

# Amy E. Gray

PhD, PE, CFEI

Principal, Vice President, Thermal



Dr. Gray is a Principal and a Director in the Fire and Explosions Technical Group with Engineering Systems Inc. (ESi). She is experienced in mechanical engineering and failure analysis, with specialization in fire and explosion origin and cause, thermal-fluid analysis, mechanical systems, and product analysis. Her expertise includes mechanical product failure, gas explosions, dust explosions, tank and boiler ruptures, natural gas pipeline and utility incidents, gas appliances, aviation fire analysis, and chemical and industrial thermal incidents. Dr. Gray has employed blast dynamics, dispersion, and fire dynamics analyses in many of these investigations, as well as performed numerous on-site and laboratory investigations. Additionally, Dr. Gray has expertise in Computational Fluid Dynamics (CFD), Dust Hazard Analysis (DHA), Process Hazard Analysis (PHA) and Computed Tomography (CT) data analysis. She has been involved in US court cases and international arbitration.

Prior to joining ESI, she gained experience in the design and implementation of aircraft cooling systems. Her graduate research related to the gas transport and internal-reforming chemistry of alternative fuels within various solid oxide fuel cell anode support materials. She designed, built, and optimized a unique experimental reactor, a protocol utilizing both mass spectrometry (MS) and gas chromatography (GC), and a computational fluid dynamics model including gas-phase and catalytic reactions for the analysis of fuel cell anodes. Dr. Gray also has experience with ceramics processing, material microstructure characterization, and in the dispersion and measurement of aerosols.

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## Education

Ph.D., Mechanical Engineering, Chemical Engineering Minor,  
Colorado School of Mines, 2012

M.S., Mechanical Engineering, Colorado School of Mines, 2010

B.S., Mechanical Engineering, Texas A & M University, 2006

## Contact Information

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## ESi Miami

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## Areas of Specialization

- Fire and Explosion
- Fire Dynamics
- Computational Fluid Dynamics (CFD)
- Gas Dispersion Analysis
- Explosion Blast Effects
- Thermal-Fluid Sciences and Heat Transfer
- Chemical and Manufacturing Processes
- Industrial and Process Safety
- Aviation
- Computed Tomography (CT)
- Gas Chemical Analysis
- Dust and Process Hazard Analysis
- Consumer Product Analysis

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## Licenses & Certifications

- State of Florida P.E. License No. 84063
- State of Louisiana P.E. License No. 43069
- State of North Carolina P.E. License No. 044997
- State of South Carolina P.E. License No. 34957
- State of Texas P.E. License No. 118830
- State of Arkansas P.E. License No. 19420
- NCEES Record P.E. ID No. 15-278-12

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## Positions Held

### Engineering Systems Inc., Miami, Florida

- Principal, 2023 – Present
- Vice President, Thermal, July 2025 - Present
- Director, Thermal/Fire & Explosion, July 2022 – July 2025
- Senior Managing Consultant, 2020 - 2022
- Senior Consultant, April 2019 - 2020
- Manager of Miami Operations, April 2019 – July 2022

### Engineering Systems Inc., Charlotte, North Carolina

- Senior Consultant, 2017 – April 2019
- Manager of North Carolina Operations, 2018 - April 2019

### Engineering Systems Inc., Dallas, Texas

- Senior Consultant, 2017
- Senior Staff Consultant, 2015 - 2016
- Staff Consultant, 2013 - 2015

### L-3 Communications, Greenville, Texas

- Mechanical Systems Engineer, 2012 - 2013

### Colorado School of Mines, Golden, Colorado

- Research Assistant, 2008 - 2012
- Teaching Assistant, 2007 – 2008

## **Sandia National Laboratories, Albuquerque, New Mexico**

- Student Intern, Summers 2004 - 2005
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## **Continuing Education**

- **Marine Fire Investigation Course** – IAAI, 2024
  - **CFITrainer.net, Various Courses**
  - **Process Hazard Analysis (PHA) and Dust Hazard Analysis (DHA) Leader Training** – ioMosaic, 2017
  - **US DHS Toxic Inhalation Hazard Chlorine Release Modeling Test (by invitation)** – Dugway Proving Grounds, 2015
  - **Advanced Fire, Arson, and Explosion Training Program** – National Association of Fire Investigators, 2014
  - **Computer Fire Modeling** – National Association of Fire Investigators, 2014
  - **Hazardous Waste Operations and Emergency Response (OSHA HAZWOPER) 40-Hr Certification** – Houston Area Safety Council, 2014
  - **Fire Dynamics Simulator** – Seneca College School of Fire Protection, 2014
  - **Phast Software Training Course** – Det Norske Veritas, 2013
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## **Professional Affiliations/Honors**

### **American Society of Mechanical Engineers (ASME)**

### **American Institute of Chemical Engineers (AIChE)**

- Contributing Member, AIChE Division of Safety and Health, 2016-2018
- Committee Secretary, AIChE Global Congress on Process Safety Loss Prevention Symposium, 2020 - Present

### **International Association of Arson Investigators (IAAI)**

### **National Association of Fire Investigators (NAFI)**

### **National Fire Protection Association (NFPA)**

- Committee Member, NFPA 715 Fuel Gases Warning Equipment, 2022 - Present

### **Society of Fire Protection Engineers (SFPE)**

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## Project Experience

### Selected Project Experience

#### Consumer Product – Gas Absorption Refrigerators

Various fires occurred in which gas absorption refrigerator leaks were alleged to have been the cause. Testing was conducted to determine the propensity of these refrigerators to result in a fire in the manner alleged. Tests involving fire spread and gas dispersion (ammonia and natural gas) were conducted during the course of the analysis

#### Consumer Product – Gas Grill Fires

Multiple Projects involving personal injury and/or property damage as a result of consumer gas grill use. Analysis involved in determining the causes of these incidents included component failure and material analysis, CT scanning, gas dispersion (i.e., the timing of gas buildup in a compartment), and testing of grill components.

#### Gas Migration and Dispersion – Natural Gas Leak and Fire

A fatality occurred as a result of an explosion caused by a natural gas leak. Analysis was conducted to determine the circumstances under which a flammable mixture could have been present, and ignition could have occurred. It was concluded that ignition would have only been possible in a small area and within a small window of time.

#### Aviation – Post-Crash Fire

A small general aviation plane experienced a fire after impact. The level of fuel in the tanks came into question during the post-crash investigation. Fire and fuel spread analysis was used to determine the relative level of fuel in each of the wing tanks.

#### Chemical Manufacturing Industry – Chemical Explosion

An explosion occurred during the batch manufacturing of a chemical. A blast damage analysis to the facility and surrounding area was conducted to approximate the energy needed to result in the observed damages. This analysis was combined with an inventory of available substances, employee interviews about activities at the time, and chemical testing to determine the cause of the explosion.

#### Petrochemical Industry – Vessel Rupture and Explosion

An explosion involving a pressure vessel occurred at a petrochemical plant. A full on-site investigation and subsequent laboratory inspection was conducted alongside the Chemical Safety Board (CSB) to determine the origin and cause of the incident. Metallurgical analysis revealed that the involved vessel ruptured at its weakest point, but above a pressure level that it was designed to sustain. Analysis of electronic plant data, interviews with operators, and plant conditions revealed that the sudden overpressure of the vessel occurred as a confluence of unforeseen circumstances.

### Petrochemical Industry – Construction Defect Arbitration

Led multidisciplinary team in supporting an international arbitration dispute involving corrosion of piping that occurred during the construction phase of a petrochemical facility, resulting in a delay of startup. A database of key construction activities and the noted corrosion locations of involved piping was built from a voluminous amount of documentation. Analysis of the flushing, draining, and drying procedures was utilized to determine the cause of the corrosion. Computational Fluid Dynamics (CFD) was among the analysis tools employed. A 3D map of the damage in the piping was developed to assist with analysis and as a presentation tool. This project involved coordination among experts across several different countries.

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### Publications

“Computational fluid dynamics model of gravity-induced slurry flow,” W.R. Broz, S. Chialvo, S.K. Das, **A. Gray**, Proceedings of the 2024 ASME Pressure Vessels and Piping Conference, ASME International, November 2024.

“Hit the Ground Running (Safely): Process Safety for the Early Career Engineer,” D. Connolley, J. Forest, **A. Gray**, 13th Global Congress on Process Safety Conference Proceedings, American Institute of Chemical Engineers, March 2017.

“Stratification During Vapor of Gas Freeing of Storage Tanks,” M. Hanks, **A. Gray**, R. Pape, 13th Global Congress on Process Safety Conference Proceedings, American Institute of Chemical Engineers, March 2017.

“Apparent Discrepancies in Methods for Predicting the Explosion Energies and Blast Effects of BLEVES,” R. Pape, **A. Richards**, M. Hanks, 12th Global Congress on Process Safety Conference Proceedings, American Institute of Chemical Engineers, April 2016.

“The New State of the Art in Evidence Preservation and Interrogation,” J. Jordan and **A. Richards**, For the Defense, November 2013: 64-68.

“The interdependence of macro- and microstructure on internal- reforming performance in Ni-YSZ SOFC anode supports,” **A.E. Richards** and N.P. Sullivan, Fuel Cells: From Fundamentals to System, 13.4 (2013): 470-475.

“Gas Transport and Internal Chemistry of Solid Oxide Fuel Cell Anode Supports Operating on Alternative Fuels,” **A.E. Richards**, Ph.D. Dissertation, Colorado School of Mines, May 2012.

“Biogas fuel reforming for solid oxide fuel cells,” D.M. Murphy, **A.E. Richards**, A. Colclasure, W. A. Rosensteel, and N.P. Sullivan, Journal of Renewable and Sustainable Energy 4.2 (2012): 023106.

“Gas transport and internal-reforming chemistry in Ni-YSZ and ferritic-steel supports for solid-oxide fuel cells,” **A.E. Richards**, M.G. McNeeley, R.J. Kee, and N.P. Sullivan, Journal of Power Sources, 196.23 (2011): 10010-10018.

“A Unique Experimental Tool for the Evaluation of Gas Transport and Internal- Reforming Chemistry within Solid Oxide Fuel Cell Anodes,” **A.E. Richards**, M.S. Thesis, Colorado School of Mines, May 2010.

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## Presentations

“Explosions and Pressure Vessel Ruptures: An Overview with Claims and Litigation Considerations,”  
**A.E. Gray**, presented to various legal and insurance audiences.

“The Rainham Chemical Works Explosion: A 100th Anniversary Perspective,” M.C.K. Sellers, **A.E. Richards**,  
Materials Science & Technology 2016, Salt Lake City, Utah, October 2016.

“Emerging Technologies for Handling Complex Evidence,” M.E. Stevenson, **A.E. Richards**, Trial Attorneys of  
America Meeting, Invited Speaker, Chicago, Illinois, June 2016.

“Technologies in Incident Investigation,” **A.E. Richards**, The Chlorine Institute Health, Environment, Safety  
and Security Seminar, Invited Speaker, Dallas, Texas, April 2016.

“Computed Tomography X-Ray Imaging – a Technique for Non-Destructive Examination of Plastic Products,”  
A.R. Shah, J.G. Jordan, **A.E. Richards**, 2015 SPE ANTEC® Conference, March 2015.

“Discrepancies in Methods for Predicting the Explosion Energy of BLEVEs,” R. Pape, **A.E. Richards**,  
M. Hanks, AIChE Midwest Regional Conference, Chicago, IL March 2015.

“Uses and Capabilities of Computed Tomography in Forensic Engineering and Science,” **A.E. Richards**,  
J.G. Jordan, Materials Science and Technology (MS&T) 2014 Conference, Pittsburgh, PA October 2014.

“Gas transport and internal reforming chemistry in SOFC anode supports and structures,” **A.E. Richards**,  
N.P. Sullivan, R.J. Kee, M. McNeeley, and S. Babiniec, 219th Meeting of the Electrochemical Society (SOFC  
XII), Montreal, Canada, May 1-6, 2011.

“Development, fabrication, and testing of perovskite-based anodes for tubular solid oxide fuel cells,”  
S. Babiniec, **A.E. Richards**, N. Faino, and N.P. Sullivan, 219th Meeting of the Electrochemical Society  
(SOFC XII), Montreal, Canada, May 1-6, 2011.

“Biogas fuel reforming for solid oxide fuel cells,” D.M. Murphy, **A.E. Richards**, A. Colclasure, W. Rosensteel,  
and N.P. Sullivan, 219th Meeting of the Electrochemical Society (SOFC XII), Montreal, Canada, May 1-6,  
2011.

“Internal reforming chemistry in novel SOFC anodes and architectures,” **A.E. Richards**, N.P. Sullivan,  
R.J. Kee, and H. Zhu, European Fuel Cell Forum, Lucerne, Switzerland, June 28-July 2, 2010.