

Larry W. Anderson, Ph.D., P.E.
Principal Engineer

Professional Profile

Dr. Larry Anderson is a Principal Engineer with professional expertise in Thermal Sciences and related Mechanical Engineering fields. He specializes in the areas of fire and explosion investigation, fluid mechanics, fire cause and origin, mechanical engineering analysis including characterizing gas or liquid flows, fuel handling and distribution equipment, and analysis of electrical and chemical energy sources. Dr. Anderson's expertise also includes failure investigations of heating, cooling and refrigeration equipment in residential, commercial, industrial and transportation sectors, as well as accident reconstruction and hazard investigation of equipment operation. His investigations have included items ranging from household appliances and equipment (toasters, stoves, ovens, dishwashers, coffeemakers, furnaces, water heaters, garage door openers), to much larger systems (boiler/steam turbine systems, industrial air conditioning and refrigeration systems, chemical process equipment, pneumatic conveyors, semi-conductor industry processes, solar and wind energy systems, and pipeline accidents).

Dr. Anderson has served as a Group Vice President and a Corporate Vice President at Exponent. Prior to joining Exponent, Dr. Anderson was the President, Chief Operating Officer, and a member of the Board of Directors of Sigma Research, Inc. He has also served as President and Chief Executive Officer of Gas Energy Corporation.

Academic Credentials and Professional Honors

Ph.D., Mechanical Engineering, University of Washington, 1966
M.S., Mechanical Engineering, University of Washington, 1964
B.S., Mechanical Engineering, University of Washington (*magna cum laude*), 1961

Licenses and Certifications

Registered Professional Mechanical Engineer, California, #M029247
Registered Professional Engineer, Michigan, #6201055787

Hazardous Waste Operations and Emergency Response Training, 29 CFR 1910.120; Fire Investigation Training (1A—Cause and Origin, 1B—Techniques of Fire Investigation) State of California, Office of State Fire Marshal; Certified Fire Investigator (CFI), International Association of Arson Investigators, Inc.

National Defense Education Act, Title IV Fellow

Publications

“Process Equipment Selection and Risky Operation: The Consequences of Not Asking: ‘What If ?’ Proceedings, 3rd Latin American Congress on Process Safety, Buenos Aires, Argentina. August 8 – 10, 2011. Center for Chemical Process Safety (with C. Barrera).

“What is an Explosion? A Case History of an Investigation for the Insurance Industry,” Journal of Loss Prevention in the Process Industries, Vol. 13, pp. 491–497, 2000 (with R.J. Martin and A. Reza).

“Marina Point Condominium Complex Fire,” Blue Ribbon Committee Report to Foster City City Council, Foster City, CA, February 27, 1996 (with J. McMullen, M. McDougall, and F. Kelly).

“An Examination of the 1977 Model Year FMVSS 301 Effect on Subcompact Car Rear-Impact Fire Risk,” American Society of Mechanical Engineers Winter Annual Meeting, New Orleans, LA, December 1993 (with R.L. McCarthy and A.C. Donelson).

“Risk Analysis of Home Appliances Fires,” American Society of Mechanical Engineers, Atlanta, GA, December 1991 (with R.M. Ray, J. Padmanaban, and R.L. McCarthy).

“Time-Dependent Boundary Layers with Application to Gun Barrel Heat Transfer,” Proceedings, 1972 Heat Transfer and Fluid Mechanics Institute, Stanford University Press, 1972 (with E.P. Bartlett and R.M. Kendall).

“An Evaluation of Ablation Mechanisms for the Apollo Heat Shield Material,” Journal of Spacecraft and Rockets, Vol. 8, No. 5, May 1971 (with E.P. Bartlett).

“Nonsimilar Solution of the Incompressible Turbulent Boundary Layer,” Proceedings, Computation of Turbulent Boundary Layers - 1968 AFOSR-IFP - Stanford Conference, Stanford University, August 1968 (with R.M. Kendall).

Presentations

“Wildland Fires and Utility Installations,” California Public Utilities Commission R.08-11-005, Consumer Protection and Safety Division Workshop, San Francisco, CA, February 17, 2009.

“Computer Modeling of Fires—What Can and Cannot Be Done,” Minnesota State Bar Association, Continuing Legal Education, Effectively Handling Fire Litigation, Minneapolis, MN, May 7, 2007.

“Engineering Detectives: Uncovering the Causes of Catastrophe,” 2005 Engineering Lecture Series – Engineering the Unexpected, University of Washington, College of Engineering, Seattle, Washington, November 8, 2005.

“Stapper v. Overhead Door,” Defense Research Institute, Products Liability Conference, Fire and Property Damage Specialized Litigation Group, Las Vegas, NV, February 21, 2001 (with W. George).

“Demonstrative Evidence: Full Scale Fire Testing,” Defense Research Institute Seminar, New Orleans, LA, February 5, 1998.

“Indoor Air Quality and Chemical Exposure,” 24th Annual Seminar, Executive Council of Homeowners’ Associations, Santa Clara, CA, October 12, 1996.

“Reducing Product Liability Risks in Product Design and Manufacturing,” GAMA Product Liability Seminar, Dallas, TX, February 20–21, 1996 (with R. McCarthy).

“The Use of Computer Animation in the Courtroom,” Invited Lecture, American College of Construction Lawyers, Palm Springs, CA, February 19, 1993.

“Coal and Synthetic Fuels from Coal,” Invited Lecture, Stanford University, 1982–1986.

Project Experience

Residential, Commercial, and Institutional Fires and Explosions

Christmas Lights—House fire involving Christmas tree and lights. Serious burn injuries to two small children. Inspected remains of tree and lights, identified modifications to light string. Deposition testimony.

Dormitory—Modeled fire in five-story mixed-use building under construction (55% complete). Fire destroyed most of the upper four floors, intended to be a college dormitory. Fire began in trash chute and dumpster outside building used by construction workers. Issue was whether non-combustible exterior wall construction would have affected the outcome. Prepared detailed computer model of fire in as-built building, and in hypothetical building having non-combustible exterior walls. Showed no substantial difference in fire spread, as trash chute fire immediately spread into wood-framed, unprotected interior of building without substantial involvement of exterior wall. Deposition testimony, case settled.

Electrical Cabinet—High-rise building, fire in electrical cabinet and room at below grade parking level. Assessed fire damage, probable cause of fire in cabinet, and prepared opinions on whether the damage in cabinet was caused by an arc alone, or by burning of insulation and plastic components. Prepared report and gave deposition. Settled before trial.

Evaporative Cooler—Investigated fire involving evaporative cooler on roof of home, spread to fully involve the residence resulting in one fatality. Examined remains of cooler and ductwork, determine origin of fire and cause. Performed test program to demonstrate cooler burning and spread of fire on rooftop. Deposition and trial testimony.

Fire Department Response—Evaluated progress of fire in condominium complex and fire department response time for city officials interested in performance of their recently consolidated fire department. Examined performance of emergency dispatch, travel time for responding units, probable size of fire upon their arrival, fire suppression actions. Presented results to City Council.

Fire Hydrant—Residential fire killed seven occupants trapped in two bedrooms of single story wood structure in Honolulu. Determined origin of fire, timeline of events, response time of fire department, role of broken fire hydrant serving the neighborhood, and likelihood of survival if suppression actions had been more timely. Deposition testimony.

Furnace—Furnace overheated air supplied to residence, allegedly causing death of occupant. Examined wiring of furnace, likelihood of overheating in the time frame of the accident, temperatures which could be reached in residence, wiring combinations that could lead to runaway furnace. Prepared report and gave deposition. Case settled.

Garage Door Opener—House fire in San Francisco, firefighters injured, one firefighter fatality when trapped in residence garage. Determined probable cause of garage door closing behind them and not opening when it struck the fire hose leading into garage. Inspected driveway slopes, garage door hardware remains, built and tested a mockup garage door. Deposition and trial testimony.

Gas Explosion—Investigated gas explosion at single family residence with 5 occupants; structure destroyed in ensuing fire, one fatality. Examined possibility of gas leaking into residence through sewer lines from gas leak across the street. Established from soils and sewer line study that gas could not migrate through clay, into sewer lines, through correctly operating traps, into home. Other fuel sources in home included very large propane bottles stored in basement. Testified in deposition, case settled.

Gas Explosion—Mobile home explosion caused by migrating gas beneath the home. Inspected site of explosion, excavated gas and electrical lines, other related evidence. Concluded that trenching associated with installation of new gas line to mobile home had damaged adjacent electrical conductors. At later date, electrical arcing occurred in immediate vicinity of plastic gas line, breaching the line and allowing gas leak. Deposition testimony, case settled.

Neon Sign—Evaluated claim that neon sign installation had caused fire at commercial building. Examined insulators, pass-throughs, other features of high voltage wiring, compared to code requirements.

Restaurant Fire – Cooking hood fire extended to exhaust blower, ductwork and attic area above restaurant, resulting in major structure fire. Inspection revealed improper ducting of smoke and vapors from hood to atmosphere, and improper cleaning of ductwork, resulting in grease accumulation in ductwork and attic. Wrote inspection report, case settled.

Trash Can—Investigated fire at condominium building in San Francisco. Ashes from apartment fireplace synthetic log fire had been placed in plastic trash receptacle in light well area outside

the building two days before fire, allegedly resulting in a fire that heavily damaged two buildings. Ran experiments in exemplar fireplaces with synthetic logs, established time frame for ashes to completely cool. Testified that for the reported time frame, ashes could not have started this fire. Case settled.

Industrial Plant and Equipment

Ammonia Refrigeration—Ammonia refrigeration plant explosion when valve failed in ammonia system. Investigated valve and cause of valve failure, amount of ammonia, which leaked, likelihood of reaching lower explosive limit with and without proper operation of emergency ventilation system. Produced reports, testified in deposition.

Chemical Plant—Plant fire in facility storing Crude Sulfate Turpentine without proper safeguards for tanks: Extensive modeling of tank performance, investigation of flame arresters, and review of NFPA requirements.

Co-Generation—Gas-fired cogeneration plant in hospital complex: evaluated internal combustion engine performance, waste heat generation from engines and steam demand of hospital. Also estimated possible uses for low pressure steam including installed absorption chiller system, cooling tower loads resulting from addition of the cogeneration plant, oil carryover into engines. Deposition testimony.

Concrete Sealer—Industrial concrete sealing compound in 55-gallon drum exploded when drum struck by power saw, resulting in fatal injuries to saw operator. Reviewed photos, testimony, and characteristics of solvent (ethanol). Concluded drum was struck by accident, sparks from saw ignited vapor in headspace. Deposition testimony.

Flame Cutting—San Francisco Opera House fire during earthquake renovation: Determined whether plywood protection placed over seating area could be used as fire barrier for flame cutting operations. Deposition testimony.

Fryer—Investigated fire at industrial complex where chickens were prepared, cooked, and packaged. Determined that fryer safety features had been modified, which led to exposed heating elements in presence of cooking oil.

Gas Pressure Regulator—Winery fire with major property damage and loss of stored wine. Small fire in janitor closet damaged gas regulator installed there, leading to major gas release vented to closet. Natural gas-fed fire moved upstairs through flue pipe chase, and spread to wine cases in cooled storage. Determined origin of fire, failure mechanism of regulator, amount of gas release, and role of regulator vent plumbing. Testified in deposition and trial.

Hospital—Fire in hospital operating room involving patient. Identified role of simultaneous use of administered medical oxygen, alcohol-based prep compound, and electrocautery instrument. Deposition testimony.

Pneumatic Conveyor—Pneumatic conveyor fatal accident: System plugged up and pressurized, worker attempting to remove inspection door, pressure blew door off striking him. Inspected equipment at site, identified mechanism for equipment failure, and code requirements for this type of equipment. Deposition and trial testimony.

Power Plant—Explosive de-slagging accident at wood-fired boiler and steam turbine plant in California. Ash and unburned fuel exited from cyclone during de-slagging activity, ignited, and burned bystanders. Inspected cyclones, testified in deposition on proper safeguards to be used during explosives use, control of onlookers, and other requirements of blaster and blasting company while in this plant. Deposition testimony.

Power Plant—Wood-chip fired steam power plant and steam turbine generator in Southern California. Evaluated fuel preparation and handling including conveyor system, effects of contaminants in fuel on furnace/boiler operation, evaluate water treatment operations, boiler controls. Deposition and trial testimony.

Power Plant—Boiler steam tube explosion investigation. Computer model of entire water circulation system created, examined level control, likelihood of steam bubble trapped in tubes during power blackout and boiler restart. Deposition testimony.

Pressure Washer—Inspected remains of fire-involved pressure washer including diesel and gasoline tanks, used in recycling facility. Tested exemplar pressure washer, examined code requirements for machines of this type. Identified failure mode for pressure washer that led to large fire at machine, and identified shortcomings of the accident machine vis-à-vis code requirements. Deposition testimony.

Refrigeration—Refrigeration compressor explosion: Analysis of freon additives, effect on freon cycle, likelihood of explosion from additive. Performed testing work to demonstrate performance of refrigeration system with and without additive, compression heating analysis and demonstration.

Ship Fire—Fatal fire aboard a fish-processing vessel in Alaska, allegedly started by heating cable in refrigerated hold. Inspected ship in detail, recovered over 50 pieces of evidence, examined accident photos from accident scene, developed opinion on origin and cause of fire. Deposition and trial testimony.

Power Lines and Communication Facility Lines – Examined the incremental wildland fire risk associated with collocating aerial communications facilities with electric power aerial facilities on jointly-owned wood poles in wildland areas in California. Reviewed related literature and databases for wildland fires and their causes, performed formal hazard analysis on collocated facilities, reviewed proposed new rules for Power Utilities and for Communications Infrastructure Providers, prepared report for client to be given to California Public Utilities Commission.

Carbon Monoxide Accidents

Boiler—CO poisoning fatality in hotel, involving modified boiler: Testing program on accident boiler and damaged exhaust ducting allowing migration of exhaust fumes into guest rooms. Tracer gas testing at hotel demonstrated pathway for combustion gases. Deposition testimony.

Combustion Equipment—CO poisoning fatalities in private residence. Mechanical room contained four combustion appliances with no ventilation or combustion air openings. One furnace had no return air duct attached, allowing blower to pull exhaust fumes from draft hood of another appliance into air being circulated in home. Inspection with air flow and pressure measurements under various equipment operating conditions, prepared report for client. Case settled.

Furnace—Alleged carbon monoxide accident in residence. Cracked heat exchanger in heating system. Inspected premises, heat exchanger, and entire heating system. Blower assist to move combustion products out flue. Identified pressures in system, likelihood of combustion products leaking into residence.

Pool Heater – CO fatality at private residence involving swimming pool heater equipment. Testing program including tracer gas and flow visualization identified major problem with venting system for heaters, allowing exhaust fumes to enter residence. Case settled.

Product Design Issues

Camping Heater—Propane fueled camping heater carbon monoxide incident with fatalities: Test heaters, detailed experimental characterizing of heater element and why it produced CO, build alternate design heater element. Deposition and trial testimony.

Degreaser—Explore alleged design defect in atmospheric pressure, multi-tank trichlorethylene degreaser system for cleaning brass parts. Inspected the tank, float switches and normally submerged heating elements. Establish failure mode of system, adequacy of controls, adequacy of operator responses to alert signals on control system.

Fabric—Flammability of child's bicycle shorts: Tests with material and flammable mixture environment, demonstration of likelihood of ignition of shorts in propane explosion.

Furnace—Furnace design issues: Examined housing tract where alleged fire-involved furnaces were installed. Inspect furnaces and conduct research program to examine failure modes of furnaces involved in fires, considering installation issues vs. design of burner tube issues. Examine role of NOx reduction design component (NOx rods) in the life expectancy and failure mode of furnace. Testified in deposition regarding likelihood that these furnaces were damaging wood construction and starting fires.

Hot Tub—Scalding death of child in hot tub: Inspect installation and thermostat control. Determined role of kinetic heating of tub water, found that tub could heat to unacceptable level even with the burner off.

Oxygen Regulator—Oxygen regulators used in emergency medical response application on portable oxygen bottles. Investigate cause of explosion and fire resulting from normal use of regulator, and role of very high purity oxygen in this type of accident. Regulators had aluminum bodies with sintered bronze filters at inlet. Deposition testimony.

Transportation

Motor Home—Motor home fire while vehicle was parked. Examined for cause and origin, identified center of dashboard as most likely origin. Battery disconnect switch located near right side entrance was not involved.

Service Station—Alleged electrostatic discharge at fuel dispenser, or in pickup truck, caused fire with spilled gasoline. Tested electrical grounding of nozzle, dispenser, truck and discharge of gas can on ground. Prepared opinions, case settled just before deposition.

Service Station—Alleged electrostatic discharge while victim filling portable welder gasoline tank permanently installed in back of truck. Tested hose/dispenser electrical grounding paths, truck grounding paths. Case settled.

Wildland Fire—Wildland fire on ranch, spreading to Los Padres National Forest land. Determine if fire caused by sparks from skip-loader exhaust, by smoking materials, or by spark from metal-rock contact. Deposition and trial testimony.

Health/Environmental Issues

Indoor Air—Indoor air quality issue at shopping center: Several inspections, air quality measurements, lab analysis of air samples and roofing materials, and detailed report on cause of odor problems.

Indoor Air—Indoor air quality problem alleged at private residence after floor refinishing. Extensive air sampling and inspection of premises. Prepared exemplar test floor in moderately-ventilated room similar to accident residence, showed rate of decline in levels of formaldehyde and other chemicals with time. Also showed level of same chemicals in plaintiff's workplace. Deposition testimony.

Solid Waste—1950's disposal of waste tape at dump site by burning. Conducted full scale test burns, determined nature of ash, and compared to waste material found in 1990's near dump site. Arbitration testimony.

Water Intrusion—Water intrusion problems in fleet of modular office-space structures. Inspected at several locations, prepared recommendations on how construction, transport, and installation could be improved to avoid water problems.

Professional Affiliations

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (member)
- American Society of Mechanical Engineers (member)
- National Fire Protection Association (member)
- Society of Fire Protection Engineers (member)
- International Association of Arson Investigators (member)
- Tau Beta Pi National Engineering Honorary (member)