ASHRAE Rocky Mountain Chapter

25TH ANNUAL TECHNICAL CONFERENCE

ADAPTING TODAY

TO SHAPE TOMORROW

WHEN

FRIDAY, APRIL 28TH

8am-5pm

WHERE

SHERATON DENVER WEST

360 Union Boulevard | Lakewood, CO 80229

REGISTER

www.rockymtnashrae.com

Co-sponsored by Rocky Mountain Chapter of the National Environmental Balancing Bureau (NEBB)

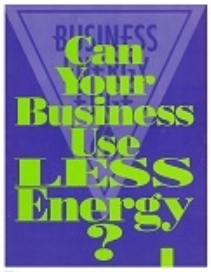
GBCI Continuing Education Hours provided by USGBC Colorado

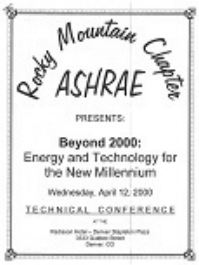
U.S. Green Building Council Chapter Colorado

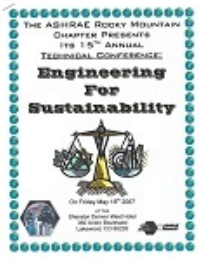
NEBB

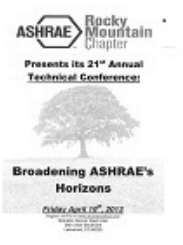
Celebrating 25 years 1992 • 2017

25 Years of Awesome ASHRAE









2017 Rocky Mountain Chapter ASHRAE Technical Conference "Adapt Today to Shape Tomorrow"

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	***Pumping System Fundamentals*** Mark Jelinske, P.E., Cator Ruma & Associates	***Acoustical Design and Space Planning for Sound-Sensitive Spaces*** Dana Hougland, Shen Milsom & Wilke GBCI CMP	***People-Centric Engineering and the WELL Building Standard*** Tom Hootman, AIA, LEED AP, WELL AP, MKK Consulting Engineers, Inc GBCI CMP	***DDC Basics*** Mike Harrington, P.E., Leed AP CFM Company	***Healthcare Topic –Chilled Beams in Healthcare*** Kevin Jayne, PE, LEED AP, AEI GBCI CMP
9:00-9:55	***Overview of ASHRAE Standard 90.1*** Sean Beilman P.E., BCER Engineering GBCI CMP	***Radiant Cooling and Heating Forum-High Mass and Low Mass Approaches*** Devin Abellon, Uponor Michael Matzura, P.E., Zehnder-Rittling GBCI CMP	***Optimizing Laboratory Controls through Fault Detection and Diagnostics Software*** Laura Dyas, P.E., CEM, LEED-AP, & Bryce Buchanan, P.E., CCP, CEM, Group 14 Engineering GBCI CMP	***IECC 2015 Code Impact on Controls*** Nick Bare, Blue Ridge Technologies GBCI CMP	***Case Study: Cleanroom Design – Microelectronics Facility*** Barry Stamp, PE, LEED AP, Director of Engineering Services, U.S. Engineering GBCI CMP
9:55-10:25	**Morning Break & Vendor Exhibits**				
10:25-11:20	***Altitude Effects on System Design*** Michael Haughey, P.E., HBDP, CEM, LEED AP Silvertip Integrated Engineering Consultants	***Did Underfloor Air Distribution Die? Will it live Again?*** Chris Burroughs, Price Industries GBCI CMP	***CSU New Chemistry Building-Making a fume hood intense building Sustainable*** Sean Convery, P.E., Cator Ruma & Associates Eric Ringold, Ambient Energy GBCI CMP	***DDC Project Pre-Start Panel*** Paul Ruffini, P.E. RKMI; Matt Cooper, P.E.,Group 14 Engineering, Jason Beu, RMH Group	***ASHRAE STD. 188 Legionellosis: Risk Management for Building Water Systems*** *William D. Mele, CIEC, RCCP-SCF, Senior Engineer, Chemistry & Industrial Hygiene, Inc* GBCI CMP
11:25-12:50	**Lunch Break and Keynote Address:**	**Climate disruption in the U.S.: The Fifty Shades of Climate Change,** **Kevin Trenberth, CGD Distinguished Senior Scientist, NCAR Climate Analysis Section** GBCI CMP			
12:50-1:15	**Vendor Exhibits**				
1:15-2:10	***Psychrometrics*** Michael Fulton P.E., Western Mechanical Solutions	***Indoor Air Quality, Air Cleaning, Engergy and Maintenance*** Duke Wiser, Environmental Dynamics Group GBCI CMP	***RMI's Net Zero Energy Innovation Center – A Case Study in Energy Efficiency and Integrated Design*** Craig Schiller, LEED AP, Rocky Mountain Institute GBCI CMP	***Internet of Things*** Kirk Rabius, P.E., Jacobs	***Modular Cleanroom Construction/Certification Considerations*** Ross Barrick, Modular Cleanrooms, Inc.
2:10-2:30	**Afternoon Break & Vendor Exhibits**				
2:30-3:25	***Fan Fundamentals*** Ryan Johnson, Air Purification Company	***Customized DX Solutions*** Adam Meyer, Technical Systems Inc.	***90.1-2016 Appendix G Updates and Fort Collins Utilities Case Study*** Gary Schroeder, Fort Collins Utilities Linda Morrison, P.E., Ambient Energy ***Sustainable Communities: Modeling, Energy, Water and Waste at Scale*** Peter Ellis, Big Ladder GBCI CMP	***Integrated Low Voltage Systems from a GC's Perspective*** Paul Boucher, RCDD, LEED AP, EIT, CCSE, JE Dunn	***Marijuana Facilities- Codes and Standards*** Bruce Straughan, PE, CEM, Building Systems Expert, Robson Forensic
3:30-5:00	**Afternoon Technical Keynote Address And Open Bar**	**Intelligent Buildings-Technology is changing what is possible in the built environment,** **Jim Vallort, ASHRAE Destinguished Lecturer** GBCI CMP			

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, April 28, 2017 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 Seventeen 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 14th

Member ½ day:	$ 150	(lunch included)
Member Full day:	$ 200	(lunch included)
Non-Member ½ day:	$ 175	(lunch included)
Non-Member Full day:	$ 220	(lunch included)

(10% discount to companies sending 5 or more)

Prices After April 14th

Member ½ day:	$ 175	(lunch included)
Member Full day:	$ 220	(lunch included)
Non-Member ½ day:	$ 195	(lunch included)
Non-Member Full day:	$ 240	(lunch included)

(10% discount to companies sending 5 or more)

Register at www.rockymtnashrae.com

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.

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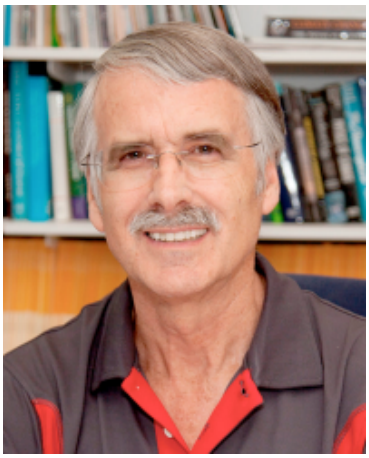
Luncheon Keynote Address:

"Climate Disruption in the US: The Fifty Shades of Climate Change"

In this talk I plan to discuss the science of climate change: the evidence, the understanding, what is happening and why, and what it means for the future. The biggest impacts and costs come from increasing extremes: heavy rains, floods, droughts, and wild fires, at costs of billions of $ per year. But what we do about the problem is for us all to decide, and depends on value systems, leadership, religion and so forth. The remarkable Paris Agreement and the Clean Power Plan appear to be in trouble, but there are things you can do. Will America be a great Climate leader again?



Speaker: Kevin Trenberth, CGD Distinguished Senior Scientist, NCAR Climate Analysis Section; Dr. Kevin E. Trenberth is a Distinguished Senior Scientist in the Climate Analysis Section at the National Center for Atmospheric Research. From New Zealand, he obtained his Sc. D. in meteorology in 1972 from Massachusetts Institute of Technology. He was a lead author of the 1995, 2001 and 2007 Scientific Assessment of Climate Change reports from the Intergovernmental Panel on Climate Change (IPCC), and shared the 2007 Nobel Peace Prize which went to the IPCC. He served from 1999 to 2006 on the Joint Scientific Committee of the World Climate Research Programme (WCRP), and he chaired the WCRP Observation and Assimilation Panel from 2004 to 2010 and chaired the Global Energy and Water Exchanges (GEWEX) scientific steering group from 2010-2013 (member 2007-14); and chaired the 2014 7th International Scientific Conference on the Global Water and Energy Cycle Committee. He has also served on many national committees. He is a fellow of the American Meteorological Society (AMS), the American Association for Advancement of Science, the American Geophysical Union, and an honorary fellow of the Royal Society of New Zealand. In 2000 he received the Jule G. Charney award from the AMS; in 2003 he was given the NCAR Distinguished Achievement Award; in 2013 he was awarded the Prince Sultan Bin Abdulaziz International Prize for Water, and he received the Climate Communication Prize from AGU. He edited a 788 page book Climate System Modeling, published in 1992 and has published 543 scientific articles or papers, including 62 books or book chapters, and over 257 refereed journal articles. On Google Scholar, there are over 54,295 citations and an ***H index of 100*** (100 papers have over 100 citations). He has given many invited scientific talks as well as appearing in a number of television, radio programs and newspaper articles. He is listed among the top 20 authors in highest citations in all of geophysics.

Afternoon Technical Keynote and Open Bar:

"Intelligent Buildings - Technology is Changing What is Possible in the Built Environment"

There is a lot of buzz around Intelligent, or Smart, Buildings, but what is an Intelligent Building? This presentation will examine the answers to this question and how you can put your building on its path to a "higher education".

Advancements in technology have given the engineer the ability to aggregate and share data across disparate systems thereby creating opportunities to increase energy and operational efficiencies, improve occupant comfort, safety, productivity, and enrich the visualization capabilities for the organization's numerous internal and external stakeholders. The intelligent building platform will result in a more efficient, secure and productive asset that has the capacity to continuously improve over its lifetime.

Speaker: Jim Vallort, ASHRAE Distinguished Lecturer; Jim Vallort has spent his career focusing on energy: ranging from

measuring energy usage, optimizing the systems, integrating automation to control energy and the impact of commissioning on energy consumption.

Jim is a Senior Vice president with ESD headquartered in Chicago, IL, a consulting engineering firm. Jim also serves as an ASHRAE Society Vice President for the 2015-2016 Board of Directors. He currently serves as a member of Standard Project Committee 211P, Standard for Commercial Building Energy Audits, and Technical Committee (TC) 7.9, Building Commissioning. Jim previously served on the Board as a director-at-large in 2005-08 and as Region VI director and Regional Chair in 2001-04.

Jim has over 20 publications and numerous presentations under his belt on topics ranging from Energy Efficiency, Automation and Commissioning to Underfloor Air Distribution. He has been an invited speaker at multiple fortune 500 companies educating their staff on building automation, energy efficiency, existing building commissioning and new construction commissioning. He brings a unique perspective on the constructability and real world aspects of our industry having been a union pipefitter, spent years in the field commissioning projects, combined with the experience as a mechanical designer, building automation designer and energy modeler.

Jim's greatest joy at work is teaching and mentoring others on the mix of art and science that is required to solve today's challenges in the engineering community. Vallort is the recipient of the ASHRAE Exceptional Service Award, ASHRAE Distinguished Service Award and an Excellence in Engineering Award from the ASHRAE Illinois Chapter in 1998.

Jim Vallort plays a large role in organizing one of ASHRAE's largest, best-attended, and most profitable Conferences held in Chicago every three years. Vallort served as advisor to the most recent 2015 ASHRAE Winter Conference; co-chaired the Chicago meetings in 2012, 2006, 2003 and 1999; and served as chair of the ASHRAE Centennial Meeting in 1993; he organized the Technical Tours and was on the Entertainment Committee for the 2009 Chicago Winter Conference. His earlier service includes Technology Council, the Planning Committee, the Standards Advisory Committee and a presidential ad hoc Committee on Certification. He also served as chair of the CIBSE/ASHRAE 2000 Joint Conference Steering Committee, the Member Council ad hoc Committee on Young Engineers (YEA) and the Society Program Committee and vice chair of the CIBSE/ASHRAE 2003 Joint Conference Steering Committee. He was president of the Illinois Chapter in 1999-2000.

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 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., Senior Associate at Cator, Ruma; Mark Jelinske, Senior Associate at Cator, Ruma, and Associates has over 30 years of engineering experience, primarily as a consulting engineer, as well as a project engineer for a large mechanical contractor. He is a registered Professional Engineer in Mechanical Engineering and Fire Protection Engineering. For the past 15 years, Mark has focused primarily on healthcare design and construction. He also has experience in laboratory, higher education, and hospitality design and construction. He performs QC, mentoring and training within CRA. He has been active in the development process for several model codes, NFPA standards, and the FGI Guidelines. He has been designated as the ASHE Code Advocacy Liaison for Colorado, and serves on the Denver Building and Fire Code Task Force for the 2016 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: Overview of ASHRAE 90.1

ASHRAE Standard 90.1 – 2013 was released in the fall of 2013. The Mechanical Chapter, Section 6 of 90.1 - 2013 includes roughly 40 changes to 90.1 – 2010. 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, BCER Engineering**;** Sean Beilman, P.E. serves as the Sustainable Services Manager at BCER Engineering, a full service Mechanical, Electrical, Plumbing, Energy, Life Safety, and Technology consulting firm. Mr. Beilman has over twelve 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: 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 D. Haughey, P.E., HBDP, CEM, LEED AP Silvertip Integrated Engineering**;** Michael, Principal of Silvertip Integrated Engineering Consultants, has 40 years' 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 60 seminars.

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 26 years' 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, and has been on the ASHRAE Research Promotions committee that has set records for the past 5 years.

2:30 – 3:25: Fan Fundamentals

Attendees will be trained on the basics of commercial / industrial fans including common fan types and frequently used terms. Topics to be covered include the different types of impellers and reasons for using each, a general overview of fan construction options and why they should or should not be used for certain applications, as well as a high level discussion of other components (motors, v-belt drives, dampers, etc.) which can be added to fans.

Speaker: Ryan Johnson, Air Purification Company**;** Ryan Johnson has 16 years of experience in the HVAC industry and has held a variety of positions working for multiple equipment manufacturers. His roles have included technical product support and application as well as factory direct OEM and international sales. The majority of his work has been related to commercial fans and blowers, but he has also supported

specific market segments such as laboratory exhaust systems, agricultural processes and mine / tunnel ventilation.

TRACK 2 – HVAC&R SYSTEMS & APPLICATIONS

Sponsored by: CFM Company

8:00 – 8:55: Acoustical Design and Space Planning for Sound-Sensitive Spaces

Successful design of performance and educational spaces with regard to acoustical quality and reducing objectionable noise starts early in the process. Dana will describe the approach to designing these facilities and making engineers aware of the most critical aspects to ensure that acoustical criteria are met. Specifically, she will cover noise control strategies including space planning, architectural acoustics treatments, and mechanical noise control approaches. She will provide guidance on the proper use and application manufacturer's acoustical data.

Speaker: Dana Hougland, Shen Milsom & Wilke**;** Dana Hougland is a Principal at SM&W with over 36 years of experience in acoustical design, theater design, and noise control. Her responsibilities include the acoustical, theatrical and audiovisual design of performing arts and convention facilities, theaters, research laboratories, religious and educational institutions. Dana has a Master's Degree in Mechanical Engineering with an acoustics specialty from the University of Texas at Austin. Dana is a Fellow of the Acoustical Society of America.

9:00 – 9:55: Radiant Cooling and Heating Forum – High Mass and Low Mass Approaches

In a moderated forum, both speakers will have a chance to explore commonalities and distinctions between high-mass and low-mass radiant heating and cooling systems, with regard to energy use, human comfort, material and installation costs, design requirements, design flexibility, applications, and integration with air systems.

Speaker: Devin Abellon, Uponor; Mr. Abellon is a registered professional engineer with 22 years of experience in the HVAC field. He was Vice President and managing principal of LSW Engineers California, Incorporated in San Diego until 2009, when he accepted a position as Business Development Manager for Uponor North America. He now works closely with engineers throughout the country, supporting projects that integrate radiant heating and cooling strategies to maximize energy efficiency.

Mr. Abellon earned his B.S. degree from the University of California at Santa Barbara in 1993. He is an active member of ASHRAE at the local chapter, regional and Society levels, currently serving as Programs Subcommittee Chair for ASHRAE TC6.5 – Radiant and Convective Space Heating and Cooling, Vice Chair for Membership Promotion, and Nominating Committee Region X Alternate.

Speaker: Mike Matzura, Zehnder-Rittling; Michael Matzura is the radiant National Business Manager for Zehnder-Rittling North America. He has over 15 years of experience in the HVAC industry with a focus on sustainable building design. Michael specializes in the application and design of radiant cooling systems in commercial buildings. During his career he acquired the Certified Energy Manager, CEM, and Leadership in Energy and Environmental Design, LEED AP certifications and is a member of ASHRAE TC 6.5 Radiant Heating and Cooling. Michael graduated from Syracuse University where he received a Master's & Bachelor's of Science in Mechanical Engineering.

10:25 – 11:20: Did Underfloor Air Distribution Die? Will it Live Again?

Underfloor Air Distribution (UFAD) was a widely-specified air distribution system in Colorado in the mid-2000s but has become less popular more recently. Chris will explore some of the benefits that owners had intended to gain (and whether they still matter), some of the pitfalls that were experienced in early projects, such as design principles, construction details, and leakage, thermal decay, and controls. Finally, he will share some lessons learned so engineers can decide for themselves whether UFAD is worth another look.

Speaker: Chris Burroughs, Price Industries**;** Chris Burroughs is a Mechanical Engineering graduate from the Georgia Institute

of Technology, and as a Senior Product Specialist in Price's Stratified Technologies division, is focused on Displacement Ventilation and Underfloor Air Distribution solutions. Chris is actively engaged in product development, marketing and manufacturing for these systems. He also plays an active role in industry research, training events and is involved in multiple ASHRAE committees including TC 9.7 Educational Facilities, TC 5.3 Room Air Distribution; UFAD subcommittee and SPC 70 Method of Testing for Rating the Performance of Air Outlets and Air Inlets.

1:15 – 2:10: Indoor Air Quality, Air Cleaning, Energy and Maintenance

The sole function of the HVAC system is to provide an environment with acceptable temperature, humidity, and pollutant containment levels. This seminar describes the importance of Indoor Air Quality (IAQ), the costs associated with it, and various technologies for helping to achieve it. Special attention will be given to the role of air cleaning, as described in ASHRAE standard 62, to ensure IAQ while reducing energy.

Speaker: Duke Wiser, Environmental Dynamics Group; Forwood Cloud "Duke" Wiser III founded Environmental Dynamics Group, Inc. in 1993 with several partners and is now the CEO. The company designs and manufactures systems for cleaning air and saving energy in a broad spectrum of applications. Mr. Wiser is an ASHRAE member, has testified before OSHA on IAQ in the workplace and holds a number of patents in the field. Among other venues, he has given talks at Greenbuild, Green Buildings New York, the International Conference for Enhanced Building Operations (ICEBO), and the National Facilities Management and Technology Conference. Duke has a B.A. from Bowdoin College.

2:30 – 3:25: Customized DX Solutions

This seminar will cover the fundamentals of refrigeration systems, including the refrigeration cycle, important components in the system, and their contributions toward reducing energy use, controlling capacity, and avoiding system failures. It will also contain some helpful analysis on the use of adiabatic pre-cooling for air-cooled chillers, and further analysis on what causes DX systems to fail.

Speaker: Adam Meyer, Technical Systems Inc.**;** Adam Meyer is the national sales manager for Technical Systems Inc, a custom manufacturer of fluid coolers, DX condensing units, chillers, and coils. Adam's team facilitates the design of customized cooling solutions. He has a BS in Mechanical Engineering from Oklahoma State University.

Track 3 – SUSTAINABILITY

Sponsored by: McNevin Company

8:00 – 8:55: People-Centric Engineering and the WELL Building Standard

Occupant health, comfort and well-being has always been the domain of MEP engineers. While the day-to-day reality of MEP engineering may seem to be equipment-centric, the WELL Building Standard is an opportunity to add more value on projects by focusing on people-centric outcomes. This session provides both an overview of the WELL Building Standard and a closer look at the people-centric features that are driven by the MEP engineer.

Speaker: Tom Hootman, AIA, LEED AP, WELL AP, MKK Consulting Engineers; Tom is an architect, engineer and author. As MKK's Performance + Design Innovation Lead, he works at the visionary intersection of architecture and engineering and leads MKK's Innovation Lab. Tom is dedicated to advancing the future of building performance and sustainability by delivering innovative solutions that are cost effective, healthy, regenerative, beautiful and transformational.

9:00 – 9:55: Optimizing Laboratory Controls through Fault Detection and Diagnostics Software

Fault detection and diagnostics (FDD) software platforms have become an established method for optimizing operation and control of mechanical systems. Whether used in new construction or existing buildings, the analytics engine provides a means of deep insight into the data available from the Building Automation System. This session will present the methods utilized in deploying the FDD software in laboratory settings.

Speaker: Laura Dyas, P.E., CEM, LEEP-AP, Group14 Engineering; Laura Dyas is a Building Performance Engineer with Group14 Engineering. She has over 5 years of experience in the building energy field with a focus in retro-commissioning, monitoring based commissioning, FDD programming, energy analysis and sustainability consulting. She graduated from University of Massachusetts Lowell with a B.S. in Chemical Engineering. She is actively involved in the Rocky Mountain Chapter of ASHRAE and is currently serving as the Junior Board Member to the Board of Governors.

Speaker: Bryce Buchanan, P.E., CCP, CEM, Group14 Engineering; Bryce Buchanan is a Building Performance Engineer with Group14 Engineering. He has worked in the building energy field for over 5 years, primarily engaged in commissioning, retro-commissioning, energy analysis, and FDD programming. He holds a M.S. from the Building Systems Program at the University of Colorado, Boulder, and currently serves as the Chairman of the Young Engineers in ASHRAE for the Rocky Mountain Chapter.

10:25– 11:20: CSU New Chemistry Building – Making a fume hood intense building sustainable

Laboratories are notorious for high energy consumption and mechanical system complexity. Join us for insight into the design, energy efficiency, and innovation at the new Chemistry Building at Colorado State University – which likely has the highest fume hood density for a laboratory in Colorado.

Speaker: Sean Convery, P.E., Cator, Ruma & Associates; Sean Convery is a Mechanical Principal at Cator, Ruma & Associates and a founding Board Member of the Colorado Chapter of the International Institute of Sustainable Laboratories (I2SL). His 22 years of mechanical design experience include energy-efficient mechanical systems for laboratories and higher education campus buildings. His expertise in sustainable lab design has had him involved in over 65 lab projects, many of which are certified LEED Gold or Platinum.

Speaker: Eric Ringold, Ambient Energy; Eric Ringold, is a Building Performance Engineer at Ambient Energy with a Master's Degree in Mechanical Engineering and Building Simulation from Cooper Union. His experience includes higher education and laboratory projects and consulting on projects targeting zero net energy or emissions.

1:15 – 2:10: RMI's Net Zero Energy Innovation Center – A Case Study in Energy Efficiency and Integrated Design

With a full year of occupancy, Rocky Mountain Institute can now verify that the Innovation Center has achieved an unprecedented level of performance by becoming one of the most energy efficient offices in the world, despite being in the continental United States' coldest climate zone. This impressive result is due to a deeply integrated design team, a whole-systems design approach, and an Integrated Project Delivery contracting mechanism. This session will provide an overview of the Innovation Center, details of its innovative approach to thermal comfort, details of the building's systems, and lessons learned from the design team.

Speaker: Craig Schiller, LEED AP, Rocky Mountain Institute; Craig Schiller, LEED AP, is a Senior Associate for Rocky Mountain Institute (RMI) who has worked in both the sustainable buildings' and communities' practices. Within RMI, Craig has managed a Superefficient Affordable Housing Design Challenge for university students, co-hosted a deep energy retrofit conference with the General Service Administration, helped formulate a new sustainable campuses initiative, and has been a core design team member for RMI's new net-zero-energy headquarters. Craig is currently working with RMI's Sustainable Aviation Fuels program dedicated to implementing energy efficiency and biofuels at airports.

2:30 – 3:25: 5A: 90.1-2016 Appendix G Updates and Fort Collins Utilities Case Study

The new energy modeling compliance path in Standard 90.1-2016 has new terms like Performance Cost Index. Join us for insight into the new path and how the City of Fort Collins Utilities Department is using it as a basis for their Integrated Design Assistance Program incentive.

Speaker: Gary Schroeder, Senior Energy Services Engineer, Fort Collins Utilities; Gary Schroeder has worked with Fort Collins Utilities for the last 18 years assisting its various customers in using energy more efficiently. His particular area of focus includes the Utility's Integrated Design Assistance Program, Building Code support, and the City's Night Sky Initiative team. Gary has held a long-term interest in energy efficiency and renewable energy, having worked for two solar companies during the "tax-credit heyday" of the early 80's. After

finally deciding that making a difference in the way people use energy was more important than skiing, he obtained a degree in Mechanical Engineering from CSU and entered the professional world of energy-efficiency consulting.

Speaker: Linda Morrison, P.E., Principal, Building Performance Engineer Team Lead, Ambient Energy; Linda Morrison has twenty-two years of experience in sustainable design, analysis of energy, renewables, and carbon, for energy and operational efficiency. She has assisted over a dozen clients in designing net zero energy facilities.

5B: Sustainable Communities: Modeling Energy, Water and Waste at Scale

We all know sustainability is about more than reaching the goals for just one building, and it's about more than just achieving energy efficiency. To begin to explore the bigger picture of sustainability we need tools that empower us to analyze entire communities across multiple measures of resource efficiency. In this session we will present an emerging web-based software tool for community-scale modeling that we've developed in collaboration with the US Army Corps of Engineers. One unique feature of the tool is that it integrates the analysis of energy, water, and waste. Examples will illustrate the application of the tool for typical projects.

Speaker: Peter Ellis, President, Big Ladder Software; Peter is President and Founder of Big Ladder Software, a Denver-based company that provides services and software for building energy modelers. Peter has been involved in developing simulation tools for more than fourteen years and has been a pioneer in the deployment of open-source software for energy modeling. Under his leadership Big Ladder has released multiple free software tools, presented numerous training workshops, and launched popular web-based resources such as the Unmet Hours website and the EnergyPlus documentation website.

Track 4 – Building Automation

Sponsored by: ATS

8:00 – 8:55: DDC Basics

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 software side of DDC which include software, programming and protocols.

Speaker: Mike Harrington, CFM Company; Mike Harrington, Senior Application Engineer for CFM Company, has been in the HVAC industry for nearly 18 years. He served as the Rocky Mountain Chapter President 2015-2016. He has extensive industry experience in commercial and industrial control systems as an integration 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 chapter leadership, the chapter was the first to surpass $100,000 in research promotion and won the flip cup championship at one of the ASHRAE Region IX CRCs.

9:00 – 9:55: IECC 2015 Code Impact on Controls

This session will discuss the many changes required in IECC 2015 as they relate to HVAC and Lighting controls. The City and County of Denver has recently adopted IECC 2015. Most of the focus will be on lighting controls as this had the biggest change. Topics will include but not be limited to new requirements for occupancy sensors, lighting controls fault detection and commissioning requirements.

Speaker: Nick Bare, Blue Ridge Technologies; Nick has been with BRT since 2013 in positions focused on technical support, product application, solution development, and regional sales. He is working with the engineering community and controls contractors to specify Unified Controls that meet current energy codes and leverage the Building Automation System to

increase operational efficiency and reduce energy consumption.

10:25 – 11:20: DDC Project Pre-Start Panel

A panel discussion from industry veterans on the benefits of having a pre-project controls kick off meeting. Each panel member will provide a quick summary of what is important to their type of company and what they find useful during these meetings such as a responsibility matrix and making sure integration is successful.

Speaker: Paul Ruffini, RK Mechanical Inc. Paul has been with RKMI since 2013 as a Preconstruction Manager focused on initial evaluation of design oversight between the engineering staff, consultants and the operations staff. He performs engineering conceptual calculations, evaluates engineering alternatives, and manages mechanical and plumbing budgets. He will coordinate design strategies with the design and construction teams, trend project changes and quantify value engineering opportunities.

Speaker: Matt Cooper, P.E., CCP, CxA, LEED AP, is a Principal and the Commissioning Team Leader at Group14 Engineering. Matt has 17 years of experience in design, construction, and commissioning. He graduated from Kansas State University with a B.S. in Architectural Engineering. He is actively involved with the Building Commissioning Association as a Southwest Chapter Board Member (2014-2017) and past president. He is also a frequent presenter on commissioning for the Colorado Educational Institute and recently presented at the 2017 ASHRAE Winter Conference on "Real Time Data Monitoring to Get Building Operation on Track."

Speaker: Jason Beu, The RMH Group, Inc; Jason Beu is a Controls Engineer with the RMH Group with experience designing control systems for various types of buildings from data centers to central plants to office buildings with an emphasis on energy efficiency. Jason has 10 years of experience installing, troubleshooting, optimizing and designing building control systems. Jason Graduated from Colorado State University with a degree in Mechanical Engineering. Jason's emphasis throughout his career has been optimizing control sequences of operation to conserve energy, provide optimal comfort, while being simple and easy to operate.

1:15 – 2:10: Internet of Things

This session will focus on the current and future state of Internet of Things (IoT) devices. The session will address what IoT devices are, a high level overview of how they work, and how IoT is changing the way we live and interact with the internet. The session will focus on how IoT devices fit into commercial and institutional buildings, and what design considerations should be taken into account to support current generations as well as future generations of IoT devices.

Speaker: Kirk Rabius P.E., Jacobs; Over the course of his 21 year career, Mr. Rabius' experience has been diverse and includes the full spectrum of technology-driven solutions from program management and team leadership to strategic planning and full-scale program implementations. Most recently, his focus has been on the development of city-driven smart city technology solutions that address infrastructure demands stemming from increased city urbanization by targeting building, public safety, transportation mobility, and social sustainability improvements. In 2016, Mr. Rabius served as the lead capture manager on behalf of the City and County of Denver for the US Department of Transportation grant competition. The challenge fostered national competitiveness among cities that spurred an unprecedented level of collaboration between city, public, private, non-profit and community stakeholders to develop truly innovative, effective, and meaningful solutions to Denver's mobility challenges.

2:30 – 3:25: Integrated Low Voltage Systems from a GC's perspective

The explosion of information technology systems in construction projects is typically a train wreck for General Contractors to manage. Facility networks, IT networks and specialty networks are exploding and integration of systems is vital to a successful project. Mr. Boucher will explain how changes in General Contracting practices can remove risk, improve efficiencies and customer satisfaction in a new approach to building.

Speaker: Paul Boucher, RCDD, LEED AP, EIT, CCSE; is the National Director of Systems Integrated Solutions (SIS) for JE Dunn Construction Company, where he manages a team of individuals focused on preconstruction and construction services focused on Division 25, Division 27 and Division 28 low voltage trades. SIS works closely with owners to building smart intelligent buildings, while also eliminating risk and

duplication in construction processes. He has over 30 years' experience in building IT networks along with complete understanding of General Contractor management practices. He has been a member of BICSI since 1998. He received a Bachelor of Science in Civil Engineering from the Colorado School of Mines. He can be reached at paul.boucher@jedunn.com.

Track 5 – Critical Environments

Sponsored by: Air Purification

8:00 – 8:55: Healthcare Topic - Chilled Beams in Healthcare

Already a mainstay in laboratory design, chilled beams are seeing increased application within the healthcare environment. This presentation seeks to offer attendees an overview of the technology, its application, code review, energy savings, and best-practice design considerations.

Speaker: Kevin Jayne, PE, LEED AP, AEI; Kevin Jayne is a project mechanical engineer with Affiliated Engineers, Inc. His 10 years in consulting have brought exposure to complex building design across a variety of market sectors, with a current focus on healthcare. A graduate of the University of Wisconsin, in summer 2016 he relocated from Madison to lead the mechanical team for AEI's Denver office.

9:00 – 9:55: Case Study: Cleanroom Design – Microelectronics Facility

This presentation will be a case study of a microelectronics facility cleanroom from the perspective of a design-assist engineer/contractor. The case study will explore design requirements and considerations, address room air distribution and room air filtration, and it will also cover design concepts associated with the air-side/water-side HVAC system that can be used to limit ACH rates. It will also cover constructability and maintenance issues that are specifically associated with microelectronics facilities.

Speaker: Barry Stamp, PE, Director of Engineering Services, US Engineering; 32 years in the HVAC industry, with 28 years of experience in the consulting engineering business. His career focus is on long-term client relationships, successfully completing complex projects in laboratory, health care, manufacturing and campus settings.

Mr. Stamp has combined technical expertise with strong client service to provide practical solutions to design challenges. He has direct project experience with the Integrated Project Delivery and has experience applying sustainable design techniques and standards for LEED® certification. In addition, he has spoken professionally and published articles on integrated design, computational fluid dynamics (CFD) air flow modeling, and displacement ventilation.

10:25 – 11:20: ASHRAE STD. 188 Legionellosis: Risk Management for Building Water Systems

In June of 2015 ASHRAE, in conjunction with ANSI, approved their long awaited and much anticipated minimum Legionellosis risk management requirements for building water systems. ANSI/ASHRAE Standard 188-2015, Legionellosis: Risk Management for Building Water Systems, was no sooner published when within a month, a Legionnaire's disease outbreak in the South Bronx area of New York City, claimed 12 lives and caused over 125 illnesses. Numerous Legionnaires'' Disease outbreaks have since been reported across the country, in Canada, Europe, and as far away as New Zealand and Australia.

This presentation will address the chain of causation of Legionnaires' disease, characterize the buildings and building water systems requiring control, and identify the elements of risk management program as required by ASHRAE Standard 188-2015.

Speaker: William D. Mele, CIEC, RCCP-SCF**;** 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 40 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.

Additional areas of expertise include life cycle analysis of process heating and cooling equipment and systems; forensic investigation of building HVAC systems and the building envelope; evaluation, design, and retrofit of ventilation, humidification, and exhaust systems including integrating new systems into existing building systems; isolation and determination of pollutant pathways; and evaluation, testing, and retrofit of controlled environments with particular focus on isolation, identification, and evaluation of contaminants of concern (both gas and particle phase).

Mr. Mele holds 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. He is a Council-certified Indoor Environmental Consultant (CIEC) and a Registered Cleanroom Certification Professional for Sterile Compounding Facilities (RCCP-SCF). His past and current affiliations include AIHA, ASHRAE, CETA, IAQA, IEST, ISPE, and SME.

1:15 – 2:10: Modular Cleanroom Construction/Certification Considerations

This presentation will begin by providing a comprehensive overview of cleanroom construction. Topics covered will include different room construction types (Hard wall, soft wall, etc.) as they relate to room classification. Equipment layout and equipment choices will be discussed including a comparison of ducted HEPA units and fan filtered units. An overview of the cleanroom certification process and reasons for certification for different cleanrooms classifications will also be given.

Speaker: Ross Barrick, Modular Cleanrooms, Inc.; Mr. Barrick has 39 years of experience in the HVAC industry as it relates to modular cleanrooms. Ross and his company have furnished and installed cleanrooms all over the world.

2:30 – 3:25: Marijuana Facilities- Codes and Standards

With the legalization of marijuana advancing rapidly around the country, a great number of building permits have been issued for facilities to grow marijuana and process extract oil. Many new codes and standards have been developed to handle these types of facilities. Due to the unique indoor air requirements and processing equipment, many hazards exist. This presentation will provide an overview of the equipment involved and the building and fire codes that apply. The discussion will include some common code violations that have been found and some actual incidents of fires and explosions.

Speaker: Bruce Straughan, P.E., Robson Forensic**;** Bruce Straughan is currently a Mechanical Engineer at Robson Forensic where he investigates incidents of property damage, personal injury, or design and construction defects involving HVAC, plumbing, and fire protection systems in order to resolve insurance claims and lawsuits. He holds a Bachelor of Science Degree in Mechanical Engineering from the University of Wyoming. Bruce has over 25 years of experience in the building systems industry, which included design, performance contracting, and commissioning.