design, it becomes increasingly difficult to decide on what system or combination of system types to use. Water source heat pump technology continues to improve and gain efficiency across the product line which allows these systems to be utilized on a wide variety of applications with varying budgets. These systems can be coupled with other technologies such as ground source loops, heat recovery chillers or make-up air, hybrid ground loops and other renewable energies to further diversity, increase the efficiency and decrease operating costs of the building as a whole. This

presentation will explore these options and will discuss how water source heat pump systems have historically, and are continued to be used in high efficient building design.

Speaker: Alan Niles, Western Regional Commercial Sales Manager at WaterFurnace International: Alan Niles is a mechanical engineer with over 30 years of experience working with manufacturers of commercial water source heat pumps (WSHPs) and ground loop heat pumps (GLHPs) concentrating on commercial tower/boiler system design and commercial geo-exchange system design. He has been with WaterFurnace International, a manufacturer of WSHP's and GLHP's, since 2009. Alan was elected in 2012 for the honor of Distinguished Lecturer for ASHRAE, speaking on the topics of economics and design of commercial ground loop systems. In 2013, Alan Niles' article "Net-Energy Water Loops: A Clear Path to Net Zero Energy," published in the August edition of HPAC (Heating/Piping/Air Conditioning) Engineering, introduces the use of water loop systems as the integral building block for a building-wide net zero energy system.

10:25 – 11:20: Don't Let This Happen to You

The Devil is often in the details in designing, constructing, and operating the built environment. Barry Stamp and Kyle Manske will share lessons learned from their careers engineering HVAC systems. Design guidance re-enforced with manufacture's data, unwritten rules of thumb and fail photos from some missed opportunities will be offered to all session attendees striving for better built environments.

Speaker: Kyle Manske, P.E., Principal/Senior Design Engineer at 20/20 Engineering, Inc.:

Kyle has been in the HVAC industry for 20 years and has experience working in both design/build and consulting engineering for built environments. He graduated from the University of Wisconsin - Madison with a BS in Mechanical Engineering and from the UW Solar Energy Laboratory with a MS in Mechanical Engineering. Through his continuing education at the College of Hard-Knocks, Kyle has continued to find better HVAC&R and plumbing system solutions in commercial buildings, custom residences, solar thermal, indoor cultivation, resort/hospitality, high alpine environments, higher education, health care, and animal hospital/shelter facilities.

Speaker: Barry Stamp, PE, LEED AP Senior Mechanical Engineering Specialist / Project Manager, The RMH Group:

Barry Stamp, PE, is a senior mechanical engineer and project manager at The RMH Group, a mechanical and electrical consulting engineering firm based in Lakewood, Colorado. He

has 35 years of mechanical engineering, project management, and executive experience for healthcare facilities, laboratories, K-12 schools, higher education campuses, and central plants. Prior to joining RMH, Barry served as Director of Engineering Services for a large mechanical contractor where he provided mechanical design services, served as a technical/contractual liaison between his firm and engineering firms on large design/build projects, and assisted with pre-construction efforts. Barry is a graduate of University of Colorado Boulder with a Bachelor of Science degree in architectural engineering (with energy engineering emphasis). He is also a member of American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) and Colorado Association of Healthcare Engineering Directors (CAHED).

1:15 – 2:10: Everybody Loves a DOAS

With an increased focus on energy efficiency and the rise of variable refrigerant flow systems in the North American market, DOAS systems have experienced a surge in popularity. As a result, a flood of information touting the benefits of these systems is readily available. But are DOAS systems right for every project? This presentation will cover considerations that should be made by designers and owners/operators when choosing between a DOAS and a centralized VAV system for a new construction or major renovation project.

Speaker: Sean Beilman, PE, Associate Principal and Manager of Energy Services @ BCER Engineering; Sean Beilman, P.E., serves as an Associate Principal and Manager of Energy Services at BCER Engineering, a full service Mechanical, Electrical, Plumbing, Energy, Life Safety, and Technology consulting firm. Mr. Beilman has over 15 years of experience in the design of HVAC and plumbing systems for governmental and educational facilities, office buildings, resorts, healthcare, and data centers. Mr. Beilman's area of expertise is high performance buildings, energy efficiency, and sustainable building design. Beilman served as the Rocky Mountain ASHRAE Sustainable Engineering Committee Chairman from 2009 to 2010 and is one of the co-founders of the Rocky Mountain Energy Simulation Engineers group. Currently he is a Voting Member of the ASHRAE Standard 90.1 Project Committee, a member of the ASHRAE Advanced Energy Standards working group, and served as the Technical Editor of the ASHRAE Standard 90.1, 2013 User's Manual.

2:30 – 3:25: Prevent Vibration Issues so Owners Don't Get Angry With You

Vibration and noise problems are easily predicted and prevented, but are often overlooked and can be difficult and expensive to fix. In this presentation, Larry will present the theoretical and practical application of vibration control to fans, pumps, air handlers, cooling towers and compressorized equipment so vibration controls can be included by the contractors and properly installed. He will also show the current ASHRAE recommendations for equipment isolation so engineers properly select the isolators for maximum value and minimum cost. If you're responsible for spec writing, quality control, or solving problems on projects, this course is very necessary for you and will help you avoid expensive, time consuming field issues.

Speaker: Larry Gelin, Engineering and End User Sales for CFM Company; Larry has been working at CFM Company for 16 years. He holds a BSME from the University of Wisconsin at Madison and a 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 and has been involved in the ASHRAE Tech Conference since 2002. He has delivered presentations to the ASHRAE community on pumping systems, vibration isolation, seismic and wind restraint, public speaking and management.

Track 3 – SUSTAINABILITY

Sponsored by: McNevin Company



8:00 – 8:55: The Value of Building Commissioning Study

Building Commissioning Association has partnered with Lawrence Berkeley National Lab to update the 2009 Evan Mills study on the value of building commissioning. This update will enrich statistical evidence validating the economic value that commissioning delivers. This presentation will provide results of

the study based on information provided by commissioning providers and by utility programs, including:

- Economic cost/benefit results with an emphasis in commissioning for new construction
- The degree to which commissioning is involved in the design and construction process
- The impact of commissioning on the performance of buildings.
- Market trends in the commissioning industry.

Speaker: Tom Poeling, P.E., CEM, CCP, Director of Quality Assurance, US Engineering – Construction: Tom is the Director of Quality Assurance at US Engineering, a top 25 mechanical contractor, nationally. He previously served as US Engineering's Director of Energy Solutions, where he coordinated internal commissioning processes during design and construction, and identified and executed energy conservation strategies for various projects. Tom has been involved in the commissioning industry for over 25 years, and serves on the International Board for the Building Commissioning Association (BCxA) and served for seven years on the Southwest Chapter Board of Directors. Tom is a graduate of Colorado State University, holding a Bachelor of Science degree in Mechanical Engineering.

9:00 – 9:55: Power Factor and Energy Efficiency

Power factor is a little understood concept among architects and other building designers. Yet, problems with this aspect of electrical systems result in greater electrical utility costs, both from consumption and demand. Technology is now available to improve power factor in large buildings, also resulting in longer electrical equipment life. Power Quality and Power Factor are inter-related.

Speaker: Paul C. Hutton, FAIA, LEED BD+C Chief Sustainability Officer, Cunningham Group Architecture: Paul has been a leader in several professional organizations, including the American Institute of Architects, the U.S. Green Building Council, and the 2030 Challenge. Paul received his Bachelor of Arts in Architecture from Princeton University and his Master of Architecture and Master of Planning from the University of Virginia. Paul was a faculty member of the University of Colorado, Graduate School of Architecture, for nearly 20 years. He has been an active proponent of the Solar Decathlon program and is the only architect to serve as a juror for both the American and Chinese Solar Decathlons. He lives

on a sustainable ranch south of Denver with his wife, dog, and free-range chickens.

Speaker: Adil H. Khan, MBA, CEO of Accentz, Inc and **TransPower Company:** For the past 30 years, Adil has been involved in next-generation technologies and is focused on the inventing, developing, manufacturing, launching and commercializing game changing high efficiency patented technologies and solutions to commercial and industrial customers. Some of technologies are Voice over IP, Solar Energy, and Energy Efficiency technologies. Adil is a founder and member of the Governing Board of Directors for American Academy, a K-8 STEM school. Adil is an Adjunct Professor of Strategic Management at Denver University and serves as member of the Advisory Board for the Center for Management Development at Denver University. Adil nominated for many awards, is a recipient of the State of Colorado, 2013 Martin Luther King Business Social Responsibility Award for "Content of Character." Adil moved to Colorado from Wisconsin 30 years ago. He is married and has two children.

10:25– 11:20: Zero Over Time: A cost-effective pathway to net-zero energy for buildings and portfolios

Net-zero energy can be a daunting and seemingly costly target for facility or portfolio managers. With increasingly stringent energy codes and corporate sustainability goals, many are seeking a cost-effective path to achieving net-zero energy. In this session, the presenter will outline a pathway to zero that is both economical and impactful. This net-zero energy over time plan leverages major building lifecycle events, such as planned equipment replacements, major renovations, and other capital improvement projects, to pinpoint the most economical points in time to improve performance and reduce energy loads in a building. Zero over time relies on a central energy master plan for the portfolio or building, which lays out smaller projects over time that are more cost-effective and add up to deep energy reductions across a given building or portfolio, on a pathway to zero energy, cost, and carbon.

Speaker: Matt Jungclaus, P.E. Manager, Rocky Mountain Institute: Matt is a Manager with RMI's buildings practice. He works on the Pathways to Zero Initiative, which focuses on driving the adoption of superefficient and net-zero energy buildings. Matt proves the technical and business case for net-zero energy at the district scale through client-driven work for district-level building developments and through involvement in

programs such as the Department of Energy's Zero Energy District Accelerator. Prior to joining RMI, Matt worked for CEG Solutions, an energy services company in Virginia, which he served as a technical analyst and a project manager for building energy projects in the public and private sectors. Before working for CEG, Matt worked as a residential energy auditor for the Local Energy Alliance Program (LEAP) in Charlottesville, VA.

1:15 – 2:10: Optimal Dispatch of Distributed Energy Resources for both behind-the-meter benefits and quantifying grid impacts

The electric grid is rapidly evolving with the prolific growth in distributed energy resources (DERs)—including solar photovoltaics (PV), electrochemical storage, flexible loads, and electric vehicles (EV)—and the ability to intelligently control these DER assets. Buildings are evolving to not only consume, but also store and generate energy. Analytic frameworks and building-to-grid models must be updated to help design and operate these systems and provide the analytic underpinning for building and energy policy to accommodate the time-sensitive and locational value of DER. This session presents a modeling workflow that allows for optimal sizing and integrated dispatch of a number of behind-the-meter technologies and then addresses how these technologies might be viewed or valued from a grid operator perspective.

Speaker: Dylan Cutler, National Renewable Energy Lab: Mr. Dylan Cutler is a senior research engineer at the National Renewable Energy laboratory (NREL) where he focuses on optimization of behind-the-meter distributed energy resources and advanced analysis on integrated controls data. He has been involved in the development of the REopt model during the last nine years at NREL, leading much of the custom development and analysis. Mr. Cutler also leads research on building and utility control systems integration and is one of the technical leads on the Intelligent Campus team, which focuses on NREL's own control system integration and energy informatics infrastructure. Recently, he has been leading the research on facilitating distributed energy markets with distributed ledger technology at the lab.

2:30 – 3:25: How ASHRAE 62.1 IAQP air cleaning can reduce equipment cost and save energy

The Indoor Air Quality Procedure (IAQP) reduces outside air intake, keeping out polluted air, in addition to providing energy and first cost savings. With people spending 90% of their time indoors, indoor air quality has an enormous impact on health. Studies from Harvard, Berkley Labs, NBER and others, show that reducing carbon dioxide levels can increase occupant performance and productivity.

Speaker: Ted Vergis, VP of Business Development, enVerid: Ted Vergis has been with enVerid for 3 years. Prior to enVerid, he had 10 years of experience in energy efficiency, storage, and renewables where he was a top salesman, manager, and executive at TESLA & SunRun. Ted has been responsible for nearly \$1BN in deployed construction projects and is responsible for all New Construction business at enVerid in the U.S. & Canada, is an Honor Medal recipient, and water sport enthusiast. He has a Bachelor's of Science Degree from California Polytechnic State University – San Luis Obispo. Originally a California native, he now resides in Washington D.C.

Track 4 – Building Automation

Sponsored by: ATS



8:00 – 8:55: The Evolution of the Control Valve

Control valve technology went largely unchanged for decades, globe and ball style valves were controlled to a positional opening in attempt to control the flow rate, in an attempt to control the heat transfer. What if a control valve could control directly flow? What is a control valve could control directly heat transfer? In the past 15 years, great leaps in technology have expanded the capabilities of control valves to the point that valves can control flow, or heat transfer, or even optimize heat transfer. The session will explore the evolution of valves and how mechanical and electronic solutions achieve pressure independence, how systems can be dynamically balanced and will also take a brief dive into flow/heat transfer optimization strategies.

Speaker: David Kandel, Belimo: The instructor is David Kandel. Mr. 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 a Regional Application Consultant for the Rocky Mountain region.

9:00 – 9:55: Closing out a Controls Project

Closing out the building automation controls portion of a project is getting tougher and tougher. This session will provide several suggestions on the following topics: Scope Clarification, Controls Milestones: (How to know when they are “done”), Controls Installation Requirements: Avoiding Common Pitfalls, Controls Contractor Coordination and Other Gotchas.

Speaker: Ken Nekvasil, ATS Rocky Mtn.: Ken, Sales Manager for ATS Rocky Mountain, has been in the HVAC industry for over 30 years. He has extensive experience in building automation controls and HVAC Equipment both from an operational and sales perspective. He is very familiar with BACnet based systems and integration to other systems.

10:25 – 11:20: Occupant-Centric Metrics for Occupant Aware Buildings

While sustainability and resiliency are still central themes in high performance building design, two new pillars are rising: occupant-centric and data-driven building design and operations. The IEA EBC convened the Annex 66 project in November 2013 to better understand how occupants use buildings, and how this can be better represented in the design phase and characterized in the operational phase. Simultaneously, there is a high uptake in occupancy-detection technologies for applications such as wayfinding, people counting, hot-desking, and real-estate evaluation, making these buildings Occupant Aware. However, as recently documented in “On occupant-centric building performance metrics” (O’Brien et al. 2017), there are few standardized metrics to quantify key aspects of building performance from an occupant perspective. This talk will discuss and characterize occupancy detection technologies available in the marketplace today, discuss occupant-centric building performance metrics, and showcase these metrics using WSP’s ThinkBOLDR innovation lab in Boulder, CO.

Speaker: Cory Morisman, WSP: Cory Morisman is a Smart Building Specialist within our building technology systems group at WSP. He works on the development of system architectures and deployment of enterprise level data collection, analysis techniques, and control strategies in converged Building Automation Systems to find business intelligence and operational efficiencies for clients.

1:15 – 2:10: Programmable

This presentation will cover the basics of controls and DDC. This 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 connections of devices to controllers and briefly touch on the software side of DDC software, programming and protocols.

Speaker: Mike Harrington, CFM Co.: Mike has been in the HVAC industry for nearly 20 years. He graduated from the Colorado School of Mines with Engineering Mechanical Specialty. He served as the Rocky Mountain Chapter President 2015-2016. He has extensive industry experience in commercial and industrial control systems as an integration controls contractor, commissioning agent, specifying engineer, and equipment representative. He is proficient with sequence of operations, the integration of equipment and multiple protocols. During his time in local ASHRAE chapter leadership, the chapter was the first to surpass \$100,000 in research promotion.

2:30 – 3:25: Air Flow Measuring Stations

Does Energy code require them? When should we use them? What is the right technology for my application? If you find yourself asking these questions, please plan to attend this session.

Speaker: Andrew Tenhundfeld, Senior Sales Engineer at Western Mechanical Solutions: Andrew has been in the HVAC industry for 19 years, spending his entire career in HVAC equipment and control sales. His area of expertise is in assisting design professionals in proper applications of HVAC equipment and coordinating control sequences for successful projects.

Track 5 – Critical Environments

Sponsored by: Air Purification



8:00 – 8:55: Myths and Misapplications You Need to Know For Your HVAC Indoor Grow Design

Much of the cannabis industry is being poorly serviced by inefficient, high cost and underperforming HVAC systems. In this session, Al Grosskurth will review the science, math and industry trends behind smart HVAC decision for an indoor grow. These are unique buildings, and the misapplication of HVAC technologies has gotten many buildings into trouble – including full crop loss, which can be a million dollars or more at a time. We will counter some of the pervasive myths in the industry, some existing solution bias amongst consulting engineers and help to ensure you're armed with everything you need to get it right. There is a lot of outdated thinking and misinformation in this industry, and we will ensure that you're empowered to make the right design decisions and recommendations for your customer.

Learning objectives:

- Grow room HVAC equipment is not typically comfort cooling
- Grow room HVAC design – temperature and humidity combinations require a well thought out plan
- Grow room HVAC energy potential trends

Speaker: Al Grosskurth, Senior Manager, Strategic Partnerships, Agronomic IQ: Al Grosskurth is the Senior Manager Strategic Accounts for the newly launched Agronomic IQ Series of Dehumidifiers, the most advanced temperature and humidity control equipment in the grow room industry. The Agronomic IQ product line is designed and manufactured by Dehumidified Air Solutions (DAS), the largest and most innovative dehumidifier company in the world. Al started his HVAC career after serving 11 years as a Navy carrier-based jet pilot. After leaving the Navy he spent nearly 20 years with Trane as a commercial sales engineer focused on applied product

solutions serving complex system projects and industrials. In 2014 Al joined Poolpak (also a DAS company) and continued to hone his industrial dehumidification expertise over the last 5 years dealing in every aspect of the dehumidification industry. Prior to being selected to be a part of the Agronomic IQ division, Al was a National Sales Manager and sales engineer, who successfully consulted on and managed dehumidification projects of every size throughout North America.

9:00 – 9:55: Sterile and Hazardous Compounding: What to Know, What to Avoid

The United States Pharmacopeia (USP), in their Chapter <797> puts forth standards, " ...to describe conditions and practices to prevent harm, including death to patients that could result from... non-sterility, ...excessive bacterial endotoxins, ...unintended chemical and physical contaminants, and ...ingredients of inappropriate quality in compounded sterile preparations." In their new Chapter <800>, they describe "practice and quality standards for handling hazardous drugs (HDs) to promote patient safety, worker safety, and environmental protection". This discussion will address elements of engineering design associated with the construction and implementation of compounding facilities of both USP <797> and <800>, what's different with <797> now that <800> has its own soon to be implemented chapter, and some pitfalls to consider when assembling a facility that must undergo frequent stringent system evaluation and compliance testing over its operating lifetime.

Learning objectives:

- Understand the design elements of sterile compounding pharmacies
- Distinguish the differences between sterile drug compounding areas and hazardous drug compounding areas
- Learn the required elements of periodic certification
- Apply knowledge of certification requirements to the facility design

Speaker: William D. Mele, CIEC, RCCP-SCF, Senior Engineer, Chemistry & Industrial Hygiene, Inc.: Mr. Mele holds the title of Senior Engineer at Chemistry & Industrial Hygiene, Inc. (C&IH) where he provides technical oversight for industrial hygiene projects that involve ventilation and/or contaminant control issues. He has over 45 years of experience in the design, evaluation, implementation, and retrofit of general and local

exhaust ventilation and contaminant control systems and specializes in the control of process-specific contaminant exposures and their potential impacts on worker or occupant health.

Mr. Mele is a Council-certified Indoor Environmental Consultant (CIEC) and a Registered Cleanroom Certification Professional for Sterile Compounding Facilities (RCCP-SCF). He holds a Class A Heating and Ventilating Certificate from the City and County of Denver, and a Career and Technical Education (CTE) Credential from the Colorado State Board of Community Colleges and Occupational Education, having taught classes in "Building Mechanical and Electrical Systems" and "Construction Project Productivity." He regularly lectures for professional and trade organizations on mechanical system and ventilation design and analysis, particle dynamics, principles of filtration, indoor air quality, and specialty contamination control product and equipment application. His past and current affiliations include AIHA, ASHRAE (Life Member), CETA, IAQA, IEST, ISPE, and SME.

10:25 – 11:20: Skeptics Guide to Sustainability in Critical Environments

Critical environments such as Data Centers, Healthcare, and Laboratories with hazardous materials are some of the highest energy use occupancies in our building stock. We rightfully target these occupancies for our sustainability goals. However, health and safety, codes and standards, and resiliency requirements may conflict with our best ideas.

Learning Objectives:

- Constraints of Critical Environments
- Typical proposed sustainability strategies
- Identify and balance conflicting goals

Speaker: Mark Jelinske, P.E. Chief Mechanical Engineer, Fire Protection Engineer, The RMH Group: Mark Jelinske is the Chief Mechanical Engineer at The RMH Group and has more than 35 years of experience in mechanical, plumbing, and fire protection design of large buildings. He has a broad base of knowledge with numerous project types including healthcare, laboratories, high education, office buildings, hospitality, and historic renovations. Jelinske's licensed in both the mechanical and fire protection engineering disciplines. He formerly served as President and Director of the Rocky Mountain Chapter of the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). Jelinske has served on several code

adoption committees with Denver, including the current code cycle. He earned a B.S. degree in mechanical engineering from the University of Missouri – Rolla (MO S&T).

1:15 – 2:10: Energy Saving Strategies for Laboratory Exhaust Systems

With labs consuming 30-100 kilowatt-hours of electricity per square foot per year (2 to 7 times the average office space), energy saving strategies are more important than ever. Over the years, the primary focus on reducing energy consumption in the laboratories is to address methods to either reduce the air flow requirements or reduce the thermal conditioning requirements. However, the exhaust fans are often left untouched because rules of thumb associated with prescriptive designs limit the minimum volume flow rates and exit velocities out of the exhaust stacks.

More recently it has become possible to employ variable air volume (VAV) lab exhaust strategies that maintain performance and safety while reducing energy consumption. Primarily, these strategies focus on the ability to reduce the exit velocities out of the top of the stack and the volume flow rates through the bypass dampers, when either wind conditions or chemical concentration within the manifold meet certain criteria. These VAV control strategies may work adequately in some situations, however, depending upon the complexity of the site and the chemical usage within the laboratories, these strategies may not be the most energy efficient approach.

This presentation will evaluate several of the VAV exhaust strategies, calculate energy savings potential, and identify keys to successful implementation.

Learning Objectives:

- Key elements necessary to implement each strategy
- How to quantify the energy savings
- Differences in plume rise calculations and how they affect proper fan selection
- When to employ a wind tunnel-based or numerical-based exhaust dispersion study

Speaker: Jim Meats, PE, Vice President of Marketing, Loren Cook Company: In the industry since 1982, Jim received his engineering degree from Kansas State University and is a licensed professional engineer. Jim started his career as a consulting engineer, designing mechanical and electrical systems for commercial, industrial and institutional projects.

Jim has been active in AMCA since 1988 and currently serves on the Board of Directors as Secretary on the Executive Committee. AMCA involvement includes technical committees in air movement, air control and acoustical product groups. Jim has been an ASHRAE guest speaker around the country on the topics of air system design, HVAC acoustical design and fire/smoke control.

With Cook, Jim has been active in industry education related to lab systems, has been a speaker at I2SL and conducted research that has resulted in an ASHRAE research project on discharge characteristics of induced flow fans.

2:30 – 3:25: Cannabis Cultivation and Extraction: Challenges for HVAC Design and Operation

Indoor cannabis cultivation and extraction facilities present many challenges to the HVAC designer and to the operator of the facility. An improperly designed, constructed, or operated facility can lead to a multitude of problems, including damage to the building or the product. This presentation addresses several of the challenges, including cooling of high intensity grow lights, odor control, CO2 emitting equipment, estimating latent loads, building envelope, and maintaining critical environmental control under highly variable loads. The discussion will include fire codes for hash oil extraction facilities and actual incidents of fires and explosions.

Learning objectives:

- Understand how Vapor Pressure Differential (VPD) is critical to plant growth.
- Understand why temperature and humidity control is critical in cannabis cultivation.
- Provide an overview of the various room types needed in a cannabis grow and extraction facility and their required lighting and equipment.
- Understand operational issues related to building pressure, humidity spikes, cooling of grow light fixtures, pest control, and containment of flammable solvents.
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Speaker: Bruce Straughan, PE, CEM, CFEI, Mechanical Engineer and Owner, Straughan Forensic, LLC: Bruce Straughan is a mechanical engineer and Certified Fire & Explosion Investigator and is the founder of Straughan Forensic, LLC, an Arvada, Colorado based litigation consulting company, where he investigates incidents of property damage, personal

injury, design defects, and construction defects involving HVAC, refrigeration, plumbing, and fire protection. He has testified in deposition and recently testified in a criminal marijuana trial. He holds a Bachelor's Degree in Mechanical Engineering from the University of Wyoming. Bruce has over 25 years of experience in the HVAC and building systems industry, which included design, performance contracting, and commissioning.

Bruce is an active member of ASHRAE and recently presented a seminar on HVAC problems in cannabis cultivation at the 2019 National ASHRAE Winter Conference in Atlanta. Bruce has been quoted in a feature article of ACHR News Magazine and has provided material for an upcoming article in the magazine. Most recently, Bruce has consulted on litigation cases involving containment of odors from cannabis cultivation and extraction facilities.



**ROCKY MOUNTAIN CHAPTER OF AMERICAN SOCIETY OF HEATING,
REFRIGERATION & AIR-CONDITIONING ENGINEERS**



**26th Annual Technical Conference
Certificate of Attendance**

Sponsored by the Rocky Mountain Chapter of ASHRAE
May 10, 2019

	HVAC&R Fundamentals	HVAC Systems & Applications	Sustainability	Building Automation	Critical Environments
8:00 - 8:55	Pumping Systems Mark Jelinske, The RMH Group	Mechanical cooling for Modern Data Centers Brooke Gummere, PE, Swanson Rink	The Value of Building Commissioning Study Tom Poeling, PE, US Engineering	The Evolution of the Control Valve? David Kandel, Belmo	Myths and Misapplications You Need to Know For Your HVAC Indoor Grow Design Al Grosskurth, Agronomic IQ
9:00 - 9:55	Overview of ASHRAE Standard 90.1 Sean Beilman, PE, BCER Engineering	Net Energy Water Loops: A Clear Path to Net Zero Energy Buildings Alan Niles, WaterFurnace International	Power Factor and Energy Efficiency Paul Hutton, Cunningham Group Architecture Adil H. Khan, TransPower Company	Closing out a Controls Project Ken Nekvasil, ATS Rocky Mtn.	Sterile and Hazardous Compounding: What to Know, What to Avoid William D Mele, Chemistry & Industrial Hygiene, Inc.
10:25 - 11:20	ASHRAE Standard 62.1 Hal Yoder, PE, Western Mechanical Solutions	Don't Let This Happen to You Kyle Manske, PE, 20/20 Engineering Inc. Barry Stamp, PE, The RMH Group	Zero Over Time: A cost-effective pathway to net-zero energy for buildings and portfolios Matt Jungclaus, PE, Rocky Mountain Institute	Occupant-Centric Metrics for Occupant Aware Buildings Cory Morisman, WSP	Skeptics Guide to Sustainability in Critical Environments Mark Jelinske PE, The RMH Group
Lunch	ASHRAE's Role in the Industry - Past, Present, and Future Julia Keen, P.E., Ph.D., ASHRAE Fellow				
1:15 - 2:10	Psychrometrics Michael Fulton, PE, Western Mechanical Solutions	Everybody Loves a DOAS Sean Beilman, PE, BCER Engineering	Optimal Dispatch of Distributed Energy Resources Dylan Cutler, National Renewable Energy Lab	Programmable Mike Harrington, CFM Company	Energy Saving Strategies for Laboratory Exhaust Systems Jim Meats PE, Loren Cook Company
2:30 - 3:25	Altitude Effects on System Design Michael Haughey, PE, Silvertip Integrated Engineering Consultants	Prevent Vibration Issues so Owners Don't Get Angry With You Larry Gelin, CFM Company	How ASHRAE 62.1 IAQP air cleaning can reduce equipment cost and save energy Ted Vergis, enVerid	Air Flow Measuring Stations Andrew Tenhundfeld, Western Mechanical Solutions	Cannabis Cultivation and Extraction: Challenges for HVAC Design and Operation Bruce Straughan PE, Straughan Forensics, LLC.
3:30 - 5:00	Best Efficiency Greg Cunniff, PE, Director Application Solutions, Williams Comfort Products				
	_____ Signature of Participant				
	_____ Professional Development Hours Awarded _____ GBCI CMP CEU's (Course ID: 0920007607) _____ ACAC RCs, (Recertification Credits) Awarded _____ ABIH CM Points (Continuing Maintenance Points) Awarded	_____ Signature of Chapter Officer			