



180 Technology Parkway • Peachtree Corners • Georgia 30092 • Phone: 404.636.8400 • Fax: 404.321.5478 • ashrae.org

Charles E. Gullledge III, P.E., FASHRAE, HBDP, LEED AP
2020-2021 ASHRAE President

Environmental Air Systems, LLC
250 Swathmore Ave.
High Point, NC 27263
Phone: 336.579.7635
GullledgeChuck@gmail.com

November 10, 2020

Dr. David Kessler
Dr. Vivek Murthy
Dr. Marcella Nunez-Smith

Dear Co-Chairs of President-Elect Biden's COVID-19 Advisory Board:

Congratulations on your appointment to the Transition COVID-19 Advisory Board. Your expertise, experience and leadership are critically important to our nation and the world, and we offer best wishes that your efforts to bring the pandemic under control are successful.

ASHRAE, a global technical society of over 55,000 engineers, scientists and other professionals with expertise in building heating, ventilation, air conditioning and refrigeration systems, offers its support to your efforts. As the coronavirus can be spread indoors via aerosol transmission, it is critical for the Advisory Board to have ready-access to unbiased scientific knowledge from the engineering community with expertise in building systems. With over 125 years of experience and a solid reputation for providing non-biased technical information and standards on building systems, ASHRAE is uniquely positioned to provide this assistance.

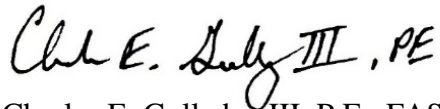
In April of this year, ASHRAE formed an Epidemic Task Force with the mission of providing guidance on engineering controls for aerosol transmission of SARS-CoV-2. That effort has resulted in a body of guidance that is being referenced by state and federal agencies, as well as being referenced in legislation, as they develop plans for reopening facilities closed by the pandemic, in particular, schools. Task force members have participated in hundreds of meetings and webinars for the public, industry, and government, including briefings for U.S. House of Representatives Energy and Commerce Committee staff, New York Department of Health, and the National Academies Federal Facilities Commission, to name only a few. ASHRAE has a resources page at [ashrae.org/covid19](https://www.ashrae.org/covid19).

Dr. William Bahnfleth, Professor of Architectural Engineering at the Pennsylvania State University (Penn State), chairs the ASHRAE Epidemic Task Force, and would be the perfect engineering representative to deliver technical expertise to the Advisory Board. Dr. Bahnfleth, a mechanical engineer whose primary research interest is control of indoor infectious aerosols, has provided advice to numerous government entities and scientific bodies concerning transmission of

Dr. David Kessler,
Dr. Vivek Murthy
Dr. Marcella Nunez-Smith
Page 2
November 10, 2020

the coronavirus in the built environment and use of engineering controls to minimize viral transmission. His curriculum vitae is provided as an attachment for your reference. ASHRAE looks forward to further engagement and providing valuable technical assistance to bring the pandemic under control. Please contact me so that we can provide our support, or contact Dr. Bahnfleth directly at wbahnfleth@psu.edu. We hope the advisory board will accept this offer of assistance from the engineering community by engaging further with ASHRAE.

Sincerely,

A handwritten signature in black ink that reads "Charles E. Gullledge III, P.E." The signature is written in a cursive style with a large, stylized "C" at the beginning.

Charles E. Gullledge III, P.E., FASHRAE, HBDP, LEED AP
2020-2021 ASHRAE President

Enclosure

WILLIAM P. BAHNFLETH, Ph.D., P.E.

EDUCATION

Ph.D.	Mechanical Engineering	University of Illinois at Urbana-Champaign	1989
B.Mus. (Highest Hons.)	Music	University of Illinois at Urbana-Champaign	1988
M.S.	Mechanical Engineering	University of Illinois at Urbana-Champaign	1980
B.S. (Highest Hons.)	Mechanical Engineering	University of Illinois at Urbana-Champaign	1979

PROFESSIONAL EXPERIENCE

2005 – present	Professor of Architectural Engineering
2002 – 2019	Director, Indoor Environment Center
1/2002 – 7/2002	Visiting Professor, The University of Wisconsin-Madison
2000 – 2005	Associate Professor of Architectural Engineering, The Pennsylvania State University
1994 – 2000	Assistant Professor of Architectural Engineering, The Pennsylvania State University
1989 – 1994	Senior Consultant, ZBA, Incorporated, Cincinnati, OH
1985 - 1989	Principal Investigator, US Army Construction Engineering Research Laboratory, Champaign, IL

RESEARCH INTERESTS

Indoor air quality, Indoor bioaerosol control, HVAC system energy efficiency, District energy systems, Thermal energy storage

THESES SUPERVISED

Ph.D.	Advisor: 7 complete, Committee Member: 13
M.S.	Advisor: 15 complete, Committee Member: 23

HONORS AND AWARDS

ASHRAE: Exceptional Service Award, 2008; Technical and Symposium Best Paper Award, 2007; Fellow, 2005; Distinguished Service Award, 1998; Technology Award, 1st Place, 1995, Louise and Bill Holladay Distinguished Fellow Award, 2018; E.K. Campbell Award of Merit, 2019; Donald Bahnfleth Environmental Health Award, 2019; F. Paul Anderson Award, 2020
ASME: Fellow, 2012; Best Paper, ASME/AIChE Heat Transfer Conference, 1984
ISIAQ: Fellow, 2016
Penn State Engineering Alumni Society, World Class Engineering Faculty Award 2016
National Science Foundation Graduate Fellowship, 1979-1982

SELECTED PUBLICATIONS (of more than 170)

Morawska, L., J. Tang, W. Bahnfleth, P. Bluysen, A. Boerstra, G. Buonanno, J. Cao, S. Dancer, A. Floto, F. Franchimon, C. Haworth, J. Hogeling, C. Isaxon, J., L. Jimenez, J. Kurnitski, Y. Li, M. Loomans, G. Marks, L. Marr, L. Mazzeo, A. Melikov, S. Miller, D. Milton, W. Nazaroff, P. Nielsen, C. Noakes, J. Peccia, X. Querol, C. Sekhar, O. Seppänen, S. Tanabe, R. Tellier, K-W Tham, P. Wargocki, A. Wierzbicka, M. Yao. 2020. How can airborne transmission of COVID-19 indoors be minimised? *Environment International*. v. 142, 7 pages.

Kowalski, W., W. Bahnfleth, M. Ragues, R. Moeller. 2019. The Cluster Model of Ultraviolet Disinfection Explains Tailing Kinetics. *J. Applied Microbiology*. 12 pages. doi.org/10.1111/jam.14527

Firrantello, J. and W. Bahnfleth. 2017. Simulation and monetization of collateral airborne infection risk improvements from UVGI for coil maintenance. *Science and Technology for the Built Environment*, 24(2): 135-148.

Jeong*, J., J. Bem, W. Bahnfleth, J. Freihaut, and B. Thran. 2009. Critical review of aerosol particle transport models for building HVAC ducts. *ASCE Journal of Architectural Engineering* 15(3):74-83.

Bahnfleth, W., P. Saekow, J. Firrantello, and P. Kremer. 2012. Semi-Quantitative and Formal Metrics for Multizone Air Flow Model Quality Assessment. *International Journal of HVAC&R Research* 18(1-2):252-263.

Wang, Y., C. Sekhar, W. Bahnfleth, K. W. Cheong, J. Firrantello 2016. Effectiveness of an ultraviolet germicidal irradiation system in enhancing cooling coil energy performance in a hot and humid climate. *Energy and Buildings* 130:321-329.

- Martin, S., C. Dunn, J. Freihaut, W. Bahnfleth, J. Lau, A. Nedeljkovic-Davidovic. 2008. Ultraviolet germicidal irradiation: current best practices. *ASHRAE Journal* 50(8): 28-36.
- Firrantello, J., P. Aumpansub, W. Bahnfleth, B. Hu, J. Freihaut, B. Thran, S. Hutchens. 2007. Effects of HVAC system and building characteristics on exposure of occupants to short duration point source aerosol releases. *ASCE Journal of Architectural Engineering* 13(2):84-94.
- National Research Council. 2007. "Protecting building occupants and operations from biological and chemical airborne threats." Committee on Protecting Occupants of DOD Buildings from Chemical and Biological Release. Washington, DC: National Academies Press. 152 pages. ISBN 0-309-10956-6.
- Hitchcock, P., M. Mair, T. Inglesby, J. Gross, D. Henderson, T. O'Toole, J. Ahern-Seronde, W. Bahnfleth, T. Brennan, H. Burroughs, C. Davidson, W. Delp, D. Ensor, R. Gomory, P. Olsiewski, J. Samet, W. Smith, A. Streifel, R. White, and J. Woods. 2006. Reducing exposure to aerosolized infectious agents in a building; recommendations of the Working Group on HVAC Systems to Reduce Risks Posed by Biological Attacks. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, And Science* 4(1): pp. 1-15.
- National Research Council. 2003. Review of EPA Homeland Security Efforts: Safe Buildings Program Research Implementation Plan. Review of EPA Homeland Security Efforts: Committee on the Safe Buildings Program. Washington, DC: National Academies Press. 38 pages. ISBN 0-309-52823-2.
- Kowalski, W., W. Bahnfleth and A. Musser. 2003. Modeling bioterrorism defense systems in a commercial office building. *ASCE Journal of Architectural Engineering* 9(2):86-96.
- Kowalski, W. and W. Bahnfleth. 2000. Effective UVGI system design through improved modeling. *ASHRAE Transactions* 106(2): 721-730.
- Kowalski, W., W. Bahnfleth and T. Whittam. 1999. Filtration of airborne microorganisms: modeling and prediction. *ASHRAE Transactions* 105(2): 4-17.

SELECTED SPONSORED RESEARCH (of approximately \$5 million in awards as PI or co-PI)

- Field Measurements and Modeling of UVC Cooling Coil Irradiation for HVAC Energy Use Reduction (1738-URP). American Society of Heating, Refrigerating and Air-Conditioning Engineers.
- Rapid semi-empirical tool for estimating air flow in facilities (T-PR-1984). American Society of Heating, Refrigerating and Air-Conditioning Engineers
- Indoor bioaerosol reservoir characterization and deposition/resuspension rate determination. Department of the Army.
- Resuspension characteristics and surface sampling protocol for indoor bioaerosol contaminants. Department of the Army
- Determination of protocols and test methods for devices intended to provide cost effective bioaerosol control in ducted HVAC systems with germicidal UV radiation. National Center for Energy Management and Building Technologies

PROFESSIONAL AFFILIATIONS

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Member (1981 – present, Director-at-Large 2006 –09, Vice President 2009-11, Treasurer 2011-12, President-Elect, 2012-13, President 2013-14), PSU Student Branch Advisor (1995 - present)

American Society of Mechanical Engineers, Member (1984 - present)

International Society of Indoor Air Quality and Climate (2011 – present)

International Building Performance Simulation Association (1989-present)

PROFESSIONAL ACTIVITIES (relevant highlights)

Chair, ASHRAE Epidemic Task Force (March 2020 – present)

Clean Air Act Advisory Committee (2019-2021)

Indoor Environmental Quality Global Alliance – founder and 1st Vice-President (2020 – present)

President, ASHRAE (2013-2014)