

Wanyu Rengie Chan, Ph.D

Staff Scientist, Indoor Environment Group
Energy Analysis & Environmental Impact Division, Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS90R2121, Berkeley, CA 94720
Email: wrchan@lbl.gov Tel: (510) 486 6570 indoor.lbl.gov

EDUCATION

- Ph.D. **University of California, Berkeley**
Environmental Engineering Program, Civil & Environmental Engineering, 2006
- M.S. **University of California, Berkeley**
Civil & Environmental Engineering, 2002
- B.S. **Carnegie Mellon University, Pittsburgh PA**
Chemical Engineering, 2001

RESEARCH INTERESTS

- Indoor air quality
- Building ventilation and energy efficiency
- Indoor airflow and pollutant transport
- Air pollutant exposure assessment and mitigation
- Wildfire smoke

RESEARCH / PROFESSIONAL EXPERIENCE

Staff Scientist, Lawrence Berkeley National Laboratory	2022–Current
Deputy Group Leader, Indoor Environment Group	
Research Scientist, Lawrence Berkeley National Laboratory	2010–2022

Indoor Air Quality, Health & Productivity

Principal Investigator:

Indoor Air Quality Scientific Findings Resource Bank, Indoor Environments Division, U.S. Environmental Protection Agency	2019–Current
--	--------------

Contributor:

Partnering for Resilient Opportunities To Eliminate Cumulative Toxic (PROTECT) Health Effects from Wildfire PM2.5 in Environmental Justice Communities, U.S. Environmental Protection Agency	2023–Current
--	--------------

Commercial Building Indoor Air Quality, Ventilation & Energy Efficiency

Principal Investigator:

Commercial Kitchen Indoor Environmental Quality Field Study, U.S. Department of Energy	2023–Current
COVID-19 Technical Assistance Program, U.S. Department of Energy	2021–2022

Co-Principal Investigator:

Efficient and Healthy Schools Program, U.S. Department of Energy	2021–Current
Measurement and Control of Ventilation Rates in California Commercial	2014–2018

Buildings (VentCon), California Energy Commission	
Healthy Zero Energy Buildings Project (HZEB), California Energy Commission	2011–2015
Technical Lead:	
Integrating Indoor Air Quality (IAQ) Sensors in Energy Management Information Systems (EMIS)	2023–Current
Ventilation Solutions for Energy Efficient California Schools – Improving Indoor Air Quality through Advanced, High Performance HVAC, California Energy Commission	2016–2019
Contributor:	
Technical Support and Assessment of Impacts of CalSHAPE Program, California Energy Commission	2023–Current
Beyond Widgets: Enabling Utility Incentive Programs for Commercial Building Systems, U.S. Department of Energy	2020–2023
Small and Medium Building Efficiency Toolkit and Community Demonstration Program (SMB Toolkit), California Energy Commission	2015–2017
<u>Residential Building Indoor Air Quality, Ventilation & Energy Efficiency</u>	
Co-Principal Investigator:	
California Residential Methane Emissions Characterization (CARMEC), California Energy Commission	2022–Current
Effective Kitchen Ventilation for Healthy ZNE Homes with Natural Gas, California Energy Commission	2016–2019
Technical Lead:	
New Home Indoor Air Quality Field Study, Building America Program, U.S. Department of Energy	2018–2021
Healthy Efficient New Gas Homes (HENGE), California Energy Commission	2014–2018
Contributor:	
Deep Energy Retrofits Cost Stack, Building America Program, U.S. Department of Energy	2019–2020
Natural Gas Leakage from Residential Buildings in California, Energy Commission	2016–2018
Residential Energy Savings from Air-Tightness and Ventilation Excellence (RESAVE), California Energy Commission	2010–2013
<u>Indoor Exposure During Emergency Response</u>	
Principal Investigator:	
Modeling Support for Material Threat Assessment 2.0, subcontractor to Lawrence Livermore National Laboratory	2014–2015
Senior Scientist, Environmental & Earth Sciences, Exponent, Inc.	2007–2010
<ul style="list-style-type: none"> • Performed air dispersion modeling and indoor air quality assessment • Conducted ambient air sampling and field testing 	

Graduate Student Research Assistant, Lawrence Berkeley National Lab. <ul style="list-style-type: none"> Developed model to predict the effectiveness of shelter-in-place Transferred model code in collaboration with National Atmospheric Release Advisory Center, Lawrence Livermore National Laboratory 	2002–2006
Research Assistant, Carnegie Mellon University <ul style="list-style-type: none"> Conducted ambient monitoring for the Pittsburgh Atmospheric Particulate Matter Supersite Program Assisted in the development and testing of a method for in-situ measurement of ambient fine aerosol water content 	2000–2001
PROFESSIONAL SERVICE	
Committee member on “Health Risks of Indoor Exposure to Fine Particulate Matter and Practical Mitigation Solutions”, The National Academies of Sciences, Engineering and Medicine	2021–2023
Committee member on “Indoor Exposure to Fine Particulate Matter and Practical Mitigation Approaches – A Workshop”, The National Academies of Sciences, Engineering and Medicine	2020–2021
Workgroup member on “Children’s Health and Wildfire Smoke”, co-sponsored by U.S. Environmental Protection Agency, CalEPA, the Pediatric Environmental Health Specialty Units, and the National Institute of Environmental Health Sciences	2020–2021
MENTORING EXPERIENCE	
Mentor several postdocs, graduate and undergraduate students each year	2010–Current
AWARDS	
Indoor Air Quality Champion, Certificate of Recognition, U.S. EPA’s Indoor Environment in Schools Recognized for dedication to increasing energy efficiency and creating healthy indoor environments in schools.	2024
Federal Laboratory Consortium Award for Excellence in Technology Transfer (Team Award), Department of Energy Recognized for advices and technical work towards improving the security of buildings and inhabitants, and the effectiveness of local emergency response.	2004
PROFESSIONAL ORGANIZATIONS	
<ul style="list-style-type: none"> Member of International Society of Indoor Air Quality and Climate (ISIAQ) Member of ASHRAE 	
INVITED TALKS	
<ul style="list-style-type: none"> Findings from NASEM consensus study – Health risks of indoor exposure to fine particulate matter and practical mitigation solutions. 2024. Presented at Regional Asthma Management & Prevention (RAMP) Community Action to Fight Asthma virtual summit. May 29. Symposium – Where children learn and breathe: The Impact of school-based exposures on childhood respiratory health. 2024. American Thoracic Society. May 22. Solutions and resources to address COVID-19 in schools: establishing lasting improvements to ventilation and IAQ. 2022. Presented at U.S. Environmental Protection Agency IAQ Tools for Schools. February 10. 	

- Ventilation: what you need to know. 2021. Presented at School Building Science Fridays. Collaborative for High Performance Schools (CHPS). October 8.
- Indoor air quality in schools. 2021. Presented at U.S. Environmental Protection Agency Children’s Health and Wildfire Smoke Workshop for Public Health Officials. May 5–6.
- Meta-analysis on dampness and mold in schools and health. 2020. Presented at U.S. Environmental Protection Agency Federal Interagency Committee Meeting on Indoor Air Quality. March 11.
- Health benefits and costs of filtration. 2019. Presented at U.S. Environmental Protection Agency web summit titled “Indoor Air Filtration to Protect Public Health during Wildland Fire Smoke Episodes – What are the Knowns and Unknowns?” June 12–13.
- Air cleaners and ventilation as indoor environmental interventions – Potential risks and mitigations. 2018. Presented at American Thoracic Society workshop titled “Personal Interventions to Reduce Exposure Levels and Health Risks from Outdoor Air Pollution.” May 19.

PUBLICATIONS

Refereed Journals

1. Antonopoulos C.A., S.I. Rosenberg, H. Zhao, I.S. Walker, W.W. Delp, W.R. Chan, and B.C. Singer. 2023. Mechanical ventilation and indoor air quality in recently constructed US homes in marine and cold-dry climates. *Building and Environment*. DOI: 10.1016/j.buildenv.2023.110480
2. Bueno de Mesquita P.J., W.W. Delp, W.R. Chan, W.P. Bahnfleth, and B.C. Singer. 2021. Control of airborne infectious disease in buildings: evidence and research priorities. *Indoor Air*. DOI: 10.1111/ina.12965
3. Laumbach R.J., K.R. Cromar, A. Gary, C. Carlsten, D. Charpin, W.R. Chan, A. de Nazelle, F. Forastiere, J. Goldstein, S. Gumy, W.K. Hallman, M. Jerrett, H.M. Kipen, C.S. Pirozzi, B.J. Polivka, J. Radbel, R.E. Shaffer, D.D. Sin, and G. Viegi. 2021. Personal interventions for reducing exposure and risk for outdoor air pollution: an official American Thoracic Society workshop report. *Annals of the American Thoracic Society*. DOI: 10.1513/AnnalsATS.202104-421ST
4. Zhao, H., W.R. Chan, S. Cohn, W.W. Delp, I.S. Walker, and B.C. Singer. 2021. Indoor air quality in new and renovated low-income apartments with mechanical ventilation and natural gas cooking in California. *Indoor Air* 31(3) 717–729. DOI: 10.1111/ina.12764
5. Tang H., W.R. Chan, and M.D. Sohn. 2020. Automating the interpretation of PM2.5 time-resolved measurements using a data-driven approach. *Indoor Air*. DOI: 10.1111/ina.12780
6. Zhao H., W.R. Chan, W.W. Delp, H. Tang, I.S. Walker, and B.C. Singer. Factors impacting range hood use in California houses and low-income apartments. *International Journal of Environmental Research and Public Health* 17(23), 8870. DOI: 10.3390/ijerph17238870
7. Chan W.R., X. Li, B.C. Singer, T. Pistochini, D. Vernon, S. Outcalt, A. Sanguinetti, and M. Modera. 2020. Ventilation rates in California classrooms: Why many recent HVAC retrofits are not delivering sufficient ventilation. *Building and Environment* 167. DOI: 10.1016/j.buildenv.2019.106426
8. Fisk W.J., B.C. Singer, and W.R. Chan. 2020. Association of residential energy efficiency retrofits with indoor environmental quality, comfort, and health: A review of empirical data. *Building and Environment* 180. DOI: 10.1016/j.buildenv.2020.107067
9. Singer B.C., W.R. Chan, Y.S. Kim, F.J. Offermann, and I.S. Walker. 2020. Indoor air quality in California homes with code-required mechanical ventilation. *Indoor Air* 30, 885–899. DOI: 10.1111/ina.12676

10. Sohn M.D., X. Li, and W.R. Chan. 2020. Estimates of pollutant temporal and spatial variability in commercial buildings from the Joint Urban 2023 field experiments. *Indoor Air* 30, 335–345. DOI: 10.1111/ina.12626
11. Fisk W.J., W.R. Chan, and A.L. Johnson. 2019. Does dampness and mold in schools affect health? Results of a meta-analysis. *Indoor Air* 29(6), 895–902. DOI: 10.1111/ina.12588
12. Fischer M.L., W.R. Chan, W. Delp, S. Jeong, V. Rapp, and Z. Zhu. 2018. An estimate of natural gas methane emissions from California homes. *Environmental Science & Technology* 52, 10205–10213. DOI: 10.1021/acs.est.8b03217
13. Chan W.R., J.M. Logue, X. Wu, N.E. Klepeis, W.J. Fisk, F. Noris, and B.C. Singer. 2017. Quantifying fine particle emission events from time-resolved measurements: Method description and application to 18 California low-income apartments. *Indoor Air* 28, 89–101. DOI: 10.1111/ina.12425
14. Fisk W.J. and W.R. Chan. 2017. Effectiveness and costs of reducing particle-related mortality with particle filtration. *Indoor Air* 27(5), 909–920. DOI: 10.1111/ina.12371
15. Fisk W.J. and W.R. Chan. 2016. Health benefits and costs of filtration interventions that reduce indoor exposure to PM_{2.5} during wildfires. *Indoor Air* 27(1), 191–204. DOI: 10.1111/ina.12285
16. Chan W.R., S. Parthasarathy, W.J. Fisk, and T.E. McKone. 2016. Estimated effect of ventilation and filtration on chronic health risks in U.S. offices, schools, and retail stores. *Indoor Air* 26(2), 331–343. DOI: 10.1111/ina.12189
17. Chan W.R., M. Sidheswaran, and W.J. Fisk. 2016. Cooking-related PM_{2.5} and acrolein measured in grocery stores. *Indoor Air* 26(3), 489–500. DOI: 10.1111/ina.12218
18. Chan W.R., S. Cohn, M. Sidheswaran, D.P. Sullivan, and W.J. Fisk. 2015. Contaminant levels, source strengths, and ventilation rates in California retail stores. *Indoor Air* 25(4), 381–392. DOI: 10.1111/ina.12152
19. Chan W.R., I.S. Walker, and M.H. Sherman. 2015. Durable airtightness in single-family dwellings: field measurements and analysis. *International Journal of Ventilation* 14(1), 27–38. DOI: 10.1080/14733315.2015.11684067
20. Dutton S.M., M.J. Mendell, W.R. Chan, M. Barrios, M.A. Sidheswaran, D.P. Sullivan, E.A. Eliseeva, and W.J. Fisk. 2015. Evaluation of the indoor air quality minimum ventilation rate procedure for use in California retail buildings. *Indoor Air* 25(1), 93–104. DOI: 10.1111/ina.12125
21. Maddalena R., M.J. Mendell, E. Eliseeva, W.R. Chan, D. Sullivan, M. Russell, U. Satish, and W.J. Fisk. 2015. Effects of ventilation rate per person and per floor area on perceived air quality, sick building symptoms and decision making. *Indoor Air* 25(4), 362–370. DOI: 10.1111/ina.12149
22. Mendell M.J., E.A. Eliseeva, M. Spears, W.R. Chan, S. Cohn, D.P. Sullivan, and W.J. Fisk. 2015. A longitudinal study of ventilation rates in California office buildings and self-reported occupant outcomes including respiratory illness absence. *Building and Environment* 92, 292–304. DOI: 10.1016/j.buildenv.2015.05.002
23. Dutton S.M., M.J. Mendell, W.R. Chan, M. Barrios, M. Sidheswaran, D.P. Sullivan, E.A. Eliseeva, and W.J. Fisk. 2014. Evaluation of the indoor air quality minimum ventilation rate procedure for use in California retail buildings. *Indoor Air* 25(1), 93–104. DOI: 10.1111/ina.12125
24. Chan W.R., J. Joh, and M.H. Sherman. 2013. Analysis of air leakage measurements of US houses. *Energy and Buildings* 66, 616–625. DOI: 10.1016/j.enbuild.2013.07.047

25. Walker I.S., M.H. Sherman, J. Joh, and W.R. Chan. 2013. Apply large datasets to developing a better understanding of air leakage measurement in homes. *International Journal of Ventilation* 11(4), 323–338. DOI: 10.1080/14733315.2013.11683991
26. Murphy B.L., and W.R. Chan. 2011. A multi-compartment mass transfer model applied to building vapor intrusion. *Atmospheric Environment* 45(37), 6650–6657. DOI: 10.1016/j.atmosenv.2011.09.009
27. Bigham G., W.R. Chan, M. Dekermenjian, and A. Reza. 2008. Indoor concentrations of mercury vapor following various spill scenarios. *Environmental Forensics* 9(2), 187–196. DOI: 10.1080/15275920802121975
28. Chan W.R., W.W. Nazaroff, P.N. Price, and A.J. Gadgil. 2008. Effectiveness of urban shelter-in-place. III: Commercial districts. *Building Simulation* 1, 144–157. DOI: 10.1007/s12273-008-8312-8
29. Chan W.R., W.W. Nazaroff, P.N. Price, and A.J. Gadgil. 2007. Effectiveness of urban shelter-in-place–II: Residential districts. *Atmospheric Environment* 41, 7082–7095. DOI: 10.1016/j.atmosenv.2007.04.059
30. Chan W.R., W.W. Nazaroff, P.N. Price, and A.J. Gadgil. 2007. Effectiveness of urban shelter-in-place–I: Idealized conditions. *Atmospheric Environment* 41, 4962–4876. DOI: 10.1016/j.atmosenv.2007.01.041
31. Chan W.R., W.W. Nazaroff, P.N. Price, M.D. Sohn, and A.J. Gadgil. 2005. Analyzing a database of residential air leakage in the United States. *Atmospheric Environment* 39, 3445–3455. DOI: 10.1016/j.atmosenv.2005.01.062
32. Stanier C., A. Khlystov, W.R. Chan, M. Mandiro, and S. Pandis. 2004. A method for the in-situ measurement of fine aerosol water content of ambient aerosol: the dry-ambient aerosol size spectrometer (DAASS). *Aerosol Science and Technology* 38(S1), 215–228. DOI: 10.1080/02786820390229525

Article in Book

1. Sherman M.H., and W.R. Chan. 2006. Building airtightness: research and practice. In *Building Ventilation–The State of the Art*. M. Santamouris, P. Wouters (Eds), Earthscan, London, 137–162.

Conference Presentations

1. Chan W.R., J. Shackelford, A. Robinson, C. Regnier, S. Applegate, and S. Petty. 2024. Efficient and Healthy Schools – Enabling Investments in Energy Efficiency, Health, and Resilience. ACEEE Summer Study, August 12–16.
2. Zhao H., W.R. Chan, C. Antonopoulos, C. Martin, P. Francisco, I. Walker, and B. Singer. 2024. Mechanical ventilation and IAQ in recently constructed U.S. homes. Indoor Air Conference, July 7–11.
3. Ackerman A., W.R. Chan, B. Gilligan, K. Keene, and S. Karerat. 2022. Emerging technologies and practices to meet IAQ requirements and energy goals. Energy Exchange 2022, October 25–27.
4. Bueno de Mesquita J., W. Delp, W.R. Chan, and B. Singer. 2022. Control of airborne infectious disease in buildings: evidence and research priorities. Healthy Buildings 2021, January 18–20.
5. Chan W.R., Hotchi T., B. Singer, C. Mande, R. McMurphy, and T. Pistochini. 2022. Field evaluation of system performance and classroom indoor air quality following HVAC retrofits. Healthy Buildings 2021, January 18–20.

6. Johnson A., J. Bueno de Mesquita, W.R. Chan, and B. Singer. 2022. Applying the indoor air quality procedure to identify acceptable levels of airborne infection control in a theoretical grade school building. *Healthy Buildings 2021*, January 18–20.
7. Maddalena R., A. Bernheim, and W.R. Chan. 2022. Achieving improved indoor air quality inside San Francisco International Airport Buildings. *Healthy Buildings 2021*, January 18–20.
8. Rosenberg S., C. Antonopoulos, W.R. Chan, B. Singer, and C. Metzger. 2022. Indoor air quality in Oregon and Colorado occupied homes with mechanical ventilation. *Healthy Buildings 2021*, January 18–20.
9. Zhao H., B. Singer, W.R. Chan, I. Walker, E. Martin, T. Khan, and S. Gloss. 2022. Residential cooking and range hood use in US homes. *Healthy Buildings 2021*, January 18–20.
10. Chan W.R., M.S. Egea Casaldue, and C.R. Shapiro. 2021. Enabling Healthy-Efficient Investments in Schools. *Green Schools Conference*, June 28–29.
11. Chan W.R., W. Fisk, and B. Singer. 2020. How residential energy efficiency retrofits influence indoor air quality, comfort, and health: a review of empirical data. *Indoor Air Conference*, November 1–5.
12. Chan, W.R., B.C. Singer, M. Russell, I. Walker, T. Khan, E. Martin, C. Antonopoulos, C. Metzger, P. Francisco, and S. Gloss. 2020. Indoor air quality in modern U.S. detached homes with and without mechanical ventilation. *Indoor Air Conference*, November 1–5.
13. Sohn M., H. Tang, and W.R. Chan. 2020. Automating source apportionment of PM_{2.5} time-resolved measurements using a data-driven machine-learning approach. *Indoor Air Conference*, November 1–5.
14. Martin E., T. Khan, D. Chasar, J. Sonne, S. Rosenberg, C. Antonopoulos, C. Metzger, W.R. Chan, B.C. Singer, and M. Lubliner. 2020. Characterization of mechanical ventilation systems in new U.S. homes: What types of systems are out there and are they functioning as intended? *ACEEE Summer Study*, August 17–21.
15. Chan W.R., C. Antonopoulos, and D. Chasar. 2020. Mechanical ventilation and IAQ in new homes. *RESENT Conference*, Scottsdale, Arizona, February 24–26.
16. Chan W.R. Indoor environmental quality, building health, and comfort. 2019. *Energy Exchange Conference*, Denver, Colorado, August 20–22.
17. Kim Y.S., B.C. Singer, W.R. Chan, and I.S. Walker. 2019. Investigation of quantitative relationships between occupant satisfaction and household IAQ-related characteristics in California homes. *ASHRAE Winter Meeting Conference*. Atlanta, Georgia, January 12–16.
18. Chan W.R. 2018. Challenges to provide adequate ventilation in buildings. *ACEEE Conference on Health, Environment, and Energy*, New Orleans, Louisiana, December 3–5.
19. T. Pistochini and W.R. Chan. 2018. Ensuring proper installation and commissioning of HVAC systems for energy efficiency and indoor air quality. *Green California Summit*, Sacramento, California, April 10.
20. Walker I.S., Y.S. Kim, B.C. Singer, and W.R. Chan. 2017. Assessing occupant and outdoor air impacts on indoor air quality in new California homes. *38th AVIC Conference*, Nottingham, United Kingdom, September 13–14.
21. Chan W.R., M. Spears, R. Maddalena, C. Stratton, B. Singer, I. Walker, M. Sherman, and Y.S. Kim. 2016. Healthy Efficient New Gas Home (HENGH) – Survey and field test preliminary results. *ASHRAE/AIVC IAQ 2016: Defining Indoor Air Quality: Policy, Standards and Best Practices*, Alexandria, Virginia, September 12–14.

22. Singer B.C., J. Logue, W.R. Chan, and N. Klepeis. 2016. Population Impact Assessment Model (PIAMF): A tool to investigate effects of infiltration and indoor emissions on PM_{2.5} exposures in U.S. homes. ASHRAE/AIVC IAQ 2016: Defining Indoor Air Quality: Policy, Standards and Best Practices, Alexandria, Virginia, September 12–14.
23. Chan W.R. and M.H. Sherman. 2014. Durable airtightness in single-family dwellings: field measurements and analysis. 35th AIVC/4th TightVent/2nd VentCool Conference, Poznan, Poland, September 24–25.
24. Chan W.R., T. Hotchi, and W. Fisk. 2014. Automated control of ventilation and filtration to improve indoor air quality in residences. Indoor Air Conference, Hong Kong, July 7–12.
25. Chan W.R., M. Sidheswaran, S. Cohn, D. Sullivan, and W. Fisk. 2014. Contaminant source strength and ventilation rates in retail stores—implications to California’s building energy efficiency standards. Indoor Air Conference, Hong Kong, July 7–12.
26. Chan W.R. 2014. Contaminant levels and source strengths in California retail stores. ASHARE Annual Conference, Seattle, Washington, June 29–July 2.
27. Chan W.R. and M.H. Sherman. 2013. Building envelope and duct airtightness of new US dwellings. Thermal performance of the exterior envelopes of whole buildings XII, Clearwater Beach, Florida, December 1–5.
28. Chan W.R. and M.H. Sherman. 2013. Improving building envelope and duct airtightness of US dwellings – The current state of energy retrofits. 2013. AIVC Airtightness Workshop, 3rd TightVent Workshop on Building and Ductwork Airtightness, Washington DC, April 18–19.
29. Logue J.M., M.H. Sherman, I.S. Walker, W.R. Chan, and B.C. Singer. 2013. Energy impacts of envelope tightening and mechanical ventilation for the U.S. residential sector. AIVC Airtightness Workshop, 3rd TightVent Workshop on Building and Ductwork Airtightness, Washington DC, April 18–19.
30. Logue J.M., W.R. Chan., and B.C. Singer. 2012. Acrolein exposure in selected microenvironments—concentrations and health risk. 22nd Annual Meeting of International Society of Exposure Science, Seattle, Washington, October 28–November 1.
31. Sidheswaran M., W.R. Chan, and R.L. Maddalena. 2012. Comprehensive VOC profiles in retail stores. 22nd Annual Meeting of International Society of Exposure Science, Seattle, Washington, October 28–November 1.
32. Chan W.R., J. Joh, and M.H. Sherman. 2012. Air leakage of US homes: regression analysis and improvements from retrofit. 33rd Air Infiltration and Ventilation Centre and 2nd TightVent Conference. Copenhagen, Denmark, October 11–12.
33. Chan W.R., and M.D. Sohn. 2012. Outdoor-to-indoor modeling using HPAC-CONTAM. 16th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, Virginia, July 17–18.
34. Chan W.R., and M.D. Sohn. 2012. Comparison of toxic load consequence assessments based on HPAC and VTHREAT prediction. 16th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, Virginia, July 17–18.
35. Chan W.R., M. Sidheswaran, D. Sullivan, S. Cohn, and W. Fisk. 2012. Contaminant levels and source strengths in U.S. retail stores – a pilot study. 10th International Conference on Healthy Buildings, Brisbane, Queensland, July 8–12.
36. Srinandini P., W.R. Chan, W. Fisk, and T. McKone. 2012. Modeling indoor exposures to VOCs and SVOCs as ventilation rates vary. 10th International Conference on Healthy Buildings, Brisbane, Queensland, July 8–12.

37. Chan W.R., Sherman M.H. 2011. Preliminary analysis of U.S. residential air leakage database v.2011. 32nd Air Infiltration and Ventilation Centre and 1st TightVent Conference, Brussels, Belgium, October 12–13.
38. Apte M., W.R. Chan, S. Dutton, M. Mendell, and H. Willem. 2011. Study design of the Healthy Zero Energy Building (HZEB) research program in California. 12th International Conference on Indoor Air Quality and Climate, Austin, Texas, June 5–10.
39. Chan W.R., and M.D. Sohn. 2011. Estimates of shelter-in-place effectiveness: how important is outdoor concentration fluctuation? 12th International Conference on Indoor Air Quality and Climate, Austin, Texas, June 5–10.
40. Gunaseelan P., C. Buehlur, and W.R. Chan. 2009. In profile: carbon dioxin emissions from U.S. petroleum refining. 102nd Air and Waste Management Association Annual Conference and Exhibition, Detroit, Michigan, June 16–19.
41. Chan W.R., G. Bigham, and M. Dekermenjian. 2008. Exposure to elemental mercury from a spill. 11th International Conference on Indoor Air Quality and Climate, Copenhagen, Denmark, August 17–22.
42. Chan W.R., J. Levy, B. Murphy, and J. Lingle. 2008. Air emissions and exposure from remediation of former manufactured gas plant sites. 101st Air and Waste Management Association Annual Conference and Exhibition, Portland, Oregon, June 24–26.
43. Chan W.R., and W. Shields. 2007. Deposition of dioxin in attics from backyard burning. 27th International Symposium on Halogenated Persistent Organic Pollutants, Tokyo, Japan, September 2–7.
44. Chan W.R., W.W. Nazaroff, P.N. Price, and A.J. Gadgil. 2005. Factors affecting indoor health effects owing to an outdoor toxic release. 15th Annual International Society of Exposure Assessment Conference, Tucson, Arizona, October 30–November 3.
45. Chan W.R., P.N. Price, A.J. Gadgil, and W.W. Nazaroff. 2005. Distribution of residential air leakage: implications for health consequences for an outdoor toxic release. 10th International Conference on Indoor Air Quality and Climate, Beijing, China, September 4–9.
46. Chan W.R., P.N. Price, A.J. Gadgil, W.W. Nazaroff, G. Loosmore, and G. Sugiyama. 2004. Modeling shelter-in-place including sorption on indoor surfaces. 84th Annual Meeting of the American Meteorological Society, Seattle, Washington, January 11–15.

Other Publications

1. National Academies of Sciences, Engineering, and Medicine (NASEM). 2024. Health Risks of Indoor Exposure to Fine Particulate Matter and Practical Mitigation Solutions. The National Academies Press. Washington, D.C. DOI: 10.17226/27341.
2. Bueno de Mesquita P.J., W.R. Chan, A. Heming, and C. Shannon. 2022. Managing air quality during the pandemic: how K-12 schools addressed air quality in the second year of COVID-19. <https://www.usgbc.org/resources/managing-air-quality-during-pandemic-how-k-12-schools-addressed-air-quality-second-year>
3. Chan W.R., B. Less, and I.S. Walker. 2021. DOE deep energy retrofit cost survey. LBNL Report. DOI: 10.2172/1777978
4. Singer B.C., W.R. Chan, W.W. Delp, I.S. Walker, and H. Zhao. 2021. Effective kitchen ventilation for healthy zero net energy homes with natural gas. CEC-500-2021-005. California Energy Commission, Sacramento, California.
5. Chan W.R., S. Kumar, A.L. Johnson, and B.C. Singer. 2020. Simulation of short-term exposure to NO₂ and PM_{2.5} to inform capture efficiency standards. LBNL-2001332. Lawrence Berkeley National Laboratory, Berkeley, California.

6. Pistochini T., C. Mande, M. Modera, S. Outcault, A. Sanguinetti, W.R. Chan, S. Dutton, B. Singer, and X. Li. 2020. Improving ventilation and indoor environmental quality in California K-12 schools. CEC-500-2020-049. California Energy Commission, Sacramento, California.
7. Chan W.R., Y.S. Kim, B. Less, B.C. Singer, and I.S. Walker. 2019. Ventilation and indoor air quality in new California homes with gas appliances and mechanical ventilation. LBNL-2001200R1. Lawrence Berkeley National Laboratory, Berkeley, California.
8. Walker I.S., W.R. Chan, and B.C. Singer. 2019. Ventilation and IAQ in new California homes. Home Energy Magazine, Spring 2019.
9. Chan W.R., S.M. Dutton, and W.J. Fisk. 2019. Measurement and Control of Ventilation Rates in California Commercial Buildings. CEC-500-2019-056. California Energy Commission, Sacramento, California.
10. Piette M.A., T. Hong, W.J. Fisk, N. Bourassa, W.R. Chan, Y. Chen, I.H.Y. Cheung, T. Hotchi, M. Kloss, S.H. Lee, P.N Price, O. Schetrit, K. Sun, S. Taylor-Lange, and R. Zhang. 2017. Small and Medium Building Efficiency Toolkit and Community Demonstration Program. LBNL-2001054. Lawrence Berkeley National Laboratory, Berkeley, California.
11. Chan W.R., Y.S. Kim, B.C. Singer, I.S. Walker, and M.H. Sherman. 2016. Healthy Efficient New Gas Home (HENGH) field study protocol. LBNL-1005819. Lawrence Berkeley National Laboratory, Berkeley, California.
12. Chan W.R., R.L. Maddalena, J.C. Stratton, T. Hotchi, B.C. Singer, I.S. Walker, and M.H. Sherman. 2016. Healthy Efficient New Gas Home (HENGH) pilot test results. 2016. LBNL-1005818. Lawrence Berkeley National Laboratory, Berkeley, California.
13. Fisk W.J., W.R. Chan, S. Cohn, H. Destailats, S.M. Dutton, E.A. Eliseeva, R.L. Maddalena, T.E. McKone, M.J. Mendell, S. Parthasarathy, M.L. Russell, U. Satish, M. Sidheswaran, M. Spears, D.P. Sullivan, and H. Willem. 2015. Commercial Building Ventilation Effects on Indoor Air Quality, Human Health and Performance, and Building Energy Use and Implications for Future Ventilation Standards. CEC-500-2016-048. California Energy Commission, Sacramento, California.
14. Mills E., J. Granderson, W.R. Chan, D. Diamond, P. Haves, B. Nordman, P. Matthew, M.A. Piette, G. Robinson, and S. Selkowitz. 2015. Green, clean, & mean: pushing the energy envelope in tech industry buildings. LBNL-1005070E. Lawrence Berkeley National Laboratory, Berkeley, California.
15. Fisk W.J., W.R. Chan, and T. Hotchi. 2015. Prototype systems for measuring outdoor air intake rates in rooftop air handlers. LBNL-181030. Lawrence Berkeley National Laboratory, Berkeley, California.
16. Chan W.R. and B.C. Singer. 2014. Measurement-based evaluation of installed filtration system performance in single-family homes. LBNL-6607E. Lawrence Berkeley National Laboratory, Berkeley, California.
17. Chan W.R., F.R. Carrie, J. Novak, A. Litvak, F. Richieri, O. Solcher, W. Pan, and S. Emmerich. 2012. Building air leakage databases in energy conservation policies: analysis of selected initiatives in 4 European countries and the USA. Air Infiltration and Ventilation Centre, Energy Conservation in Buildings and Community Systems Programme, International Energy Agency.
18. Chan W.R., J. Joh, and M.H. Sherman. 2012. Analysis of Air Leakage Measurements from Residential Diagnostics Database. LBNL-5967E. Lawrence Berkeley National Laboratory, Berkeley, California.
19. Chan W.R., M. Sidheswaran, D. Sullivan, S. Cohn, and W.J. Fisk. 2012. Healthy Zero Energy Buildings (HZEB) Program—Interim Report on Cross-Sectional Study of Contaminant

- Levels, Source Strengths, and Ventilation Rates in Retail Stores. LBNL-5953E. Lawrence Berkeley National Laboratory, Berkeley, California.
20. Chan W.R. and F. Noris. 2011. Side-by-Side Comparison of Particle Count and Mass Concentration Measurements in a Residence. LBNL-5327E. Lawrence Berkeley National Laboratory, Berkeley, California.
 21. Price P.N., A. Shehabi, and W.R. Chan. 2007. Indoor-outdoor air exchange rates of California apartments and commercial buildings. California Energy Commission, CEC-500-2006-11.
 22. Chan W.R., P.N. Price, and A.J. Gadgil. 2004. Sheltering in buildings from large-scale outdoor releases. Air Infiltration and Ventilation Centre, Ventilation Information Paper No. 10.