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CURRICULUM VITAE

William J. Fisk

BUSINESS ADDRESS:

Lawrence Berkeley National Laboratory, 1 Cyclotron Road, M.S. 90-3058, Berkeley, California 94720
Phone: (510) 486-5910; Fax: (510) 486- 6658; Email: wjfisk@lbl.gov

PRIMARY RESEARCH INTERESTS:

Relationship between indoor environmental quality and health and productivity, Advanced energy efficient ventilation technologies; use of tracer gases to study ventilation and indoor air flow; air cleaning; indoor radon. .

PROFESSIONAL EXPERIENCE AT LAWRENCE BERKELEY NATIONAL LABORATORY:

2000 – Present: Staff Scientist, Department Head, Group Leader, Indoor Environment Department, Environmental Energy Technologies Division.

The Department Head responsibilities include providing scientific oversight and management for an interdisciplinary program of research focusing on indoor air quality and building energy efficiency. The Department has 50 staff with an annual budget of approximately \$8 million. The Group Leader responsibilities include scientific leadership and conduct of research on commercial building ventilation and the effects of indoor environmental conditions on health and productivity.

1997 – Present: Group leader for Commercial Building Ventilation and Indoor Air Quality Control Technologies Group

1988 – 1997: Group Leader for Indoor Radon Group, Project Leader for Ventilation and Indoor Air Quality Control Project and Project leader for Healthy Buildings and Productivity Research Project.

1980 – 1988 Staff Scientist-Project Leader for Ventilation and Indoor Air Quality Control Project (1980- 1988)

1979 (September-December) Staff Scientist, Solar Energy Group, Energy and Environment Division. Temporary continuation of research performed for M.S. degree.

EDUCATION:

M.S. in Mechanical Engineering (1980); specialized in the field of heat and fluid transport; University of California, Berkeley.
B.S. in Mechanical Engineering (1978); University of New Mexico, Albuquerque.

PROFESSIONAL LICENSES:

Registered Professional Engineer, State of California, Registration No. M21287.

PROFESSIONAL ORGANIZATION MEMBERSHIP:

International Academy of Indoor Air Sciences, 1999 to present

American Society of Heating, Refrigerating, and Air Conditioning Engineers, 1979 to present;

Chairman of ASHRAE Standard Committee SPC- 129P (Standard Method of Measuring of Air Change Effectiveness)

Member of Environmental Health Committee, 1999-2002

Chairman of Research Subcommittee of Environmental Health Committee (1999-2002)

Member of organizing committee for ASHRAE's IAQ'96, IAQ'98, IAQ'2001, and 2007 Conferences.

International Society of Indoor Air Quality and Climate, 1994 to present.

EDITORIAL BOARDS, NATIONAL-LEVEL COMMITTEES, AND ADVISORY ACTIVITIES:

Member, Clean Air Action Committee, American Lung Association national office, 2004 - present

Member of the National Academy of Sciences, Institute of Medicine, Committee on The Relationship between Mold, Damp Indoor Spaces and Health. (2002 – 2004)

Editorial Advisory Board for *Indoor Air: International Journal of Indoor Air Quality and Climate*. (1989-present)

Member of the National Occupational Research Agenda-Indoor Environment Team established by NIOSH to define priority research needs related to non-industrial indoor environments. (1997-2003).

Member of the National Academy of Sciences, Institute of Medicine, Committee on Assessment of Asthma and Indoor Air, (1998 –2000).

Member, Science Advisory Committee, NY STAR Center for Environmental Quality Systems (2002- present)

Member, University Policy Committee, Center for the Built Environment, U.C. Berkeley (2002- present)

Vice President of Organizing Committee of Indoor Air 2002 Conference. (2000 – present)

Member of committees and work groups established to advise EPA, DOE, and EPRI on research priorities in the ventilation and indoor air quality field.

Reviewer of research proposals submitted to NSF, ASHRAE, DOE, California Energy Commission, the University-wide Energy Research Group, and the Honk Kong Research Grants Council.

Advisory Council of the Bay Area Air Quality Management District, 1985 to 1996

Chairperson of Long Range Planning Committee, 1987-1988

Vice-Chairperson of Advisory Council, 1989-1990

Chairperson of Technical Committee (1990 - 1992).

Member, Steering or Advisory Committees for numerous conferences addressing indoor air quality.

Reviewer of papers for *ASHRAE Transactions*, *ASHRAE Journal*, *Environment International*, *Indoor Air*, *Building and Environment*, *Health Physics*, *Environmental Science and Technology*, *Energy and Buildings*, *Journal of the Air and Waste Management Association*, conferences.

CONSULTING

Consultant on litigation related to sick building syndrome.

Consultant for industry on modeling of formaldehyde removal by air pollution control equipment used in gas streams

Authorship of a document for homeowners on indoor air quality

Consultant for industry on demand controlled ventilation

Consultant for industry on particle air cleaning for residences

Authorship of document on ventilation and indoor air quality in the U.S. for Helsinki University of Technology

Consultant for industry on opportunities for IAQ product development

AWARDS

Elected Fellow of American Society of Heating, Refrigerating, and Air Conditioning Engineers. January 2006

Best Paper Award for papers published between 1999 and 2002 in the Journal *Indoor Air*, for Apte, M.G., Fisk, W.J., and Daisey, J.M. (2000) Associations between indoor CO₂ concentrations and sick building syndrome symptoms in US office workers: an analysis of the 1994-1996 BASE Study data. *Indoor Air* 10(4): 246-257

Elected to International Academy of Indoor Air Sciences, 1999

Best Paper Award for papers published between 1996 and 1999 in the Journal *Indoor Air*, for: Fisk WJ and Rosenfeld AH (1997) "Estimates of improved productivity and health from better indoor environments", *Indoor Air* 7(3): 158-172.

Best Paper Award for papers published between 1996 and 1999 in the Journal *Indoor Air*, for: Ten Brinke J, Selvin S, Hodgson AT, Fisk WJ, Mendell MJ, Koshland CP, and Daisey JM (1998) "Development of new VOC exposure metrics and their relationship to sick building syndrome symptoms", *Indoor Air* 8(3): 140-152.

1996 Ralph G. Nevins Award in Physiology and the Human Environment from the American Society of Heating, Refrigerating and Air Conditioning Engineers.

ASHRAE Best Paper award for: Bauman FS, Faulkner D, Arens EA, Fisk WJ, Johnston LP, McNeel PJ, Pih D, and Zhang H (1991) "Air movement, comfort and ventilation in workstations." *ASHRAE Transactions* 98(1): 756 - 780.

PUBLICATIONS:

1. Refereed Archival Journals

Published

1. Seppanen O, Fisk WJ, and Wargocki P (2006) Quantitative estimates of the influence of the indoor environment on productivity in offices. *IAQ Applications* 8(1): 1-6.
2. Fisk WJ, Faulkner D, Sullivan DP, Chao C, Wan MP, Zagreus L, Webster T (2006) Performance of underfloor air distribution in a field setting. *International Journal of Ventilation* 5(3): 291-300. LBNL-62102
3. Seppanen O and Fisk WJ (2006) Some quantitative relations between indoor environmental quality and work performance or health. *International Journal of HVAC&R Research* 12(4): 957-973. LBNL-59876
4. Mendell MJ, Brennan T, Hathorn L, Odom JD, Offermann FJ, Turk BH, Wallingford KM, Diamond RC, Fisk WJ (2006) Causes and prevention of symptom complaints in office buildings: Distilling the experience of indoor environmental quality investigators. *Facilities* 24: 436-444. LBNL-59329
5. Fisk WJ, Faulkner D, Sullivan DP (2006) Measuring outdoor airflow into HVAC systems. *ASHRAE Journal* 48(8): 50-57. LBNL-58753
6. Seppanen O, Fisk WJ, Lei QH (2006) Ventilation and performance in office work. *Indoor Air* 16:28-36. LBNL-58516.
7. Fisk WJ, Seppanen O, Faulkner D, and Huang J (2005) Economic benefits of an economizer system: energy savings and reduced sick leave. *ASHRAE Transactions* 111(2): 673-679. LBNL-54475.
8. Seppanen O and Fisk WJ (2005) A model to estimate the cost effectiveness of indoor environment improvements in office work. *ASHRAE Transactions* 111(2):663-669. LBNL-55447
9. Seppanen O, Fisk WJ, Faulkner D (2005) Control of temperature for health and productivity in offices. *ASHRAE Transactions* 111(2): 680-686. LBNL-55448
10. Fisk WJ, Faulkner D, Sullivan DP (2005) An evaluation of three commercially available technologies for real-time measurement of rates of outdoor airflow into HVAC systems. *ASHRAE Transactions* 111(2): 443-455. LBNL-56603
11. Fisk WJ, Faulkner D, Sullivan DP (2005) Technologies for measuring flow rates of outdoor air into HVAC systems: some causes and suggested cures for measurement errors. *ASHRAE Transactions* 111(2): 456-463. LBNL-56604
12. Faulkner D, Fisk WJ, Sullivan DP, Lee SM (2004) Ventilation efficiencies and thermal comfort results of a desk-edge-mounted task ventilation system. *Indoor Air*. 14 (supplement 8):92-97. LBNL-53798
13. Federspiel CC, Fisk WJ, Price PN, Liu G, Faulkner D, Dibartolomeo DL, Sullivan DP, Lahiff M (2004) Worker performance and ventilation in a call center: analyses of work performance data for registered nurses. *Indoor Air* 14 (supplement 8):41-50. LBNL-55032
14. Hodgson, AT, Shendell DG, Fisk WJ, and Apte MG (2004) Comparison of predicted and derived measures of volatile organic compounds inside four new relocatable classrooms. *Indoor Air* 14 (supplement 8): 135-144 LBNL-52520
15. Shendell DG, Prill R, Fisk WJ, Apte MG, Blake D, Faulkner D (2004) Associations between classroom CO₂ concentrations and student attendance. *Indoor Air* 14(5): 333-341. LBNL-54413.
16. Seppanen O and Fisk WJ. (2004) Summary of human responses to ventilation. *Indoor Air* 14 (supplement 7): 102-118. LBNL-55748
17. Wagner, J., D.P. Sullivan, D. Faulkner, W.J. Fisk, L.E. Alevantis, R.L. Dod, L.A. Gundel, J.M. Waldman. (2004) Environmental Tobacco Smoke Leakage From Smoking Rooms. *Journal of Occupational and Environmental Hygiene* 1: 110-118. LBNL-51010
18. Hodgson, A.T.; Faulkner, D.; Sullivan, D.P.; Dibartolomeo, D.L.; Russell, M.L.; Fisk, W.J. (2003). Effect of Outside Air Ventilation Rate on Volatile Organic Compound Concentrations in a Call Center. *Atmospheric Environment* 37 (39-40): 5517-5528. LBNL-52497.
19. Apte MG, Dibartolomeo D, Hotchi T, AT Hodgson AT, Lee SM; Liff SM, Rainer LI, Shendell DG, Sullivan DP, and WJ Fisk WJ (2003) Simultaneous energy Savings and IEQ improvements in relocatable classrooms, *IAQ Applications*, Fall 2003, American Society for Heating, Refrigerating, and Air Conditioning Engineers, Inc., Atlanta. LBNL-52690 (non-refereed archival trade journal.)
20. Alevantis L, Wagner J, Fisk B, Sullivan D, Faulkner D, Gundel L, Waldman J, and Flessel P (2003) Designing for smoking rooms. *ASHRAE Journal*, July 2003. LBNL-53201

21. Fisk WJ, Faulkner D, Palonen J, and Seppanen O (2003) Performance and Costs of Particle Air Filtration in HVAC Supply Airstreams, HPAC Engineering, July 2003. LBNL-53212
22. Fisk WJ, Faulkner D, Palonen J, and Seppanen O (2002) Performance and cost of particle air filtration technologies. *Indoor Air* 12(4):223-234. LBNL-47833
23. Mendell MJ, Fisk WJ, Kreiss K, Levin H, Alexander D, Cain WS, Girman JR, Hines CJ, Jensen, PA, Milton DK, Rexroat LP, Wallingford KM (2002) Improving the Health of Workers in Indoor Environments: Research Needs for a National Occupational Research Agenda, *American Journal for Public Health* 92(9): 1430-1440.
24. Seppanen O. and Fisk WJ (2002) Association of ventilation system type with SBS symptoms in office workers. *Indoor Air* 12(2): 98-112. LBNL-47457
25. Seppanen O, Fisk WJ, and Mendell MJ (2002) Ventilation rates and health. *ASHRAE Journal* 44(8): 56-58.
26. Kumar S. and Fisk WJ (2002) IEQ and the impact on employee sick leave. *ASHRAE Journal* 44(7): 97-98., LBNL-51289
27. Modera MP, Brzozowski O, Carrie FR, Dickerhoff DJ, Delp WW, Fisk WJ, Levinson R, Wang D (2002) Sealing ducts in larger commercial buildings with aerosolized sealant particles. *Energy and Buildings* 34: 705-714
28. Carrié, F. R., Levinson, R., Xu, T. T., Dickerhoff, D. J., Fisk, W. J., McWilliams, J., Modera, M. P., Wang, D. 1999. "Laboratory and field testing of an aerosol-based duct-sealing technology for large commercial buildings". Published in *ASHRAE Transactions*, Jan. 2002. LBNL-44220.
29. Mendell MJ, Fisk WJ, Petersen MR, Hines CJ, Dong M, Faulkner D, Deddens JA, Ruder AM, Sullivan D, Boeniger MF. (2002) Indoor particles and symptoms among office workers: results from a double-blind cross-over study. *Epidemiology* 13: 296-304.
30. Xu, T.T., Carrie, F.R., Dickerhoff, D.J., Fisk, W.J., McWilliams, J., Wang, D., and Modera, M.P. (2002) Performance of thermal distribution systems in large commercial buildings. *Energy and Buildings* 34: 215-226.
31. Kumar, S and Fisk WJ (2002) IEQ and the impact on building occupants. *ASHRAE Journal* 44(4): 50-52, LBNL-51288.
32. Fisk, WJ (2002) How IEQ affects health, productivity. *ASHRAE Journal* 44(5): 56-60.
33. Fisk, W.J. (2000) Health and productivity gains from better indoor environments and their relationship with building energy efficiency. *Annual Review of Energy and the Environment* 25(1): 537-566. LBNL-45484. (invited paper)
34. Apte, M.G., Fisk, W.J., and Daisey, J.M. (2000) Associations between indoor CO₂ concentrations and sick building syndrome symptoms in US office workers: an analysis of the 1994-1996 BASE Study data. *Indoor Air* 10(4): 246-257, LBNL-44385
35. Fisk, W.J., Faulkner D., Sullivan, D., and Mendell, M.J. (2000) "Particle concentrations and sizes with normal and high efficiency filtration in a sealed air-conditioned office building", *Aerosol Science and Technology* 32: 527-544, LBNL-43835
36. Fisk, WJ; Delp, W; Diamond, R; Dickerhoff, D; Levinson, R; Modera, M; Nematollahi, M; and Wang, D (1999) "Duct systems in large commercial buildings: physical characterization, air leakage, and heat conduction gains", *Energy and Buildings* 32(1): 109-119. LBNL-42339
37. Hines, CJ; Milton, DK; Larsson, L; Petersen, MR; Fisk, WJ; Mendell, MJ, (1999) "Characterization of endotoxin and 3-hydroxy fatty acids in an office building", *Indoor Air* 10(1): 2-12.
38. Litvak, A., Gadgil, A.G., and Fisk, W.J. (2000) "Hygroscopic fine mode particle deposition on electronic circuits and resulting degradation of circuit performance: an experimental study", *Indoor Air* 10(1): 47-56. LBNL-41315
39. Faulkner, D, Fisk, W.J., Sullivan, D, and Wyon, D.P. (1998) Ventilation Efficiencies of Desk-Mounted Task/Ambient Conditioning Systems, *Indoor Air* 9: 273-281. LBNL-42700
40. Seppanen, O.A., Fisk, W.J., and Mendell, M.J. (1999) Association of ventilation rates and CO₂ concentrations with health and other human responses in commercial and institutional buildings. *Indoor Air* 9: 226-252. LBNL-43334
41. Mendell, MJ, Fisk, W.J, Dong, M.X., Petersen, M., Hines, C.J., Faulkner, D., Deddens, J.A., Ruder, A.M., Sullivan, D., and Boeniger, M.F. (1999) "Enhanced particle filtration in a non-problem office environment: preliminary results from a double-blind crossover intervention", *American Journal of Industrial Medicine* 1: 55-57. LBNL - 42221
42. Fisk, W.J. and de Almeida, A.T. (1998) "Sensor based demand controlled ventilation: a review", *Energy and Buildings* 29(1): 35-44. LBNL- 41698
43. Ten Brinke, J.; Selvin, S.; Hodgson, A.T.; Fisk, W.J.; Mendell, M.J.; Koshland, C.P.; and Daisey, J.M. (1998) "Development of new VOC exposure metrics and their relationship to sick building syndrome symptoms", *Indoor Air* 8(3): 140-152. LBNL-42047
44. Litvak, A, Gadgil, A.J., and Fisk, W.J. (1998) Experimental observation of hygroscopic fine mode aerosol deposition on electronic circuits and resulting degradation of circuit performance. *J. Aerosol Science* 29 suppl. 1: S1235-1236.
45. Fisk, W.J. and Rosenfeld, A.H. (1998) "The indoor environment -- productivity and health -- and \$\$\$", *Strategic Planning for Energy and the Environment* 17(4), 53-57 (unrefereed)
46. Fisk, W.J. and Rosenfeld, A.H. (1997) "Estimates of Improved Productivity and Health from Better Indoor Environments", *Indoor Air* 7(3): 158-172.

47. Robinson, A.L.; Sextro, R.G.; and Fisk, W.J. (1996) "Soil gas entry into an experimental basement driven by atmospheric pressure fluctuations, measurements, spectral analysis, and model comparison", *Atmospheric Environment* 31(10): 1477-1485.
48. Fisk, W.J., Faulkner, D., Sullivan, D., and Bauman, F (1997). "Air Change Effectiveness and Pollutant Removal Efficiency During Adverse Mixing Conditions", *Indoor Air* 7: 55-63
49. Faulkner, D.; Fisk, W.J., and Walton, J.T. (1996) Energy Savings in Cleanrooms from Demand-Controlled Filtration", *Journal of the Institute of Environmental Sciences* 39(2): 21-27. LBNL-38869
50. Mendell M.J., Fisk, W.J., Deddens, J.A., Seavey, W.G., Smith, A.H., Smith, D.F., Hodgson, A.T., Daisey J.M., Goldman, L. R. (1996) "Elevated Symptom Prevalence Associated with Ventilation Type in Office Buildings: Findings from the California Healthy Building Study-Phase 1", *Epidemiology* 7(6): 583-589
51. Riley, W.J., Fisk, W.J., and Gadgil, A.J. (1996) "Regional and National Estimates of the Potential Energy Use, Energy Cost, and CO₂ Emissions Associated with Radon Mitigation by Sub-Slab Depressurization", *Energy and Buildings* 24(3): 203-212.
52. Faulkner, D., Fisk, W.J., and Sullivan, D.P. (1993) "Indoor Airflow and Pollutant Removal in a Room With Floor-Based Task Ventilation: Results of Additional Experiments", *Building and Environment* 30(3), pp. 323-332.
53. Fisk, W.J., Prill, R.J., Wooley, J., Bonnefous, Y.C., Gadgil, A.J., and Riley, W.J. (1995) "New Methods of Energy Efficient Radon Mitigation", *Health Physics* 68(4), pp. 689-698.
54. Gadgil, A.G., Bonnefous, Y.C., and Fisk, W.J. (1994) "Relative Effectiveness of Subslab Pressurization and Depressurization Systems for Indoor Radon Mitigation: Studies with an Experimentally Verified Numerical Model." *Indoor Air* 4 (4), pp. 265-275.
55. Daisey, J.M., Hodgson, A.T., Fisk, W.J., Mendell, M.J., Ten Brinke, J.A. (1994) "Volatile Organic Compounds in Twelve California Office Buildings: Classes, Concentrations, and Sources." *Atmospheric Environment* 28(22), pp. 3557-3562.
56. Bonnefous, Y.C., Gadgil, A.G., and Fisk, W.J. (1994) "Impact of Subslab Ventilation Technique on Residential Ventilation Rate and Energy Costs." *Energy and Buildings* 21, pp. 15-22.
57. Fisk, W.J., Mendell, M. J., Daisey, J. M., Faulkner, D., Hodgson, A.T., Nematollahi, M., and Macher, J. (1993) "Phase 1 of The California Healthy Building Study: A Summary" *Indoor Air* 3(4), pp. 246-254. LBNL-51497
58. Faulkner, D., Fisk, W.J., and Sullivan, D.P. (1993) "Indoor Air Flow and Pollutant Removal in a Room With Desk-Top Task Ventilation", *ASHRAE Transactions* 99(Pt. 2), pp. 750-758
59. Garbesi, K., Sextro, R.G., Fisk, W.J., Modera, M.P., and Revzan, K.L. (1993) "Soil Gas Entry Into an Experimental Basement: Model-Measurement Comparisons and Seasonal Effects." *ES&T* 27(3), pp. 466 - 473.
60. Revzan, K.L., Fisk, W.J., and Sextro, R.G. (1993) "Modeling Radon Entry into Florida Slab-on-Grade Houses." *Health Physics* 65(4), pp. 375 - 385.
61. Bauman, F.S., Helm, R.S., Faulkner, D., Arens, E.A., and Fisk, W.J. (1993) "Air Movement, Comfort, and Ventilation in Partitioned Work Stations." *ASHRAE J.* 35(3), pp. 42-50.
62. Revzan, K.L. and Fisk, W.J. (1992) "Modeling Radon Entry into Houses with Basements: The Influence of Structural Factors." *Indoor Air* 2 (1), pp. 40 - 48.
63. Bonnefous, Y. C., Gadgil, A.G., Fisk, W.J., Prill, R.J., and Nematollahi, A.R. (1992) "Field Study and Numerical Simulation of Subslab Ventilation Systems." *ES&T* 26 (9), pp. 1752 - 1759.
64. Bauman, F.S., Faulkner, D., Arens, E.A., Fisk, W.J., Johnston, L.P., McNeel, P.J., Pih, D., and Zhang, H. (1991) "Air Movement, Comfort and Ventilation in Workstations." *ASHRAE Transactions* 98 (Part 1), pp. 756 - 780.
65. Fisk, W.J., Faulkner, D., Pih, D., McNeel, P.J., Bauman, F.S., and Arens, E.A. (1991) "Indoor Air Flow and Pollutant Removal in a Room with Task Ventilation." *Indoor Air* 1 (3), pp. 247 - 262.
66. Revzan, K.L., Fisk, W.J., and Gadgil, A.J. (1991) "Modeling Radon Entry into Houses with Basements: Model Description and Verification." *Indoor Air* 1 (2), pp. 173-190.
67. Turk, B.H., Prill, R.J., Fisk, W.J., Grimsrud, D.T., and Sextro, R.G. (1991) "Effectiveness of Radon Control Systems in 15 Homes." *J. Air & Waste Manage. Assoc.* 41 (5), pp. 723 - 734.
68. Prill, R.J., Fisk, W.J. and Turk, B.H. (1990) "Evaluation of Radon Mitigation Systems in 14 Houses over a Two-Year Period." *J. Air Waste Manage. Assoc.* 40, pp. 740-746.
69. Wallman, P.H. and Fisk, W.J. (1990) "Exhaust-Air Heat Pump Performance with Unsteady-State Operation." *Heat Recovery Systems and CHP* 10 (3), pp. 231-241.
70. Seppanen, O., Fisk, W.J., Eto, J., and Grimsrud, D.T. (1989) "Comparison of Conventional Mixing and Displacement Air Conditioning and Ventilating Systems in U.S. Commercial Buildings." *ASHRAE Transactions* 95 (Part 2), pp. 1028-1040.
71. Mowris, R.J. and Fisk, W.J. (1988) "Modeling the Effects of Exhaust Ventilation on Radon Entry Rates and Indoor Radon Concentrations." *Health Physics* 54 (5), pp. 491-501.
72. Wallman, P.H., Pedersen, B.S., Mowris, R.J., Fisk, W.J. and Grimsrud, D.T. (1987) "Assessment of Residential Exhaust-Air Heat Pump Applications in the United States." *Energy* 12 (6), pp. 469-484.
73. Pedersen, B.S. and Fisk, W.J. (1986) "An Experimental Study of Air Washing for the Removal of Formaldehyde from Indoor Air." *Environment International* 12, pp. 439-447.

74. Offermann, F.J., Sextro, R.G., Fisk, W.J., Grimsrud, D.T., Nazaroff, W.W., Nero, A.V., Revzan, K.L., and Yater, J. (1985) "Control of Respirable Particles in Indoor Air with Portable Air Cleaners." *Atmospheric Environment* 19 (11), pp. 1761-1771.
75. Fisk, W.J., Chant, R.E., Archer, K.M., Hekmet, D., Offermann, F.J., and Pedersen, B.S. (1985) "Onset of Freezing in Residential Air- to-Air Heat Exchangers." *ASHRAE Transactions* 91 (Pt. 1B), pp. 145-158.
76. Fisk, W.J., Chant, R.E., Archer, K.M., Hekmat, D., Offermann, F.J., and Pedersen, B.S. (1985) "Performance of Residential Air-to-Air Heat Exchangers during operation with Freezing and Periodic Defrosts." *ASHRAE Transactions* 91 7(Pt. 1B), pp. 159-172.
77. Fisk, W.J., Pedersen, B.S., Hekmat, D., Chant, R.E., and Kaboli, H. (1985) "Formaldehyde and Tracer Gas Transfer Between Airstreams in Enthalpy-Type Air-to-Air Heat Exchangers." *ASHRAE Transactions* 91 (Pt. 1B), pp. 173-186.
78. Offermann, F.J., Fisk, W.J., Grimsrud, D.T., Pedersen, B.S., and Revzan, K.L. (1983) "Ventilation Efficiencies of Wall - or Window- Mounted Residential Air-to-Air Heat Exchangers." *ASHRAE Transactions* 89 (Pt. 2), pp. 507-529.
79. Turiel, I., Fisk, W.J., and Seedall, M. (1983) "Energy Savings and Cost-Effectiveness of Heat Exchanger Use as an Indoor Air Quality Mitigation Measure in the BPA Weatherization Program." *Energy* 8 (5), pp. 323-335.
80. Fisk, W.J., and Turiel, I. (1983) "Residential Air-to-Air Heat Exchangers: Performance, Energy Savings, and Economics." *Energy and Buildings* 5 (3), pp. 197-211.

Submitted or Accepted for Publication

81. Hodgson AT, Destailats H, Sullivan DP, Fisk WJ (2006) Evaluation of ultra-violet photocatalytic oxidation for indoor air applications. Accepted for publication in *Indoor Air* LBNL-59631.

2. Books and Chapters of Books

1. Seppanen O and Fisk WJ (2006) A procedure to estimate the cost effectiveness of the indoor environment improvements in office work. Chapter 26 (pages 407 – 433) in *Creating the productive workplace*, ed, Derek Clements Croome, Taylor and Francis Publishers. LBNL-60951
2. Committee on Damp Indoor Spaces and Health, Institute of Medicine (2004) *Damp indoor spaces and health*. National Academy Press, Washington, D.C. This is a report of a National Academy of Sciences Committee. William Fisk was a committee member and co-author of three chapters.
3. Fisk, W.J. (2000) "Estimates of potential nationwide productivity and health benefits from better indoor environments: an update", Chapter 4 in *Indoor Air Quality Handbook*, eds. J.D. Spengler, J.M. Samet, and J.F. McCarthy, McGraw Hill, LBNL-42123 (invited chapter)
4. Institute of Medicine, Committee on the Assessment of Asthma and Indoor Air. *Clearing the Air: Asthma and Indoor Air Exposures*. National Academy Press. Washington DC (Author of Chapter 10 entitled: Impact of ventilation and air cleaning on asthma).
5. Fisk, W.J. and Grimsrud, D.T. (1993) "Indoor Air Controls." Chapter 4 in *Environmental Carcinogens, Methods for Analysis and Exposure Measurement, vol. 12 -Indoor Air*. International Agency for Research on Cancer Publication No. 109, B. Seifert, H.J. van de Wiel, B Dodet, and I.K. O'Neill, Eds. Lyon, France. (refereed)
6. Fisk, W.J., Spencer, R.K., Grimsrud, D.T., Offermann, F.J., Pedersen, B. and Sextro, R. (1987) *Indoor Air Quality Control Techniques: Radon, Formaldehyde, Combustion Products*. Noyes Data Corporation, Park Ridge, New Jersey, ISBN 0-8155-1129-9 (unrefereed)

3. Articles in Conference Proceedings

1. Hodgson AT, Sullivan DP, Fisk WJ (2006) Evaluation of Ultra-Violet Photocatalytic Oxidation for Indoor Air Applications. *Proceedings of the Healthy Buildings 2006 Conference*, vol. 2, pp. 243 – 248. June 4-8, Lisbon, Portugal. Lawrence Berkeley National Laboratory Report, LBNL-59631
2. Seppanen O, Fisk WJ, Lei QH (2006) Room temperature and productivity in office work. *Proceedings of the Healthy Buildings 2006 Conference*, vol. 1, pp. 243 – 247. June 4-8, Lisbon, Portugal. Lawrence Berkeley National Laboratory Report, LBNL-60952
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