

CURRICULUM VITAE

PERSONAL

Tim Keane
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FORMAL EDUCATIONAL EXPERIENCE

- U.S. Merchant Marine Academy Kings, Point, N.Y. 1973 – 1977.
Graduated with;
 - Bachelor of Science Marine Engineering
 - US Coast Guard License 3rd Asst. Engineer Unlimited Steam and Diesel
 - US Navy Reserve Commission

WORK EXPERIENCE

- 2000 – current. Consulting engineer with and President of Legionella Risk Management, Inc.
- 1999 – 2000 National Sales Manager Halox Technologies Inc., Bridgeport, CT
- 1987 – 1999. Director BetzDearborn, Trevose, PA
- 1985 – 1987. Director of Engineering, M/V Stuyvesant, Zapata Offshore Houston, TX
- 1980 – 1985. Project Engineer for New Ship Construction – M/V Stuyvesant, Zapata Offshore Houston, TX
- 1978 – 1980. Subsea Engineer - Semi-Submersible Offshore Oil Rig Fleet Zapata Offshore Houston, TX
- 1977 - 1978. - Maintenance Manager Semi-Submersible Offshore Oil Rig Fleet Zapata Offshore Houston, TX

PROFESSIONAL ORGANIZATIONS – MEMBERSHIP AND PARTICIPATION

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 - Water Treatment Technical Committee (2003 to 2018)
 - Program Chairman (past)
 - Legionella Standard 188 Committee (original member to 2018)
 - Committee Secretary (past)
- American Society of Healthcare Engineering (ASHE)
 - Coauthor of Joint Commission / ASHE Waterborne Pathogen Regulatory Advisory (Mar 2000)
- Association for Professionals in Infection Control and Epidemiology (APIC)
- American Society of Plumbing Engineers (ASPE)
- American Water Works Association (AWWA)
- ASTM International
 - Committee E60 on Sustainability
 - Committee D22 on Air Quality
- Cooling Technology Institute (CTI)
- Facilities Guideline Institute (FGI) 2026 Health Guidelines Revision Committee, Plumbing design task group
- International Association of Plumbing and Mechanical Officials (IAPMO)
- International Code Council (ICC)
 - ICC 815 Sizing Water Distribution, Drainage and Venting Standard Consensus Committee for the development of the first edition of ICC 815 -202X Standard for Sizing Water Distribution, Sanitary Drainage and Vent Piping Systems
- International WELL Building Institute
 - Advisor - WELL Home Advisory
 - Advisor - WELL Building Standard Water Advisor
 - Faculty member
- Pool & Hot Tub Alliance (PHTA)

GUIDELINES AND STANDARDS

- ASPE. Engineering Methodologies to Reduce the Risk of Legionella in Premise Plumbing Systems Feb 2023
Note: Only input is lead author of Legionella Control Methodologies section 3.14.5.12
- AWWA. Responding to Water Stagnation in Buildings with Reduced or No Water Use. Sep 2020.
- ASHRAE Guideline 12-2020, Managing the Risk of Legionellosis Associated with Building Water Systems. Mar 2020
- IAPMO. UPC Plumbing Code Appendix N 2021. Developed code proposal and acted as committee member of final document. Impact of Water Temperature on the Potential for Scalding and Legionella Growth. Feb 2020
- ASHRAE Standard Committee 188. Legionellosis- Risk Management for Building Water Systems. Jun 2005 – 2018. Revised Aug 2018.
- IAPMO Water Efficiency and Sanitation Standard Dec 2017.
- ASHRAE Standard Committee 188. Legionellosis- Risk Management for Building Water Systems. Jun 2005 – 2018. Jun 2015.
- South Dakota Health Department. Author of guideline titled Guidelines for Control of Legionella in Ornamental Water Features. Dec 2005.
- ASHE / Joint Commission. Coauthor of guideline review document. Regulatory Advisory on Waterborne Pathogens. Mar 2000

AWARDS

- Outstanding Professional Achievement Award – US Merchant Marine Academy Alumni Association, 2017

PUBLICATIONS

1. T. Keane, G Klein Legionella: Cost Effective Controls of This Serious Pathogen Part 3. Temperature alone is often ineffective in Legionella control. Plumbing Engineer magazine October 5, 2021
<https://legionellae.org/plumbing-design/>
2. T. Keane, G Klein Legionella: Cost Effective Controls of This Serious Pathogen Part 2. Mitigating Legionella Risk by Design. Plumbing Engineer magazine August 9, 2021 <https://legionellae.org/plumbing-design/>
3. T. Keane, G Klein Legionella: Cost Effective Controls of This Serious Pathogen. Recognizing the contamination risk difference in hot versus cold premise plumbing systems is critically important. Plumbing Engineer magazine June 1, 2021 <https://legionellae.org/plumbing-design/>

4. W Rhoads, T Keane, M. Spencer, A Pruden, M Edwards. Did Municipal Water Distribution System Deficiencies Contribute to a Legionnaires' Disease Outbreak in Quincy, IL? *Environmental Science & Technology Letters* Sept 2020 <https://pubs.acs.org/doi/10.1021/acs.estlett.0c00637>
5. T Keane, W Rhoads. Water Stagnation and Reopening Our Campuses After COVID-19. Association of Physical Plant Administrators (APPA) Facilities Manager magazine. Jul 2020 <https://www1.appa.org/facilitiesmanager/article.cfm?ItemNumber=4400&parentid=2742>
6. C. Proctor, W Rhoads, T Keane, M Salehi, K Hamilton, K Pieper, D Cwiertny, M Prevost, A Whelton. Considerations for Large Building Water Quality after Extended Stagnation. AWWA Water Science Jun 2020
7. T. Keane. Developing a Building Potable Water System Flushing Program May 2020 www.legionellae.org
8. T. Keane. COVID-19 and Legionella – Preparations to consider for Municipal and Building Potable Water Systems. Apr 2020 www.legionellae.org
9. W Rhoads, T Bradley, A Mantha, L Buttlng, T Keane, A Pruden, M Edwards. Residential water heater cleaning and occurrence of Legionella in Flint, MI. *Water Research Journal* Jan 2020
10. T. Keane. Managing a Legionnaires' outbreak. McKnight's Long-Term Care News. April 10, 2019.
11. T. Keane. Quincy Veterans' Home Multi-Year Outbreak A Case Study in Failed US Legionella Policy. April 9, 2019. www.Legionellae.org
12. T. Keane. Whitewash? Quincy Veterans' Legionnaires' disease report by Illinois Auditor ignores Expert reports' findings and recommendations. April 9, 2019. www.Legionellae.org
13. Technical consultant for California Energy Commission Energy Research and Development Division "Distribution System Performance Assessment." 2018
14. T. Keane and D. Bush. CMS requirement for Legionnaires' disease control in LTC. McKnight's Long-Term Care News. October 2, 2017 <https://www.mcknights.com/blogs/guest-columns/cms-requirement-for-legionnaires-disease-control-in-ltc>
15. T Keane. ANSI/ASHRAE standard creates multiple benefits in Legionella prevention. The Domino Effect of ASHRAE 188. *PM Engineer*. Jan 2016. <https://www.pmenginer.com/articles/92279-ansiashrae-standard-creates-multiple-benefits-in-legionella-prevention>
16. T. Keane. Myths & misconceptions - Understanding the true nature of outbreaks associated with building potable water systems. *HPAC*. October 1, 2015 <https://www.hpacmag.com/features/myths-misconceptions/>
17. T. Keane. Legionnaires' Disease: A Changing Tide in the Plumbing Industry. *Viega Voice*. July 2015.

18. W Hansen, JM Bartley, R Case, RL Dooley, T Keane, JR. Layman, B Meins, W Meins, PR Morey, AA Schillinger. Infection Control During Construction Manual: Policies, Procedures, and Strategies for Compliance Third Edition. HCPPro, Inc.; November 21, 2011. https://www.amazon.com/Tim-Keane/e/B00726XFG/ref=dp_byline_cont_pop_book_5
19. MM Williams, TH Chen, T Keane N Toney S Toney, CR. Armbruster, WR Butler, MJ Arduino. Point-of-Use Membrane Filtration and Hyperchlorination to Prevent Patient Exposure to Rapidly Growing Mycobacteria in the Potable Water Supply of a Skilled Nursing Facility, Infection Control and Hospital Epidemiology Sept 2011. <https://www.researchgate.net/publication/51559282>
20. T Keane. Impact of ASHRAE Standard 188 on Legionnaires' Disease. Outbreak Control. HospitalityLawyer.com, Dec 2010.
21. T. Keane. Legionnaires' Disease – Nothing Ironic At All. HospitalityLawyer.com, Jan 2010.
22. T. Keane. Legionnaires' Disease – The Disease of Modern Plumbing Systems and Costly Litigation. Oct 2009. <https://www.armstronginternational.com/sites/default/files/resources/files/legionnairesdisease-timkeane.pdf>
23. R.E. O'Loughlin et al. Restaurant outbreak of Legionnaires' diseases associated with a decorative Fountain: an environmental and case control study. BMC Infectious Diseases, Aug 2007 <https://stacks.cdc.gov/view/cdc/3400/>
24. International Conference on Emerging Infectious Diseases (ICEID). Poster presentation - Outbreak of Legionnaires' disease associated with a decorative fountain in a restaurant. Atlanta, GA, Mar 2006.
25. T Keane. Guidelines for Control of Legionella in Ornamental Water Features. South Dakota Health Department, Dec 2005. <http://europepmc.org/article/PMC/4519350>
https://journals.lww.com/jphmp/Fulltext/2015/09000/Legionellosis_on_the_Rise_A_Review_of_Guidelines.20.aspx
26. 65th Annual International Water Conference. Evaluation of chlorine dioxide in potable water system for Legionella control in an acute care hospital environment. Pittsburgh, PA October 17, 2004.
27. W Hansen, JM Bartley, R Case, RL Dooley, T Keane, P Morey, A Streifel, J Wideman, L Bost, B Meins, S McLaughlin. Infection Control During Construction Manual: Policies, Procedures, and Strategies for Compliance Second Edition. HCPPro, Inc., May, 2004. https://www.amazon.com/Tim-Keane/e/B00726XFG/ref=dp_byline_cont_pop_book_5
28. T Keane. Water Watch - A look at water quality recommendations and requirements. Health Facilities Magazine, Jan 2004.
29. Z Pospichal, T Keane. A Technical Perspective on Controlling Legionella in Building Water Systems. International Hospital Engineering and Facilities Management Dec 2001.

30. T Keane. Legionnaires' Disease --- How Will the New JCAHO EC 1.7 Guidelines Impact Health Care? Booklet published by American Society of Healthcare Engineering (ASHE) as part of Healthcare Facilities Management Series, Oct 2001.

Selected articles based on Tim Keane comments

1. Ed McMEnamin. Unintended consequences and blessings in disguise. Legionella creates opportunity for improvement. PM Engineer. Feb 19, 2019.
2. Ed McMEnamin. Plumbing industry takes harder look at legionella threat Standards and codes work toward the future. PM Engineer. Feb 6, 2019.
3. Kelly M. Pyrek. Preventing Waterborne Pathogen Transmission. Infection Control Today. March 2019.
4. Scott Van Voorhis, Erin Richey, and Richard Korman. The Facts Behind the Fear of Legionnaires' Disease. Scientists link energy-saving water systems to outbreak conditions, but what are the real risks? ENR Engineering News Record. October 30, 2015
5. Caroline McDonald. Taking Control of Legionnaires' Disease. RIMS Risk Management Society. October 1, 2015
6. B. Miodowski. Plumbing design workshops focus on curtailing Legionnaires' disease. PM Engineer. September 30, 2015
7. Evan Sweeney. Hospitals at risk for Waterborne Diseases. Health Leaders Media. August 2, 2010.
8. ICP Report. JCAHO's New Waterborne Pathogen Requirements Take Effect This Year: Is Your Facility Ready. March 2001

INVITED PRESENTATIONS

- ICC – Water Standards for a Resilient Future – Boosting Water Efficiency and Protecting Public Health Panelist Washington, DC Oct 2022
- ECRI – Training seminar title: *Legionella Prevention in Aging Services Organizations* Jun 2022
- American Council for an Energy Efficient Economy (ACEEE) – Hot Water Forum. Presentation title: Plumbing System Design - Legionella, Sustainability & Equity Mar 2022

- Plumbing Manufacturers International – PMI21 Conference. Presentation title: Key Interdependent Building Water System Drivers - Energy Efficiency, Water Conservation, & Control of Opportunistic Premise Plumbing Pathogens (OPPP's). Nov 2021
- Alliance to Prevent Legionnaires' Disease. Turning the Tide on Legionnaires': Tackling the 96%. Presentation title: Impact of Municipal Water Plant Management on Sporadic Legionnaires' disease Cases. Webinar Oct 2021
- Premise Plumbing Modeling Task Committee. Presentation title: Impact of Codes Technology on Legionella Risk and Energy Efficiency in Building Water. Webinar Jan 2021
- Building Water Research Symposium – Purdue University led Symposium for Academic Researchers. Presentation Title: Plumbing 101 for the Academic Researcher Oct 2020
- APIC Pine Tree Chapter. Presentation title: Complying with CMS Mandated Waterborne Pathogen Risk Management. Portland, ME. Sep 2018
- Florida Department of Health Waterborne Pathogen Workshop. Presentation title: Legionellosis Risk Assessment and Water System Management. Orlando, FL. May 2018
- National Academy of Sciences, Engineering & Medicine Committee on Management of Legionella in Water Systems. Presentation title: Successes and failures in cost effective public health policy related to control of *Legionella* in building water systems. Washington, D.C. May 2018
- American Council for an Energy Efficient Economy (ACEEE) Hot Water Forum. Presentation title: Report on ASHRAE Standard 188 and other Recent Regulations Regarding Legionellosis. Portland, OR. Mar 2018
- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). Seminar Water Treatment: Navigating the Changing Landscape of Regulations, Codes and "Best Practices" Around Legionella and Building Water Safety, Presentation Legionella: The Drive for More Effective Codes. Chicago, IL. Jan 2018
- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). Seminar Water Treatment: The Overlooked Aspect of Commissioning Hydronic Systems, Presentation Potable Water and Other Indoor Aerosolizing Systems. Long Beach, CA. Jun 2017
- Joint American Society of Plumbing Engineers (ASPE) and American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE) San Diego Chapter Presentation title: ASHRAE 188, Legionella, & How It Pertains to Industry. San Diego, CA. Jan 2017

- Canadian Institute of Plumbing and Heating (CIPHEX) West Conference. Presentation title: Impact of Plumbing Code and Design on Legionnaire's Disease Outbreaks. Vancouver, BC. Nov 2016
- American Society of Plumbing Engineers (ASPE) Conference. Presentation title: Legionella: Compliance with ASHRAE 188. Phoenix, AZ. Nov 2016
- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). Presentation title: Building Water Systems: Issues and Insights from Outbreaks of Legionnaires' Disease Lessons Learned from Potable Water Outbreak Investigations. St. Louis, MO. Jun 2016
- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). Presentation title: Plumbing System Design Criteria to Minimize the Potential for Legionella Growth - Lessons Learned from Failure Analysis. St. Louis, MO. Jun 2016
- Emory School of Public Health International Conference From Watersheds to Shower Heads: A Workshop on Legionella Research and Policy. Panel title: Approaches for Control and Primary Prevention. Atlanta, GA. May 2016
- International Emerging Technology Symposium. Risk and Mitigation (Panel Discussion) Water Quality, Water Savings and the Water-Energy Nexus Three Issues, One Solution? (Presenter) Rosemont, IL. May 2016
- Canadian Mechanical and Plumbing Exposition (CMPX). Presentation title: Design Strategies to Minimize Microbial Growth in Commercial Plumbing Systems. Toronto, ON Mar 2016
- American Society of Plumbing Engineers (ASPE) Webinar title: Domino Effect of ASHRAE 188 on Waterborne Pathogens, Legionella and Plumbing Systems. Chicago, IL. Feb 2016
- Consulting – Specifying Engineer (CSI) Magazine Webinar title: Pathogen Control by Design. Nov 2015
- American Society of Plumbing Engineers (ASPE) Symposium – Presentation title: U.S. Legionella Guidelines and Their Impact on Plumbing System Design and Operation Legionella. St. Louis, MO. Oct 2015
- International Emerging Technology Symposium: Panelist – Panel Discussion Risk and Mitigation. Arlington, VA. Apr 2014
- American Society of Plumbing Engineers (ASPE) Conference Presentation title: Legionella: Codes, Compliance and the Impact on the Plumbing Community. Chicago, IL. May 2014
- American Council for an Energy Efficient Economy (ACEEE) 2013 Hot Water Forum. Presentation title: Legionella - An engineering system and code problem. Atlanta, GA. Nov 2013
- American Society of Plumbing Engineers (ASPE) Philadelphia Chapter. Product Exposition & Technical Seminars. Presentation title: Unintended

Consequences of Plumbing Codes and Regulations on Increasing Rates of Legionnaire's Disease. Philadelphia, PA. Oct 2013

- Plumbing Manufactures International (PMI) Fall Conference Presentation title: Unintended Consequences of Plumbing Codes and Regulations on Increasing Rates of Legionnaire's Disease. Washington, DC. Oct 2013
- American Water Works Association (AWWA) Water Quality Technology Conference. Presentation title: Case Studies of Legionnaires' Disease Outbreaks Related to Municipal Water Disruptions. Toronto, ON Nov 2012
- Building Owners and Managers Association (BOMA) Legionella Roundtable Education Program for Property Managers, Asset Managers, Engineers, & Facility Manager Members of BOMA Baltimore: Presentation title: Legionella Compliance for Building Owners. Baltimore, MD June 2012
- International Emerging Technology Symposium. Presentation title: Impact of Electronic Faucets & Water Efficiency Guidelines on a Legionnaires' Disease Outbreak in a Healthcare Facility. Washington, DC. May 2012
- Florida Section of American Water Works Association (FSAWWA) Fall Conference Workshop on Legionella. Presentation title: Legionella Issues in Potable Supply and Building Water Systems. Orlando, FL. Nov 2010
- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE) Winter Meeting Technical Program. Presentation title: Best Water Treatment Practices in Commissioning Buildings: What Should Happen Between Installation and Building Occupation. Orlando, FL. Feb 2005
- 73rd Annual Michigan Safety Conference. Presentation title: Protecting Patients, Customers & Employees from Legionnaires' Disease. Lansing, MI. Apr 2003
- Child Health Corporation of America Presentation title: Path to Addressing the Problem of Waterborne Pathogens. Scottsdale, AZ. Apr 2003
- American Society for Healthcare Engineering (ASHE) of the American Hospital Association 39th Annual Conference Presentation title: Selecting a Disinfectant to Control Legionella in Hospital Potable Water Nashville, TN Jul 2002
- American Society for Healthcare Engineering (ASHE) and the American Institute of Architects Academy of Architecture for Health 2002 International Conference and Exhibition on Health Facility Planning, Design, and Construction Presentation title: Strategies to Minimize the Risk of Design & Construction Related Legionnaires' Disease. Orlando, FL Mar 2002

Webinars

- Premise Plumbing Modeling – Hot Water in Premise Plumbing Systems Jan 2021 EWRI-ASCE Premise Plumbing Modeling Committee
<https://www.youtube.com/watch?v=s9aDzbiGI2w>
- COVID-19 A Safe Workplace During Reopening and Operations. May 2020. Sponsor ASA
- Legionella Outbreaks Preparation, Response, Remediation Post COVID-19 Building Water Risks. Jun 2020. Sponsor Nephros.

Seminar Instructor

- Viega Seminar Series - Pathogen Risk Reduction by Design - Design strategies to minimize microbial growth in commercial plumbing systems.
 - 2018 – ASPE Phoenix, AZ (Mar)
 - 2017 – ASPE - Boston, MA (Feb), Los Angeles (Jul), New York (Sep)
 - 2016 –San Francisco, CA (Mar), ASPE Charlotte, NC (May), Boston, MA (Jun), Nashville, TN (Oct)
 - 2015 – Buffalo, NY (Jan), ASPE San Diego, CA (Feb), Miami, FL (Mar), Washington, DC (May), Manchester, NH (May), Chicago, IL (Jun), Houston, TX (Sept), New York, NY (Oct)
 - 2014 – Los Angeles, CA (Mar), San Francisco (Mar), Chicago (May), Seattle (Jun), NYC (Aug), Washington, DC, (Aug) Dallas (Oct)
 - 2013 - Nashua, NH, Wichita, KS (Sept)
- South Dakota Health Department Legionella Seminar Series - Cooling tower / potable water system design, operation and maintenance
 - Pierre, SD 12/6/2005
 - Sioux Falls, SD 12/7/2005
- EICC Seminar Series - Sensible Strategies for Environmental Infection Control in Healthcare Facilities
 - University of Rochester Rochester, NY May 2006
 - Duke University Medical Center Durham, NC Nov 2005
 - Hershey Medical Center Hershey,. Pa Mar 2005
 - Duke University Medical Center Durham, NC Mar 2004
 - Scripps Memorial Hospital LaJolla, CA Feb 2004
 - Texas Children's' Hospital Houston, TX Oct 2003
 - St. Mary's Health System Knoxville, TN Oct 2003

- American Society for Healthcare Engineering (ASHE), faculty member of two-day workshops titled, “Managing the Threat of Infection from Construction and Maintenance Related Activities in the Healthcare Environment”.
 - 2003 - Durham, NC (Feb), Denver, CO (Apr), Woburn, MA (May) Milwaukee, WI (Jun)
 - 2002 – Phoenix, AZ (Apr), Baltimore, MD (May), New Orleans, LA (May), Seattle, WA (Jun), Tampa, FL (Sept), Chicago (Oct), Costa Mesa, CA (Nov)