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Engineering & Scientific Consulting

Erik W. Christiansen, Ph.D., P.E., CFI

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Professional Profile

Dr. Christiansen specializes in fire science, combustion chemistry, fluid mechanics, thermodynamics, and heat transfer. He performs origin and cause investigations of fires and explosions, ranging from small residential fires to large-scale industrial incidents to multi-acre wildland fires. Dr. Christiansen has investigated numerous vehicle related fires, including passenger cars, recreational vehicles, and on- and off-highway trucks, as well as fires in marine vessels such as recreational boats, cruise ships and large shipping vessels. He also investigates thermal related failures of consumer appliances; commercial and residential cooking equipment; and heating, ventilation, air-conditioning, and refrigeration (HVAC&R) systems.

Dr. Christiansen's project experience also includes natural gas and propane appliances and systems, oxygen equipment, welding and hot work activities, industrial ovens, furnaces and boilers, runaway chemical reaction (spontaneous combustion), burn injuries, carbon monoxide (CO) exposure, and fire and building code review. Additionally, he performs engineering analysis of fire protection systems, including the design, testing, and operation of automatic fire sprinkler systems and dry and wet chemical fire suppression systems. Dr. Christiansen has testified as an expert witness in state and federal court on various occasions.

Prior to joining Exponent, Dr. Christiansen was a research assistant in the Combustion and Energy Laboratory at Princeton University where he conducted research on the effects of flame instabilities on extinction and the limits of flammability.

Academic Credentials & Professional Honors

Ph.D., Mechanical and Aerospace Engineering, Princeton University, 2002

B.E., Mechanical Engineering, Cooper Union, 1996

Guggenheim Merit Fellowship, Princeton University, 1996

William C. and Esther Hoffman Beller Prize in Mechanical Engineering, The Cooper Union, 1996

Licenses and Certifications

Certified Fire Investigator (C.F.I.), in accordance with the International Association of Arson Investigators (IAAI), Certificate No. 22-080801

Registered Professional Mechanical Engineer, California, #M32771

Registered Professional Fire Protection Engineer, California, #FP1724

Registered Professional Mechanical Engineer, Nevada, #021098

Registered Professional Mechanical Engineer, Colorado, #45809

Registered Professional Mechanical & Fire Protection Engineer, Idaho, #15956

Certified Forklift Operator

Fire Cause and Origin Investigation Training (1A), California Office of State Fire Marshal

Techniques of Fire Investigation Training (1B), California Office of State Fire Marshal

Wildland Fire Origin and Cause Determination (FI-210), National Wildfire Coordinating Group

FI-210 Bridge/Refresher Course on 2014 updates, National Wildfire Coordinating Group

Advanced Fire/Arson Investigation (Live Burn), California Conference of Arson Investigators

Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) Certification

Industrial Furnaces and Ovens Safety Standards Training, Industrial Heating Equipment Association

Professional Affiliations

[2014 – Present] Principal Member: Technical Committee on Wildland and Rural Fire Protection, NFPA 1141 *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas; and NFPA 1142 Standard for Water Supplies for Suburban and Rural Firefighting;* NFPA 1144 *Standard for Reducing Structure Ignition Hazards from Wildland Fire, National Fire Protection Association*

[2010 – Present] Principal Member: Technical Committee on Industrial and Medical Gases, NFPA 51 *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes;* NFPA 51A *Standard for Acetylene Cylinder Charging Plants;* NFPA 55 *Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks;* and NFPA 560 *Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigation, National Fire Protection Association*

[2004 – 2018] Principal Member: Technical Committee on Ovens and Furnaces, NFPA 86 *Standard for Ovens and Furnaces, National Fire Protection Association*

[2010 – 2018] Principal Member: Technical Committee on Fluid Heaters, NFPA 87 *Recommended Practice for Fluid Heaters, National Fire Protection Association*

National Fire Protection Association (member)

International Association of Wildland Fire (member)

Publications

Simeoni A, Owens ZC, Christiansen EW, Kemal A, Gallagher M, Clark KL, Skowronski N, Mueller EV, Thomas JC, Santamaria S, Hadden RM. A preliminary study of wildland fire pattern indicator reliability following an experimental fire. Journal of Fire Sciences 2017; 35:359-378.

Jokar A, Christiansen EW, Reza A. Refrigeration systems failures due to sudden evaporation and condensation phenomena. Proceedings, ASHRAE Annual Conference, art. no. SE-14-C015, Seattle, WA, 2014.

Reza A, Christiansen EW. A case study of an ethylene oxide explosion in a sterilization facility. Chemical Engineering Transactions, 31, 463-468 DOI: 10.33303/CET1331078. Also in Proceedings of the 14th EFCE Symposium on Loss Prevention and Safety Promotion in the Process Industries, Florence, Italy, May 2013.

Martin RJ, Christiansen EW. New explosion relief standards impact coating equipment. Metal Finishing; 2007; 105:77-81. July.

Christiansen EW, Reza A. Case study of a TFE explosion in a PTFE manufacturing facility. Process Safety Progress 2007; 26(1):77-82, March.

Christiansen EW, Tse SD, Law CK. A computational study of oscillatory extinction of spherical diffusion flames. Combustion and Flame 2003; 134:327-337.

Christiansen EW, Law CK. Pulsating instability and extinction of stretched premixed flames. Proceedings, Combustion Institute, 2003; 29:61-68.

Yoo SW, Christiansen EW, Law CK. Oscillatory extinction of spherical diffusion flames: micro-buoyancy experiment and computation. Proceedings, Combustion Institute, 2003; 29:29-36.

Christiansen EW, Sung CJ, Law CK. The role of pulsating instability and global Lewis number on the flammability limit of lean heptane/air flames. Proceedings, Combustion Institute 2001; 28:807-814.

Christiansen EW, Law CK, Sung CJ. Steady and pulsating propagation and extinction of rich hydrogen/air flames at elevated pressures. Combustion and Flame, 2001; 124: 35-49.

Christiansen EW, Sung CJ, Law CK. Pulsating instability in near-limit propagation of rich hydrogen/air flames. Proceedings, Combustion Institute, 1999, 27:555-562.

Presentations

Christiansen EW, Xiouris, C, Zelhofer, AJ, Cymbalist, N. The Effect of Fuel Moisture on the Ignition of Forest Fuels by Molten Copper and Aluminum Droplets. Sixth International Fire Behavior and Fuels Conference, Sydney, Australia, May 2019.

Christiansen EW, Karnesky J. Understanding Ignition: How One Spark Can Burn an Entire Forest. The Fire Continuum Conference: Preparing for the Future of Wildland Fire, Missoula, MT, May 2018.

Karnesky J, Christiansen EW. Ignition of wildland fuels by hot metal particles and droplets. 15th International Conference, Fire and Materials, San Francisco, CA, February 2017.

Simeoni A, Owens ZC, Christiansen EW, Kemal A, Gallagher M, Clark KL, Skowronski N, Mueller EV, Thomas JC, Santamaria S, Hadden RM. A study of wildland fire direction indicator reliability following two experimental fires, International Symposium on Fire Investigation Science & Technology, Scottsdale, AZ, September, 2016.

Christiansen EW. How to Safely Process a Fire Scene. IEEE Symposium on Product Compliance Engineering, Anaheim, CA May 2016.

Christiansen EW. What makes a competent ignition source? Experimental techniques for answering the fundamental question. 8th Annual Wildland Fire Litigation Conference, Monterey, CA, April 2014.

Reza A, Christiansen EW. A case study of an ethylene oxide explosion in a sterilization facility. 14th EFCE Symposium on Loss Prevention and Safety Promotion in the Process Industries, Florence, Italy, May 2013.

Christiansen EW. Transformer fires and explosions. 7th Annual Wildland Fire Litigation Conference, Monterey, CA, April 2013.

Christiansen EW. Scientific methods for fire investigations. Guest Lecture for AA252: Techniques of Failure Analysis, Stanford University, April 2013 & 2014.

Christiansen EW. Investigation of an explosion in a polymer manufacturing plant. Guest Lecture for Ae150: Aerospace Engineering Seminar, California Institute of Technology, March 2013.

Jokar A, Christiansen EW. Condensation induced shock in thermal/fluid systems. ASME Heat Transfer/Fluids Engineering Summer Conference, HT2012:58117, Puerto Rico, USA, July 2012.

Christiansen EW, Carnahan R, Reza A, Qin W, Ross B. A case study of two shiploader fires in a coal and pet coke facility. 11th International Conference, Fire and Materials, San Francisco, CA, January 2007.

Christiansen EW, Reza A. A case study of a TFE explosion in a PTFE manufacturing facility. Proceedings, 40th Annual Loss Prevention Symposium, American Institute of Chemical Engineers, April 2006.

Christiansen EW, Reza A. Chemical analysis of fire debris. 2004 Summer Meeting of the California Conference of Arson Investigators, Seaside, CA, July 26-28, 2004.

Christiansen EW, Tse SD, Law CK. A computational study on oscillatory extinction of spherical diffusion flames. 39th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2001.

Christiansen EW, Sung CJ, Law CK. Pulsating propagation and extinction of rich hydrogen/air flames at elevated pressures. 37th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 1999.

Christiansen EW, Sung CJ, Sun CJ, Law CK. Pulsating instability and flammability limits of one-dimensional planar flames with one-step chemistry and constant properties. Technical Meeting of the Eastern States Section of the Combustion Institute, Hartford, CT, October, 1997.