December 2019

ASHRAE Insights

Standard 90.1

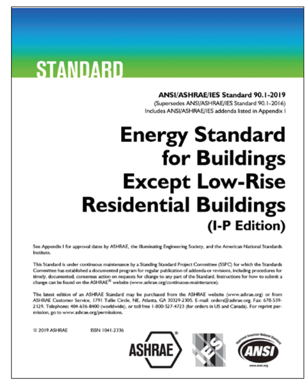
Updates to Energy Standard Provide Guidance to Exceed Efficiency Goals

The latest edition of ASHRAE's most well-known energy standard includes more than 100 updates since it was last published. ANSI/ASHRAE/IES Standard 90.1-2019, *Energy Efficiency Standard for Buildings Except Low-Rise Residential Buildings,* includes new and updated equipment efficiency requirement tables and a clearer compliance path for renewable energy treatment.

The expanded, revised version focuses on energy-saving measures the Standard 90.1 committee hopes will help designers create more energy-efficient buildings.

"The goal of the 2019 version of 90.1 was to provide clearer guidance for exceeding efficiency goals," said Drake Erbe, Member ASHRAE, chair of the Standard 90.1 committee. "This new version focuses on energy-saving measures which we hope will reward designs for achieving energy cost levels above the standard minimum and result in more efficient buildings and more innovative solutions."

From energy efficiency requirements for design and construction of new buildings and their systems, the standard provides minimum requirements for energy-efficient design for most buildings.



The energy standard

See Standard 90.1, Page 12

Standard 62.1

Ventilation Rate Procedure Simplified in 2019 Revision

The recently updated ANSI/ASHRAE Standard 62.1-2019, *Ventilation for Acceptable Indoor Air Quality,* simplifies calculations and improves options in procedures for designers and practitioners to apply in many of their designs, said Jennifer Isenbeck, P.E., Member ASHRAE, who is chair of the standard's project committee.

The 2019 version of the standard includes recent research and equipment updates, removes citations and provides clarification and options to users.

"ASHRAE 62.1-2019 will continue on a path of improved indoor air quality to address all of humanity. The updates in this document hope to achieve clarity to the user, address misinterpretations and include improved equipment and building requirements," she said.

Among the changes is a simplified Ventilation Rate Procedure to im-

See 62.1, Page 13

Standard 62.2

Optional Particle Filtration Credit Improves Flexibility

ANSI/ASHRAE Standard 62.2-2019, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, allows for more design flexibility through the use of the optional particle filtration credit, said Iain Walker, Ph.D., Fellow ASHRAE, chair of the standard's project committee.

The updated standard's com-

See 62.2, Page 13

ASHRAE®
1791 Tullie Circle NE;
Atlanta, GA 30329-2305
Phone: 404-636-8400; Fax: 404-321-5478
www.ashrae.org

DIRECTOR OF PUBLICATIONS AND EDUCATION
Mark S. Owen

EDITORIAL STAFF
Jay Scott, Sarah Foster, Rebecca Matyasovski, Mary Kate McGowan, Courtney Payne, Jeri Alger, Tani Palefski

CONTRIBUTING EDITOR, EUROPE & MIDDLE EAST
W. Stephen Comstock

PUBLISHING SERVICES
David Soltis, Jayne Jackson

ASHRAE OFFICERS

President
Darryl K. Boyce, P.Eng.

President-Elect
Charles E. Gulledge III, P.E.

Treasurer
Michael Schwedler, P.E.

Vice Presidents
K. William Dean, P.Eng.
Malcolm Dennis Knight, P.E.
William F. McQuade, P.E.
Farooq Mehboob, P.E.

Secretary & Executive Vice President
Jeff H. Littleton

POLICY GROUP
2019–20 Chair, Publications Committee
Chee Sheng Ow, Ph.D., P.E.

ASHRAE® INSIGHTS

ASHRAE Fall CRCs

Around the World in Two Months

From Charlotte, N.C., to Athens, Greece, to Amman, Jordan, ASHRAE members represented their chapters at fall chapters regional conferences (CRCs). In August and September, CRCs were held for 12 regions in 10 locations in five countries. Keep track of the conferences here. Spring 2020 CRCs kick off in April with Region VIII in Houston.

Winter Conference Technical Program

Big Data, Controls, Standards And Codes Highlighted

Learn practical applications for achieving energy savings with novel HVAC&R systems, to creating resilient designs and to better understanding how to design and operate ventilation and air-distribution systems.

The conference's technical program addresses must-know industry topics and has two new tracks: Big Data and Smart Controls and Standards, Guidelines and Codes. The technical program's more than 100 sessions will present research and papers focusing on building performance, operations and maintenance, refrigerants, indoor environmental quality and more.

"With changing energy, economic and environmental concerns at the forefront of building decisions, a focus on emerging approaches and advanced concepts of addressing those concerns have become more crucial to building professionals," said conference chair, Melanie Derby, Ph.D., Member ASHRAE.

The Big Data and Smart Controls track will examine the use of big data, advanced algorithms, occupancy-based control strategies, data mining and other analytical techniques to economically automate buildings.

The Standards, Guidelines and Codes track showcases addresses the standards development process and how standards help mechanical systems survive disasters.

For more information, visit www.ashrae.org/orlando.

Spotlight: Winner of the 2019 LowDown Showdown

Minimizing Global Warming Impact

The goal of the annual LowDown Showdown design challenge is to model buildings that get as close to zero energy as possible. This year's winning team had a slightly different focus: minimize its building's global warming impact.

The C.R.E.A.M. team, which stands for "Carbon Rules Everything Around Me," addressed what it calls "the three main culprits of greenhouse gas emissions," operational energy, embodied carbon and refrigerant impact, in its winning project in this year's competition. The annual modeling competition challenges industry professionals to use their design and modeling skills to create a near net-zero energy building. This year's contest took place at the 2019 ASHRAE Building Performance Analysis Conference in September in Denver, Colo.

The building can generate enough power for net positive energy during normal operations and can serve the community during emergencies and disasters.

Five teams competed to design and model a resilient city hall for San Diego capable of withstanding natural disasters and providing prolonged emergency operations. The proposed building is 88,740 ft^2 (8244 m^2) that can act as an emergency operation center. The building was to be designed to weather and maintain functionality during natural and manmade disasters.

The C.R.E.A.M. team designed the building to maintain operations for 14 days during a utility outage to help coordinate emergency responses and maintain critical functions such as life safety and security. The proposed building model can generate enough power for net positive energy during normal operations.

Building Resiliency

Jason Lackie, the C.R.E.A.M. team's captain, said the team's project created synergies between sustainability and performance goals.

"Increasing daylight and natural ventilation reduces energy use during normal operation and allows the building to function more passively during emergency operations," he said.

This year's competition challenged teams to model a resilient, near-net-zero energy building.

He said the team looked at the most strenuous conditions to understand the energy storage needs for the emergency operation requirement, but the model did not represent the hottest conditions. The team had an abundance of sunlight that allowed the PV array to produce a great deal of energy.

"Instead, we had to look at the times where we would have minimal PV production during the day. We sized our battery storage and designed our system operational modes for the building under those conditions," he said.

Despite obstacles, the building was modeled to achieve sustainability and resilience. The C.R.E.A.M. team's model provides 24/7 operation to the Emergency Operation Center (EOC) and in half of the office spaces, said Lackie.

Other energy-efficient strategies the C.R.E.A.M. team used include:

1. Mass Timber and CLT Construction

The team chose mass timber because it has less embodied carbon than steel and concrete and because the team wanted to incorporate as many biophilic elements as possible, he said.

2. Air-cooled heat recovery chillers with low-global warming potential (GWP) refrigerants

Lackie said using low-GWP refrigerants in this competition was a great design test case for the team. They

See LowDown Showdown, Page 14

Cairo Chapter Celebrates Silver Jubilee

The ASHRAE Cairo Chapter celebrated its 25th anniversary with the help of ASHRAE President Darryl K. Boyce, P. Eng, Fellow/Life Member ASHRAE. Held in Cairo, Egypt, on Nov. 8, the event marked the chapter's Silver Jubilee by acknowledging the chapter's history, recognizing past chapter presidents (pictured with Boyce, fifth from left) and honoring guests including ASHRAE Vice President Farooq Mehboob, P.E., Fellow/Life Member ASHRAE; ASHRAE Region-at-Large Director and Regional Chair Ahmed Alaa Eldin, Ph.D., and Tim Wentz, P.E., Presidential/ Life Member ASHRAE.

ASHRAE Signs MOUs with NEBB, American Chemistry Council

NEBB: To Achieve Mutual Objectives

Through the MoU and the joint MoU committee selected to uphold the agreement, NEBB and ASHRAE will continue to enhance their working relationship and individual efforts toward achieving mutual objectives. By committing to the ongoing advancement of collaborative projects, keeping one another informed of major initiatives, and discussing new opportunities for collaboration, both organizations will be better suited to promote adoption and widespread use of codes and standards in order to serve engineers and facilities professionals. In addition, this MoU formalizes the commitment of ASHRAE and

See NEBB. Page 14

ACC: Formalizes ASHRAE Relationship

ASHRAE and the American Chemistry Council (ACC) have signed a Memorandum of Understanding (MOU) formalizing the organizations' relationship.

The MOU was signed by 2019-20 ASHRAE President Darryl K. Boyce, P.Eng. and ACC President & CEO Chris Jahn on November 19 in Atlanta. The agreement defines parameters on how the two organizations will

See ACC. Page 14

ASHRAE Hosts First 'Tech Hour'

ASHRAE launched its first ever Tech Hour video on November 19. ASHRAE Tech Hour provides relevant technical content in the form of one-hour videos to members and interested individuals through the ASHRAE 365 app.

"ASHRAE Tech Hour offers easily accessible content to professionals at all levels, presented by some of ASHRAE's brightest minds," said 2019-20 ASHRAE President Darryl K. Boyce, P.Eng. "We are excited to present our first video and anticipate this digital training format will be a welcomed resource for sharing pertinent building-related topics."

On November 19, ASHRAE premiered Tech Hour #1: Optimize Occupant Health, Building Energy Performance and Revenue through Indoor-Air Hydration. This video, presented by Stephanie Taylor, M.D., M. Arch. and CEO of Taylor Healthcare Inc., examines the powerful influence of indoor air and humidification on humans and actionable steps to improve health, productivity and learning.

The video provides a history of human health and shelters, new building assessment tools, data on occupant health and myths about humidity, mold and energy.

Viewer learning points include:

- Impacts of humidity on

See Tech Hour, Page 15

Research from STBE

Assessing Demand Response Potential In Small Commercial Buildings

Proper building demand management could improve grid operation and robustness, according to research from *Science and Technology for the Built Environment*. Researchers conducted a national assessment of building demand responsive control strategies that included seven types of commercial buildings, five climate locations and a variety of rate structures offered by the major utility companies in "Assessments of Demand Response Potential in Small Commercial Buildings across the United States."

Jie Cai, Associate Member ASHRAE, discusses the research.

What is the research's significance?

This research conducted a national assessment of building demand responsive control strategies across the U.S. The study covered seven types of commercial buildings, five climate locations and a variety of rate structures offered by the major utility companies across the U.S. The reported performance metrics include peak demand reductions, utility savings and indoor comfort impact.

Why is it important to explore this topic now?

The U.S. electric grid has seen dramatic increases in renewable generation in recent years and deeper renewable penetration causes significant challenges for reliable and stable operation of the grid, e.g., the "duck curve" observed in the California market due to high solar power utilization.

Buildings are responsible for 75% of national electricity use in the U.S. and can provide grid reliability and stability support in a cost-effective manner.

Results presented in this paper can be leveraged by building owners, utility companies and system operators to identify the most effective and economical solutions

See Demand Response, Page 15

Calculating g-Function of Bore Fields with Series- and Parallel-Connected Boreholes

Thermal response factors used in the design and simulation of ground-source heat pump systems have been extended to fields with mixed parallel and series connections between the boreholes. They previously were only applicable to fields of parallel-connected geothermal boreholes.

In a recent article from *Science and Technology for the Built Environment,* "Semi-Analytical Method for g-Function Calculation of Bore Fields With Series- And Parallel-Connected Boreholesj," Massimo Cimmino, Associate Member ASHRAE, with Polytechnique Montréal, presents a semi-analytical method for the calculation of g-functions of bore fields with mixed arrangements of series- and parallel-connected boreholes.

Cimmino discusses his research.

What is the significance of this research?

Thermal response factors used in the design and simulation of ground-source heat pump systems were previously only applicable to fields of parallel-connected geothermal boreholes. This research extends their application to fields with mixed parallel and series connections between the boreholes.

Why is it important to explore this topic now?

With the growing popularity of ground-source heat pumps and borehole thermal energy storage systems, new tools are needed to not only assess the consequences of the borehole positions within the borehole field but also the impacts of the piping connections between the boreholes.

What lessons, facts and/or guidance can an engineer working in the field take from this research?

See Calculating g-Function, Page 16

Analyzing CO_2 Use as a Refrigerant In Geothermal Evaporators

To increase the use of ground source heat pumps, researchers are proposing using natural refrigerants such as carbon dioxide in direct expansion.

The article, “Theoretical and Experimental Analysis of a Vertical Direct Expansion Geothermal Evaporator Using CO_2 as Refrigerant,” from *Science and Technology for the Built Environment,* explores theoretical and experimental investigations on a single U-tube vertical direct expansion borehole heat exchanger using CO_2 as the refrigerant.

Researcher Messaoud Badache, Ph.D., discussed the research.

What is the significance of this research?

Ground source heat pump (GSHP) systems provide many possibilities

Eight Research Projects Up For Bid

ASHRAE is soliciting proposals for five new research projects and three rebids. Proposals are due December 15th, 2019. Projects are scheduled to begin April 1st, 2020.

To access the Requests for Proposals (RFPs) for these projects, visit https://tinyurl.com/y2fladg8.

1683-TRP-Rebid, Experimental Evaluation of Two-Phase Pressure Drop and Flow Pattern in U-Bends with Ammonia

Responsible Committee: TC 1.3, Heat Transfer and Application

Co-Sponsor: TC 8.4, Air-to-Refrigerant Heat Transfer Equipment

1780-TRP-Rebid, Test Method to Evaluate Cross-Contamination of Gaseous Contaminant within Total energy Recovery Wheels

Responsible Committee: TC 9.10, Laboratory Systems

Co-Sponsors: TC 2.3, Gaseous Air Contaminants and Gas Contaminant Removal Equipment; TC 9.6, Healthcare Facilities; SSPC 62.1, Ventilation for Acceptable Indoor Air Quality

1799-TRP, Validation of Extrapolation of Performance Rating Test Results for Small Energy Exchangers to Large Exchangers

Responsible Committee: TC 5.5, Air-to-Air Energy Recovery

1817-TRP, Long-term Temperature Change of Ground Heat Exchangers

Responsible Committee: TC 6.8, Geothermal Heat Pump and Energy Recovery Applications

1824-TRP, Accounting for the Barometric Pressure Impacts on Psychrometric Performance Testing of Unitary Air-Conditioning and Heat Pump Equipment

Responsible Committee: TC 8.11, Unitary and Room Air Conditioners and Heat Pumps

Co-Sponsor: SSPC 41, Standard Methods for Measurements

1830-TRP-Rebid, Experimental Characterization of Aircraft Bleed Air Particulate Contamination

Responsible Committee: TC 9.3, Transportation Air Conditioning

Co-Sponsor: SSPC 161, Air Quality within Commercial Aircraft

1852-TRP, Develop Performance Metric, Criteria, and Process to Measure and Predict Speech Privacy in High Performance Buildings

Responsible Committee: TC 2.6, Sound and Vibration Control

Co-sponsors: TC 2.1, Physiology and Human Environment; TC 4., Building Materials and Building Envelope Performance; TC 9.6, Healthcare Facilities

1865-TRP, Optimizing Supply Air Temperature Control for Dedicated Outdoor Air Systems

Responsible Committee: TC 1.4, Control Theory and Application

Co-Sponsor: TC 8.10, Mechanical Dehumidification Equipment and Heat Pipes for energy savings for cooling and heating in various applications ranging from space and water heating in buildings to industrial processes. Although well recognized as among the most efficient end-use technologies currently available, they are not widely used due to their cost, the relatively suboptimal efficiencies of the ground heat exchanger (GHE) and, to some extent, environmental challenges to the soil and the environment.

The approach proposed to overcome these issues is to adapt natural refrigerants such as carbon dioxide (CO_2) in direct expansion ground source heat pumps (DX-GSHP). Carbon dioxide circulates directly in a metallic GHE, which acts as a condenser or evaporator, depending on the operation mode. A CO_2 in DX-GSHP system reduces the overall size and cost of the system, making it a promising environmentally friendly and energy-efficient alternative compared to existing equipment.

How can this research further the industry's knowledge on this topic?

This research familiarizes the industry with the concept of the direct expansion (DX) ground source heat pump and particularly the operation of the ground heat exchanger as the evaporator of the system. Furthermore, it demonstrates in detail the characteristics of CO_2, a natural refrigerant, as the working fluid of the geothermal boreholes. It also quantifies the performance of a CO_2 DX borehole under different operating conditions.

Completed Research

RP-1794

Finding the Right Odorants for Flammable Refrigerants in HVAC Industry Applications

As the HVAC&R industry uses more low-global warming potential (GWP) refrigerants that could be flammable, a leak could create a flammable vapor cloud that if ignited could result in severe consequences. ASHRAE Research Project "1794-RP, White Paper Investigation Relating to the Use of Odorants in Flammable Refrigerants," provides a detailed literature survey to identify odorants in different industries to help the HVAC&R industry identify suitable odorants to use with flammable refrigerants.

Eric Forssell, a senior engineer with Jensen Hughes and principal investigator of this research project, discusses the project.

What is the significance of this research?

With the use of a flammable refrigerant, there is a possibility of the formation of a flammable vapor cloud resulting from a leak. If this cloud were to be ignited, the consequences could be severe. As the refrigerants are odorless, colorless and refrigeration equipment generally does not include refrigerant loss monitoring, there currently is no provision for a warning of a refrigerant leak. Adding an odorant to the refrigerant is a means of providing a warning.

Why is it important to explore this topic now?

With the need to reduce global warming, the switch to using refrigerants that have a lower global warming potential will be increasing. The options for refrigerants with reduced global warming potentials have narrowed to refrigerants that are flammable, ASHRAE Standard 34 classes A2L and A3.

What lessons, facts, and/or guidance can an engineer working in the field take away from this research?

There are few easy answers in mitigating the risks involved with flammable refrigerants. With increased use due to their low global warming potentials, all options for mitigating this risk need to be evaluated, including the use of odorants as a means of providing a warning of the development of flammable conditions.

How can this research further the industry's knowledge on this topic?

The research conducted identified a large number of odorants that are

See Odorants, Page 16

ASHRAE Celebrates IEQ-GA Incorporation

ASHRAE announced the incorporation of the Indoor Environmental Quality Global Alliance (IEQ-GA) as a legal entity. The announcement of IEQ-GA's incorporation took place at a ceremony during the 40th AIVC conference, Oct. 15 in Ghent, Belgium.

The mission of the IEQ-GA is to promote and advocate for acceptable indoor environmental quality (thermal environment, indoor air quality, lighting and acoustics) for building occupants globally, while ensuring the knowledge from IEQ research is implemented in practice.

At the ceremony, the founding members celebrated with short speeches about the establishment of the alliance and presented its vision for achieving a healthy indoor environment in the building industry.

Founding members of the corporation are the Italian Association of Air Conditioning, Ventilation and Refrigeration (AiCARR), the American Industrial Hygiene Association (AIHA), the Air Infiltration and Ventilation Center (AIVC), the Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE), the Federation of European Heating, Ventilation and Air Conditioning (REHVA) and ASHRAE.

"We are inspired by the forward-thinking approach IEQ-GA has in the building industry," said 2019-20 ASHRAE President Darryl K. Boyce, P.Eng. "It is critically important that we advocate for the well-being of the people who occupy our buildings. Through the collaborative efforts and resources of IEA-GA's member organizations, we will continue to provide safe buildings for generations to come."

The creation of the IEQ-GA was the result of a presidential initiative of Bill Bahnfleth, 2013-14 ASHRAE Pres-

See IEQ-GA, Page 16

ASHRAE, Empower Discuss District Cooling

In November, ASHRAE dignitaries discussed the latest developments in the district cooling sector with industry partner Empower. (From left to right) ASHRAE Falcon Chapter President Hassan Younes; ASHRAE Region-at-Large Director and Regional Chair Ahmed Alaa Eldin, Ph.D.; Ahmad Bin Shafar, CEO of Empower; ASHRAE President Darryl Boyce; ASHRAE Presidential Member Tim Wentz; and ASHRAE Vice President Farooq Mehboob visited Emirates Central Cooling Systems Corporation, also known as Empower, in Dubai, UAE, on Nov. 11.

Historical Minute

Cooling Inhabited Spaces

"The cooling of inhabited spaces, which means living and workrooms, during the heated term, is an application of refrigeration, which has been much talked about, but with which comparatively little has been done. Most people prefer to 'swelter' rather than provide comfortable working temperature in warm weather.

Even those who can well afford conveniences and comforts of any kind do not take much interest in this proposition, and very little progress has been made in past years in this direction. Some few theaters, hotel rooms, public halls, etc., have been cooled, but only experimentally as it were, and in a clumsy and cheap sort of way."

From: Practical Cold Storage, 1914, pp. 10-11

obituaries

Rafael Amaral
84; Life Member ASHRAE; Bayamon, Puerto Rico; joined ASHRAE in 1970.

Barry Kenneth Anderson, HBDP
60; Member ASHRAE; Kent, Wash.; joined ASHRAE in 2014.

Floyd J. Breeser, Jr.
92; Life Member ASHRAE; Brookhaven, Ga.; joined in 1957.

James B. Clark
74; Life Member ASHRAE; Charleston, W.Va.; joined ASHRAE in 1978.

Hernando Clavijo
98; Life Member ASHRAE; Bogota, Columbia; joined ASHRAE in 1971.

Haig Demergian, P.E.
86; Member ASHRAE; Los Angeles, Calif.; joined ASHRAE in 1991.

Avinash M. Garde
70; Life Member ASHRAE; Mosman Park, Western Australia; joined ASHRAE in 1983.

William E. Held
62; Member ASHRAE; Marietta, Ohio; joined ASHRAE in 2013.

Richard T. Jacobsen, P.E., Ph.D.
77; Life Member ASHRAE; Idaho Falls, Idaho; joined ASHRAE in 1985.

Gary S Miloradovich, P.E.
67; Member ASHRAE; Angleton, Texas; joined ASHRAE in 2006.

Carl H. Nordeen, P.E.
91; Life Member ASHRAE; Northbrook, Ill.; joined ASHRAE in 1965. He served as a member of the Guideline Project Committee for Guideline 11, Field Testing Of HVAC Controls Components.

Robert Rea
58; Member ASHRAE; Surrey, British Columbia, Canada; joined ASHRAE in 1988.

Michael S. Schwan
64; Member ASHRAE; Fresno, Calif.; joined ASHRAE in 1980.

Christopher J. Van Gerwen
54; Member ASHRAE; Conestogo, ON, Canada; joined ASHRAE in 1990.

Ted Zachwieja
84; Life Member ASHRAE; Winfield, W. Va.; joined ASHRAE in 1965.

membership advancements

The following members were approved for advancement to Member grade.

September

Robert Lee, Puget Sound
Zachary Alderman, Northern Indiana
Mark Christian E Manuel, Philippines
Adam Puls, Iowa
Ian Colten, Bluegrass
Edward P Bricker, New York
Justin Hays, Northwest Arkansas
John R Stischok, Southwest Florida
Adediran Akerele, ASHRAE Nigeria
Michael Genin, Toronto
Donald P Lynch, Utah
Kenneth A Gibbs, Utah
Fred Sakaki, Utah
Joseph V Simmons, Utah
Knute W Peterson, Utah
Gordon M Bigham , Utah
Davis Mullholand, Utah
Benjamin Davis, Utah
Robert J Kesler, P.E., Utah
Michael B Bailey, Utah
Kenneth M Carrillo, Utah
Noe E Casalino, Utah
Mitch F Tervort, Utah
Patrick T Cantrell, Utah
Roger L Hamlet, Jr, P.E., Utah
Spencer Howell, P.E., Utah
Jaden T Perry, P.E., Utah
Keith R Bonham, Utah
Kevin E Rice, Utah
Scot Muir, Utah
Scott E Hartwig, P.E., Utah
Jason A Wendel, Utah
Michael Dallon, Utah
Sanjiv A Devnani, P.E., Utah
Inoke Joe Touhuni, Utah
David W Griffin, II, Utah
Brad Shakespeare, Utah
G Joshua Elliott, Utah
Christian Sellers, Utah
Craig M Campbell, Atlanta
Max Missbichler, Malaysia
Chin Kok Hoe, Malaysia
Leandro Augusto Medea Antonioli, Brasil
Claudio K Misumi, Brasil
Flavio Marinho Vasconcelos, Brasil
Eduardo Seiji Yamada, Brasil
Thomas Morgenthau, Florida West Coast
Ryan Staton, Southern Piedmont
Dario Genolet, Monterrey
Ryan Stephen Pierce, Sierra Delta

October

Joseph P Fong, Utah
Jarrett W Capstick, Utah
Dhirendra N Shukla, Western India
Mark Donald Binanitan Tampis, Eng., ASHRAE Falcon

Carine Georges Saliba, ASHRAE Falcon
Sidney Lynn Smith, South Dakota
Samuel Philipp, Baltimore
Jeremy J Eitreim, South Dakota
Tony Dupsky, Nebraska
Jake Andrews, Atlanta
Muhyudeen Alimi Yusuf, ASHRAE Nigeria
Thad J Kuzma, Western Michigan
Billy C Matowski, Montreal
Lucy Szablak, Montreal
Martin Roy, Montreal
Marc Schuler, Montreal
Arto Doramajian, Montreal
Yanick Bouchard-Latour, Montreal
Miguel Gagnon, Montreal
Hung T Ha, Montreal
Christian Dubeau, P.Eng., Montreal
Anthony N Palucci, Montreal
Chris Lester, Montreal
Kateri Heon, Montreal
Guy Beaumont, Montreal
Genevieve Huftier-Tabourin, Montreal
M. Victoria Gomez Weiss, Montreal
Alexandre Éric Provost, Sr, Montreal
Ralph Frank, Montreal
Louis-David Cerise, Montreal
Frederic Sauriol, Montreal
Matei Maxim, Montreal
Pierre Henault, P.E., Montreal
Mai Anh Dao, Montreal
Jean-Sébastien Trudel, Montreal
Philippe Hudon, Montreal
Daniel Picard, Montreal
Francis Banville Ing., Montreal
Brandt E Fick, Lehigh Valley
Thomas M Hoffman, Lehigh Valley
Vickie Dautrich, Lehigh Valley
Frank Paretti, Jr, Lehigh Valley
Edward L Caulkins, Lehigh Valley
James D Waechter, Jr, P.E., Lehigh Valley
Preston L Roberts, Lehigh Valley
Brian P Keller, Lehigh Valley
John P Gagge, Jr, Lehigh Valley
Mark A Berean, Lehigh Valley
Kevin A Sweeney, Lehigh Valley
Justin Knapp, Lehigh Valley
Michael P Harbove, Lehigh Valley
Bob Bender, Lehigh Valley
Hamza Salih Erden, Turkish
David C Larson, South Dakota
Al L Grode, South Dakota
Gerald S Ailts, South Dakota
Steven D Gaspar, South Dakota
Michael J Hubbard, South Dakota
Jeffrey A Rentschler, South Dakota
Paul D Ronken, South Dakota
Travis J Sichmeller, South Dakota
Barry D Nielsen, South Dakota
Martin E Schmidt, P.E., South Dakota
Darrin L Tille, South Dakota
David L Heibult, South Dakota
Ryan W Van Der Bill, South Dakota
Joshua R Howe, South Dakota
Paul R Doohen, South Dakota
Tom S J Jacknisky, Northern Alberta
Marcus Holland, Jr, Atlanta
Ivan Nikolov Dimchev, Eng., Danube
John F Moore, Houston
Craig M Parks, Baltimore
Nathaniel Alan Hogue, San Diego
Jonathan Henkel, Houston
Bryan E Garza, Houston
Timothy P Griffin, Houston
Kevin Danger Ngo, San Diego
Rigoberto Tromp Eng., ASHRAE Caricom
Atharva Abhay Barve, Houston
Jiajun Liao, Houston

new certified professionals

The following people have recently earned ASHRAE certifications.

Certified HVAC Designer (CHD)

The first class of Certified HVAC Designer certificants includes 23 people from six countries including Egypt, Canada and United Arab Emirates. ASHRAE's newest certification helps certificants validate their knoweldge, skills and abilities to design HVAC systems to meet building/project requirements to employers, customers and peers.

Name, ASHRAE Chapter
Tanveer Alam, ASHRAE Falcon
Mohammad Ali Alhemide, ASHRAE Falcon
Mohammed Mubashir Ali
Hassan F. Ali Younes, ASHRAE Falcon
Arash Ashtari, San Diego
Mohammad Bochi
Curtis Bockenstette, Wichita
Abhijith Chandrsekaran Maniamma, Chennai
Nissun Feiner, Toronto
Osama Atef Khayata, ASHRAE Falcon
Michael Richard Knott, Spacecoast
Kyle E. Koval, Johnstown
John H. McGee, Southern California
Mohamed Mahmoud Nasr, Cairo
Robert R. O'Brien, Illinois
Seyed Mostafa Rashidsalehi, San Jose
Anwar Raza Rizvi, ASHRAE Falcon
Gabriel Rodriguez, Boston
Mohammed Saad, Illinois
Ahmad Fadel Shaar, ASHRAE Falcon
Louis Alexander Smith, Windsor
Joseph Stillo, Boston
Roger Tiguelo, Philippines

Building Commissioning Professional (BCxP)

Oliver Baumann, Illinois
Charles J. Caramanna, Philadelphia
Anthony Chiarelli
Oscar A. Corcios
Tarek R. Dalati, ASHRAE Falcon
Nick Gingerich, Cleveland
J. David Holtzclaw, Nebraska
Travis McDaniel, Southern California
Sonny P. Perez, Region XIII - Other

Building Energy Modeling Professional (BEMP)

Simon B. Elsahi, Hamilton
Nick Plaitis, Toronto
Justin S. Shultz, National Capital
Dr. Yuna Zhang

High-Performance Building Design Professional (HBDP)

Christopher M. Imparato, P.E., Rocky Mountain

Healthcare Facility Design Professional (HFDP)

Spencer Crane, Boston
Kian Nam NG, Malaysia

ASHRAE endorsed conferences

December 2020

50th International HVAC&R Congress and Exhibition, Dec. 4 – 6, Belgrade, Serbia. . Contact organizers at 381 11 3230 041, office@smeits.rs or http://kgh-kongres.rs.

February 2020

ASHRAE Winter Conference, Feb. 1 – 5, Orlando, Fla. Contact ASHRAE at 800-527-4723, meetings@ashrae.org or www.ashrae.org/orlando.

AHR Expo, Feb. 3 – 5, Orlando, Fla. Cosponsored by ASHRAE. Contact the International Exposition Company at 203-221-9232, info@ahrexpo.com or www.ahrexpo.com.

March 2020

Refrigeration 2020, March 23 – 24, Melbourne, Australia. Contact the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) at 03 8623 3000, conferences@airah.org.au or www.airah.org.au/Refrigeration-Conference.

April 2020

CIBSE ASHRAE Technical Symposium, April 16 – 17, Glasgow, United Kingdom. Contact the Chartered Institution of Building Services Engineers at +44 (0)20 8675 5211, websupport@cibse.org or https://cibse.org/technical-symposium-2020.

May 2020

2020 IEA Heat Pump Conference, May 11-14, 2020, Jeju-si, Jeju-do, Korea. Heat pumps are the key equipment for energy savings and greenhouse gas reductions. This conference will serve as a forum to discuss the latest technologies in heat pumps and exchange valuable knowledge in market, policy and standards information on related technologies. Exhibitions at the conference will share products and technologies. Visit http://hpc2020.org/ for more information.

June 2020

Thermag IX International Conference on Caloric Cooling, June 7 – 11, College Park, Md. Contact Mary Baugher, Center for Environmental Energy Engineering, University of Maryland, at 301-405-7661, mbaugher@umd.edu or www.ceee.umd.edu/events/thermag2020.

July 2020

Indoor Air 2020, July 20 – 24, Seoul, Korea. Contact organizers at +82-2-566-5950, 6031, info@indoorair2020.org or http://indoorair2020.org/.

International IIR Rankine 2020 Conference, July 26 – 29, Glasgow, Scotland. Contact the Institute of Refrigeration at +44 (0)208 6477033, ior@ior.org.uk or https://ior.org.uk/rankine2020.

September 2020

AHR Expo-Mexico, Sept. 22 – 24, Monterrey City, Mexico. wContact the International Exposition Company at 203-221-9232, info@ahrexpomexico.com or www.ahrexpomexico.com/en/.

October 2020

BuildSim Nordic, Oct. 13 – 14, Oslo, Norway. Contact Matthias Hassse at matthias.haase@sintef.no or http://www.ibpsa-nordic.org. You are invited to participate in the BuildSim Nordic 2020 conference, to be held on the 13th & 14th of October, hosted by OsloMet University in Oslo, Norway and organized in cooperation between the Nordic chapter of IBPSA, OsloMet and NORVAC. The conference program includes a technical tour and rooftop dinner in the new Munch Museum. Visit for more information.

November 2020

Outlook 2020, Nov. 8 – 10, Sydney, Australia. Contact the Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH) at 03 8623 3000, conferences@airah.org.au or www.airah.org.au/Outlook2020.

Topical Conferences

For information about ASHRAE's Topical Conferences, visit https://www.ashrae.org/conferences/topical-conferences.

From Standard 90.1, Page 1

can be viewed in ASHRAE's online 90.1 Portal, a multiple-publication online tool that brings together the standard, User's Manual guidance and tools (see https://tinyurl.com/yzkjc5ml).

Significant changes to the 2019 version include:

Administration and Enforcement

- New commissioning requirements in accordance with ASHRAE/IES Standard 202, Commissioning Process for Buildings and Systems.

Building Envelope

- Combined categories of "non-metal framed" and "metal framed" products for vertical fenestration.
- Upgraded minimum criteria for SHGC and U-factor across all climate zones.
- Revised air leakage section to clarify compliance.
- Refined exceptions related to vestibules, added new option and associated criteria for using air curtains.

Lighting

- Modified lighting power allowances for Space-by-Space Method and the Building Area Method.
- New simplified method for lighting for contractors and designers of renovated office buildings and retail buildings up to 25,000 ft^2 (2300 m^2).
- Updated lighting control requirements for parking garages to account for the use of LEDs.
- Updated daylight-responsive requirements, added definition for "continuous dimming" based on NEMA LSD-64-2014.
- Clarified side-lighting requirements and associated exceptions.

Mechanical

- New requirements to allow the option of using ANSI/ASHRAE Standard 90.4-2016, Energy Standard for Data Centers, instead of ASHRAE Standard 90.1 in computer rooms that have an IT equipment load larger than 10 kW.
- Added pump definitions, requirements, and efficiency tables to the standard for the first time.
- New equipment efficiency requirement tables and changes to existing tables.
- Replaced fan efficiency grade (FEG) efficiency metric with fan energy index (FEI).
- New requirements for reporting fan power for ceiling fans and updated requirements for fan motor selections to increase design options for load-matching variable-speed fan applications.
- New energy recovery requirements for high-rise residential buildings.
- New requirement for condenser heat recovery for acute care inpatient hospitals.
- Energy Cost Budget (ECB) Method (Section 11).
- Numerous changes to ensure continuity.
- Set baseline for on-site electricity generation systems.
- Performance Rating Method (Appendix G).
- Clarified Appendix G rules and corresponding baseline efficiency requirement when combining multiple thermal zones into a single thermal block.
- New explicit heating and cooling COPs without fan for baseline packaged cooling equipment.
- New rules for modeling impact of automatic receptacle controls.
- Set more specific baseline rules for infiltration modeling.
- Clarified how plant and coil sizing should be performed.
- Updated building performance factors.

Both Compliance Paths

- Clearer, more specific rules for treatment of renewables.
- New updates to rules for lighting modeling.

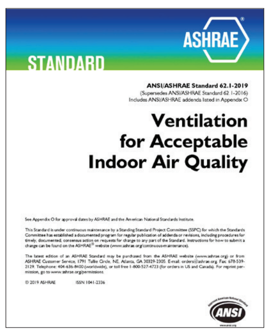
From Standard 62.1, Page 1

prove calculations for system ventilation efficiency and zone air distribution effectiveness.

"The Natural Ventilation procedure has been enhanced, resulting in more applicability to climate zones and regions where it can be utilized," said Isenbeck.

When using the VRP, additional occupancies have been added, and other standards have been referenced where appropriate, such as ANSI/ASHRAE/ASHE Standard 170, Ventilation of Health Care Facilities, and ANSI/ASSP/AIHA Z9.5, Laboratory Ventilation, according to Isenbeck.

"There has also been an emphasis in equipment and building performance that recognizes improved humidity control and ozone producing devices," she said.



First published in 1973 as Standard 62, Standard 62.1 specifies minimum ventilation rates and other measures for new and existing buildings to provide acceptable indoor air quality that minimizes adverse health effects.

The revised 2019 edition of the standard includes significant changes, including:

- New informative tables of ventilation rates per unit area for checking new and existing buildings ventilation calculations.
- Simplified version of the Ventilation Rate Procedure improving calculations for system ventilation efficiency and zone air distribution effectiveness.
- Modified Natural Ventilation Procedure calculation methodology.
- Revised scope to specifically identify occupancies previously not covered.
- Natural ventilation now requires considering the quality of the outdoor air and interaction of the outdoor air with mechanically cooled spaces.
- Humidity control requirements are now expressed as dew point and not as relative humidity.

The 2019 update includes new material in Section 5.7, which addresses ozone producing equipment, and 5.1, which details maximum indoor dew point reflect concerns of designers and practitioners, according to Isenbeck.

"Further, the document recognizes that not all procedures are equal, nor are all occupancies equal. The revised procedures, along with informative appendices, will provide insight on the intentions of designing and maintaining a minimum ventilation and indoor air quality. Our goal is to address both," said Isenbeck.

Hoy Bohanon, P.E., Life Member ASHRAE, who served as the committee's chair from 2015 to earlier this year, said designers also have the opportunity to develop more efficient air distribution systems by taking credit on zone air distribution effectiveness (E_z) with the standard.

Isenbeck said the standard project committee worked diligently over the past three years to respond to various interpretation requests and user inquiries. A clarified Table 6.1 "Minimum Ventilation Rates in Breathing Zone" is the result of this work, she said.

Isenbeck also recognized other ASHRAE members for their contributions to this update, including Bohanon and committee and subcommittee chairs Wayne Thomann, Member ASHRAE; Tina Brueckner, Member ASHRAE; Nathan Ho, P.E., Associate Member ASHRAE; Dan Pettway, Life Member ASHRAE; and Brian Hafendorfer, P.E., Member ASHRAE.

"Members should know that we have listened to and acknowledged their requests," Isenbeck said. "The committee may not be able to accomplish all, but the ANSI process has allowed a fair and transparent pathway to improve this standard."

From Standard 62.2, Page 1

partmentalization requirements will mean designers and practitioners need to pay more attention to this aspect of building construction to be in compliance with the standard. The other changes will both simplify the calculations and lead to better estimates of total ventilation that will not require significant changes to building practice.

There may be small changes to minimum mechanical system airflows for unbalanced systems, but this will still allow ventilation systems to be installed that designers and practitioners are already familiar with, said Walker. The standard also allows for single-point envelope leakage test results to be used when calculating infiltration credit.

From LowDown Showdown, Page 3
selected air-cooled heat recovery chillers that use low-GWP refrigerant HFO-1234ze.

These chillers have slightly lower peak COP and can operate as modular heat recovery chillers for excellent efficiency at any part load, which makes them attractive for resilient operations and greenhouse gas reduction.

2. Mixed-mode natural ventilation that turns off HVAC system

The team created a building concept that was a porous form that allows light and air in from the exterior and interior shaded courtyards. The team designed the floor plates to be narrow in width to allow for good light and air penetration for most of the office space, said Lackie. Plus, San Diego's favorable outdoor temperatures allowed the team to use natural ventilation instead of mechanical conditioning for many hours, particularly if solar gains could be avoided, he said.

"The natural ventilation offsets mechanical cooling, saving energy. However, sensors that turn off the HVAC system when windows are opened are needed to make sure the energy savings are realized," said Lackie.

3. Recirculating showers

The showers in the locker rooms and holding cells were the largest water end uses in the building beside irrigation when the team calculated initial water consumption, said Lackie. The team used a recirculating shower product developed by NASA engineers to create a closed-water loop to decrease shower water and energy consumption.

"The shower water recaptures, filters and treats the water locally before it is reheated and reused in the shower. Not only does this save water, but most of the heat from the shower is recaptured as well saving energy," he said.

Next year's LowDown Showdown will be held during the 2020 Building Performance Analysis Conference and SimBuild, which is scheduled for August 12-14 in Chicago. For more information, visit www.ashrae.org/buildperform2020.

Meet the C.R.E.A.M. Team

All team members work for WSP's multiple U.S. offices.

Team Members

Jason Lackie
Audrey Ng
Zachary Stevens
Elliot Glassman
Joelle Jahn
Xinxin Hu
Kristy Kwong
Mohammed Abbasi

Engineering Support

Chad Spencer
Konstantin Udilovich

Intern Support

Jack Rusk
Claudia Mezey
Aneri Shah

From NEBB, Page 4
NEBB to work together to advance research into the sustainable design, construction, and operation of healthcare facilities.

"NEBB has a longstanding history of working with ASHRAE to better the building industry through the promotion of procedural standards, educational programs, and similar agreements designed around cooperative efforts. We look forward to continuing to strengthen our relationship through this strategic partnership, while working with many talented professionals to build the future of our industry together," stated NEBB Executive Vice President Tiffany Suite.

"The MoU between NEBB and ASHRAE reinforces the power of collaboration and provides both organizations a greater opportunity to leverage our resources as we offer innovation and emerging technologies to the building services industry," said 2019-20 ASHRAE President Darryl K. Boyce, P.Eng. "I look forward to continuing our partnership as we bring our unique strengths together to advance the built environment through sustainable practices."

From ACC, Page 4
collaborate more closely to continue promoting the advancements of a more sustainable built environment.

The organizations have committed to work together on the following shared objectives:

- Engaging in projects and activities whose purpose is to help improve the health, safety, and welfare of communities through the built environment.
- Supporting the development, adoption, and enforcement of building codes and standards

that support those improvement goals.

- Promoting the use of sound science in the development and assessment of building standards and codes.
- Enhancing building performance by fostering improvements in energy efficiency, resiliency, indoor air quality, and the health, well-being, and productivity of building occupants.
- Increasing communication between professionals of the building, design and construction industry and chemistry industry to promote innovation and sustainability.

"We are pleased to collaborate with ACC as we work toward our shared goal of achieving optimal building performance," said Boyce. "ASHRAE and ACC are on the forefront of developing innovative technologies that are significantly impacting the building industry. This partnership signifies our commitment to broadening industry knowledge of energy efficient and sustainable building solutions to support the health and well-being of building occupants everywhere."

"The products of chemistry, from foam insulation and silicone caulks and sealants to plastics pipes and next-generation refrigerants, provide a range of benefits that help enable energy-efficient, sustainable buildings," Jahn said. "We look forward to collaborating with ASHRAE to advance solutions that help enhance sustainability, health and wellness in building performance."

From Tech Hour, Page 4

occupant health, the microbiome of the built environment and the transmission of germs.

- Understanding of the relationships between water in the liquid and vapor state and the human body.
- How humidity levels affect the infectivity of viruses and bacteria.
- Technical information on the application of energy-saving and hygienic approaches to active humidification when supplementation is necessary as an intervention for dry air.
- Cost-benefit analysis of occupant health as a building performance metric for building owners.
- Information on ASHRAE discussions regarding best-practices for indoor humidification levels for occupied buildings.

During the first 30 days after the video’s launch, one PDH will be available to viewers through a registration form link in ASHRAE 365. Following the launch of the first video, ASHRAE plans to launch additional new videos on a quarterly basis.

To view ASHRAE Tech Hour videos, download ASHRAE 365 on the App Store or Google Play. For more information on ASHRAE Tech Hour, visit ashrae.org/techhour.

From Demand Response, Page 5

to mitigate the adverse impact of renewables and to improve the grid operational efficiency.

What lessons, facts and/or guidance can an engineer working in the field take away from this research?

Thermostat setpoint scheduling can provide the most significant peak demand reductions and utility cost savings. Savings potentials from lighting and shading controls are marginal. However, inappropriate thermostat settings could compromise indoor comfort and reduce the savings potential.

We found optimal temperature setpoints of 70°F (21°F) for pre-cooling periods and 75~76°F (23.9~24.4°C) for demand-limiting periods.

How can this research further the industry's knowledge on this topic?

The HVAC industry has adopted the demand response (DR) feature to some extent. High-end commercial products already have built-in demand responsive control options. This research identified the optimal temperature settings for the pre-cooling and demand-limiting periods, which can be adopted by the industry to further promote deployment of DR.

In addition, the national assessment results clearly identify the most economically viable regions/locations to deploy DR, and this can be used by HVAC manufacturers to adapt their marketing strategies.

Were there any surprises or unforeseen challenges for you when preparing this research?

We carried out a survey to collect the most updated electricity rate schedules across the U.S. and found significant variations across different regions of the U.S. Electricity can be as cheap as half-cent per kWh in Colorado and as expensive as 25 cents/kWh in California. This non-uniformity makes DR less favorable for certain regions compared to others.

From Calculating g-Function, Page 5

The research introduces the concept of the effective borehole field thermal resistance, which gives a relation between the total heat extraction rate from the borehole field, the mean fluid temperature within the borehole field and the effective borehole wall temperature.

It is seen that series connections between boreholes increase the borehole field thermal resistance when compared to strictly parallel connections between boreholes. This borehole field thermal resistance is then needed for accurate predictions of ground-source heat pump efficiency and an accurate design of a borehole field.

How can this research further the industry's knowledge on this topic?

The presented methodology enables the analysis of borehole fields with both parallel and series connections between the boreholes. It will prove useful in the design and simulation of ground-source heat pump systems as well as the interpretation of thermal response tests.

From Odorants, Page 7

used in a variety of industries and applications. However, the number of potential candidates narrowed significantly with the requirements for the odorant to remain with the refrigerant throughout the refrigerant loop and not accumulate in the compressor lubricant reservoir. The identified candidates need further evaluation to determine if they can be successfully applied. This further evaluation would concentrate on material compatibility, the amount of odorant required to be added and the reliability of the warning provided.

Were there any surprises or unforeseen challenges for you when preparing this research?

The primary challenge or surprise with the research was how quickly the list of candidate odorants narrowed with the need to have a similar boiling point to the candidate refrigerants and to be non-toxic at concentrations above their detection threshold.

From IEQ-GA, Page 8

idential Member and current IEQ-GA Vice President, based on the report of a presidential ad hoc committee chaired by Bjarne Olesen, 2017-18 ASHRAE Presidential Member and current ASHRAE IEQ-GA Alternate Director. The committee was tasked with exploring ways in which industry groups could work together to address all aspects of indoor environmental quality and health.

A memorandum of understanding was established between the Air & Waste Management Association (A&WMA), the Indoor Air Quality Association (IAQA), AIHA, AIVC, REHVA and ASHRAE to form IEQ-GA. AiCARR and ISHRAE later became members of the alliance.

"An important attribute of IEQ-GA is that it is a non-industrial alliance among societies representing members that promote IEQ" said Olesen. "The intent of IEQ-GA is to work with all partners of the value chain for indoor environmental quality including building research, comfort and health research, building design, installation, commissioning, operation and occupant behavior. Furthermore IEQ-GA will work with industry organizations to help their members to provide products and services that promote IEQ."

The founding members represent professionals from various disciplines linked to indoor environment and are committed to work together and promote education, research and knowledge exchange at a global scale, to develop standards, codes, guidelines and advocacy of the general public in indoor environments around the world.

The IEQ-GA is currently seeking new members from all the involved sectors and disciplines to join forces. Sectors include architects, engineers, environmental professionals, industrial/occupational hygienists and health section specialists, among others.

For more information on IEQ-GA, visit https://ieq-ga.net/.