



J. ROBERT McGRAW, Jr., P.E., NC-CFI, IAAI-CFI, CFEI

Education

North Carolina State University - Raleigh, NC – B.S. Civil Engineering – Construction Option, 1997

University of Maryland at College Park, College Park, MD – M.S. Fire Protection Engineering, 1998

- Areas of concentration: Fire dynamics, flame spread, dehydration of gypsum wallboard, operation and use of the Cone Calorimeter (ASTM E-1354)

Professional Experience

Principal Engineer, Element Analytical, PLLC, Knightdale, NC – August 2008 to present: Management of engineering investigations and inspections with consultation in the solution of technical questions pertaining to fire origin and cause analysis, fire protection system evaluations, structural damage assessment, foundation damage, building material defects, water damage assessment, roofing/cladding exams, and appliance/product investigations.

Professional Engineer, Forensic Engineering Incorporated, Raleigh, NC – January 2002 to August 2008: Application of engineering knowledge and principles in the investigation, analysis, and solution of technical questions regarding vehicle accidents and accident reconstruction, fire cause and origin, fire suppression system evaluations, building material defects, structural failures, foundation failures, roofing examinations, exterior cladding inspections (including EIFS/DEFS), consumer product failures, and the interpretation of codes and standards. Supervision of other forensic investigators.

Engineer in Training, Forensic Engineering Incorporated, Raleigh, NC – January 1999 to January 2002: Application of engineering knowledge and principles in the investigation, analysis, and solution of technical questions regarding vehicle accidents and accident reconstruction, fire cause and origin, fire suppression system evaluations, building material defects, structural failures, foundation failures, roofing examinations exterior cladding inspections (including EIFS/DEFS), consumer product failures, and the interpretation of codes and standards.

Driver (former Deputy Chief/Assistant Chief/Captain/Firefighter), Swift Creek Fire Department, Wake County, NC – March 1999 to present: Provides emergency response, fire suppression, search and rescue, and medical care during fire, rescue, HAZMAT, and EMS calls. Conducts driver/operator operations, served as mentor for probationary firefighters, and presents departmental fireground and driving training. Assumes command, directs, and coordinates multi-agency response activities during emergency incidents as needed. Managed assigned project budget responsibilities.

Element Analytical, PLLC
Post Office Box 1091 Knightdale, North Carolina 27545
(888) 875-5973 (phone/fax) www.elementanalytical.com NC PE Firm #P-0658

Providing Engineering Analysis, Investigation, and Inspection Solutions.

September 18, 2023

Professional Experience (continued)

Firefighter, Greenbelt Fire Department and Rescue Squad, Inc., Prince George's County, MD – September 1997 to December 1998: Conducted emergency response, fire suppression search and rescue, and medical care during fire, rescue, HAZMAT, and EMS calls.

Professional Development

NFPA 241 – A Tool for Subrogation!, National Association of Subrogation Professionals, <https://www.subrogation.org/>, September 12, 2023

Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Sanford, NC, May 15-19, 2023

Mold Matters: The Effect of Fungi on Building Materials, Eurofins, recorded webinar www.EurofinsUS.com/CEI, May 15, 2023

Ethics in Engineering, ASCE North Carolina Section, Eastern Branch Meeting, April 27, 2023

Critical Evaluation and Testing of Commonly Reported Accidental Causes – International Association of Arson Investigators, www.CFITrainer.net, Apr 17, 2023

Fire Chemistry – International Association of Arson Investigators, www.CFITrainer.net, April 12, 2023

Pipe Freeze Investigations – Rimkus Consulting, webinar, March 25, 2023

Fire Flow Analysis - International Association of Arson Investigators, www.CFITrainer.net. March 11, 2023

Vacant and Abandoned Buildings: Hazards and Solutions – International Association of Arson Investigators, www.CFITrainer.net, March 10, 2023

NFPA 18A: The Lithium-ion Battery Fire Solution – Hazard Control Technologies, webinar, March 9, 2023

Evaluating Hail Damage – Rimkus Consulting Group, webinar, <https://rimkus.com/webinars-and-seminars/>, February 23, 2023

The Impact of Li-Ion Energy Storage Systems on Residential Garage Fire Dynamics – Society of Fire Protection Engineers, February 23, 2023

Science of Fire and Explosion Hazards from Lithium-Ion Batteries, Fire Safety Research Institute, webinar, <https://fsri.org/research-update/online-training-available-science-fire-and-explosion-hazards-lithium-ion-batteries>, February 4, 2023

HAZWOPER Refresher Special Operations Annual Recertification – Emergency Response Training, Sanford, NC, November 17, 2022

Fundamentals of Fire Investigation - The Relationship Between Compartment Fire Dynamics and Resulting Post-Incident Damage Patterns– Society of Fire Protection Engineers, webinar, <https://www.pathlms.com/sfpe/courses/44314/webinars/30534> , August 24, 2022

NFPA 1033 & 921: 2022/2021 Editions Important Updates, – International Association of Arson Investigators, www.CFITrainer.net, July 26, 2022

Propane Explosions: Investigation, Failure Modes, Scene Exam, and Litigation Essentials – National Association of Subrogation Professionals, <https://www.subrogation.org/>, June 14, 2022

Dust Explosion: Hazard Recognition, Assessment, and Management – Society of Fire Protection Engineers, webinar, <https://www.pathlms.com/sfpe/courses>, June 13-July 25, 2022

Classification of Origin and Cause, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Sanford, May 5, 2022



Professional Development (continued)

Marine Fire Investigations, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Sanford, May 3, 2022

Medical Examiners Role in Fire Death Investigations, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Sanford, May 2, 2022

Designing for Fire Protection – HalfMoon Education, Inc., webinar, <https://halfmoonseminars.org/>, April 21-May 1, 2022

Gas System Check – Propane Education and Research Council, webinar <https://training.propane.com>, March 23, 2022

Gas Appliance System Check – Propane Education and Research Council, webinar <https://training.propane.com>, March 14, 2022

HAZWOPER Refresher Special Operations Annual Recertification – Emergency Response Training, Sanford, NC, November 11, 2021

Combustion By-Products Testing – Eurofins, recorded webinar www.EurofinsUS.com/CEI, October 28, 2021

Lithium Batteries and the Investigation of Related Fires – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 21, 2021

Wildland Serial Fire Case Study – NC/SC IAAI, recorded webinar of May 10, 2021, viewed July 2, 2021

Preparing for Expert Witness Testimony – NC/SC IAAI, live webinar, June 14, 2021

CSST Examinations – NC/SC IAAI, live webinar, June 7, 2021

NFPA 1033: Update and New Information – NC/SC IAAI, live webinar, May 24, 2021

Lithium Ion Battery Fires – International Association of Arson Investigators, www.CFITrainer.net, May 17, 2021

Investigator Health and Safety – NC/SC IAAI, live webinar, May 17, 2021

Corrosion and Freeze Protection in Fire Sprinkler Systems – PHCP Pros/AGF Manufacturing, live webinar AGF University www.agfmfg.com, April 22, 2021

Combustion By-Products Analysis and Overview – Eurofins, recorded webinar www.EurofinsUS.com/CEI, April 22, 2021

NCBELS Best Practices for Remote Work – PENC, www.penc.org, virtual meeting platform, December 14, 2020

Electrical Conductor Evaluation and Arc Recognition – NC/SC IAAI, virtual meeting platform, December 14, 2020

Post Blast Investigations – NC/SC IAAI, virtual meeting platform, December 7, 2020

NFPA 921 Updates 2021 – NC/SC IAAI, virtual meeting platform, November 16, 2020

HAZWOPER Refresher Special Operations Annual Recertification – Emergency Response Training, Sanford, NC, November 6, 2020

NFPA 70-E and Arc Flash – Energy Applications, Sanford, NC, August 20, 2020

West Cabarrus Street Redevelopment Project – ASCE North Carolina Section, Eastern Branch Meeting, May 21, 2020

Hurricane Resistant Glazing Systems – How to Ensure Installation of a Safe and Secure Building Envelope, <http://mylearning.asce.org/>, December 28, 2019

Tools to Ensure Effective Preparation and Testimony as an Engineering Professional – American Society of Civil Engineers, <http://mylearning.asce.org/>, December 17, 2019

HAZWOPER Refresher Special Operations Annual Recertification – Emergency Response Training, Sanford, NC, November 8, 2019



Professional Development (continued)

- The Basics of Building Moisture Inspections – Infrared Training Center, www.infraredtraining.com, August 6, 2019
- The Basics of Infrared Thermography – Infrared Training Center, www.infraredtraining.com, August 6, 2019
- Understanding Undetermined – International Association of Arson Investigators, www.CFITrainer.net, February 28, 2019
- HAZWOPER Refresher Special Operations Annual Recertification – Emergency Response Training, Sanford, NC, November 2, 2018
- Asbestos Awareness – The National Environmental Trainers, www.natlenvtrainers.com, July 7, 2018
- The Testifying Investigator, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 4, 2018
- Scissor Lift Safety – Compliance Training Online, www.ComplianceTrainingOnline.com, March 6, 2018
- Zone Fire Modeling and CFD Analysis – CIBSE ASHRAE Group, Webinar, December 13, 2017
- Motive, Means, and Opportunity, Determining Responsibility in an Arson Case – International Association of Arson Investigators, www.CFITrainer.net, November 30, 2017
- NCBELS Rules of Professional Conduct – ASCE North Carolina Section, Eastern Branch Meeting, November 16, 2017
- HAZWOPER 40 Hour Certification – Emergency Response Training, Sanford, NC, November 9-11, 2017
- Examination of the Impact of Ventilation on Room Fires in Full Scale Structures – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 18, 2017
- Fire Investigator Scene Safety – International Association of Arson Investigators, www.CFITrainer.net, September 14, 2017
- Basic Electricity – International Association of Arson Investigators, www.CFITrainer.net, September 12, 2017
- Investigating Natural Gas Systems – International Association of Arson Investigators, www.CFITrainer.net, July 12, 2017
- Residential Natural Gas Systems – International Association of Arson Investigators, www.CFITrainer.net, July 12, 2017
- Appliance Fires – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 3, 2017
- Moisture Intrusion and High Ambient Humidity Causation Analysis – Decatur Professional Development, LLC, PDHengineer.com, January 19, 2017
- Thermometry, Heat and Heat Transfer – International Association of Arson Investigators, www.CFITrainer.net, January 18, 2017
- Electrical Engineering for Non-Electrical Engineers – SEM-Train, LLC, Raleigh, NC, November 1-2, 2016
- Forensic Electrical Surveys & Arc Mapping for the Fire Investigator – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 19, 2016
- Kirk's Fire Investigation Update – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 20, 2016
- Large Loss Fires – Managing Complex Fire Investigations, International Association of Fire Investigators, Webinar, July 27, 2016
- Ethical Duties Beyond the Fire Scene – International Association of Arson Investigators, www.CFITrainer.net, June 13, 2016



Professional Development (continued)

- The HAZWOPER Standard – International Association of Arson Investigators, www.CFITrainer.net, June 13, 2016
- NFPA 70: National Electrical Code (NEC): Conductor Sizing (2014) – National Fire Protection Association, www.nfpa.org, June 13, 2016
- NFPA 70: National Electrical Code (NEC): Equipment Grounding and Bonding (2014) – National Fire Protection Association, www.nfpa.org, June 9, 2016
- NFPA 70: National Electrical Code (NEC): Overcurrent Protection (2014) – National Fire Protection Association, www.nfpa.org, June 9, 2016
- NFPA 70: National Electrical Code (NEC): General Installation Requirements (2014) – National Fire Protection Association, www.nfpa.org, June 3, 2016
- Introduction to the 2014 NFPA 70 NEC: National Electrical Code – National Fire Protection Association, www.nfpa.org, June 3, 2016
- X-ray/CT Training – Nikon Metrology, SAFE Laboratories and Engineering Corporation, Sanford, NC, May 2-5, 2016
- Structural Investigation into Farmville Silo Fire – ASCE North Carolina Section, Eastern Branch Meeting, February 18, 2016
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 19-22, 2015
- Investigating Residential Dryer Fires – Fire Findings Laboratories, Benton Harbor, MI, September 22-23, 2015
- NFPA 70: National Electrical Code (NEC) System Grounding and Bonding (2014) – National Fire Protection Association, www.nfpa.org, September 17, 2015
- Introduction to Evidence – International Association of Arson Investigators, www.CFITrainer.net, July 17, 2015
- Wind Energy in NC and the Southeast – ASCE North Carolina Section, Eastern Branch Meeting, July 16, 2015
- Radar Rainfall Estimation for Modeling and Design – American Society of Civil Engineers, <http://mylearning.asce.org/>, June 24, 2015
- Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 4-8, 2015
- Evaluating Damage and Repairing Metal Plate Connected Wood Trusses – American Society of Civil Engineers, <http://mylearning.asce.org/>, April 10, 2015
- Underpinning and Strengthening of Foundations Trouble – American Society of Civil Engineers, <http://mylearning.asce.org/>, March 13, 2015
- Structural Building Condition Surveys: Looking for Trouble – American Society of Civil Engineers, <http://mylearning.asce.org/>, February 6, 2015
- Petrographic Analysis of Concrete Deterioration – American Society of Civil Engineers, <http://mylearning.asce.org/>, February 6, 2015
- Electrical Forensics Engineering – Decatur Professional Development, LLC, PDHengineer.com, February 5, 2015
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 20-22, 2014
- Design, Construction, and Troubleshooting of Concrete Slabs-On-Grade + Pervious (Porous) Concrete – North Carolina State University, August 25, 2014



Professional Development (continued)

- Physical Evidence at the Fire Scene – International Association of Arson Investigators, www.CFITrainer.net, July 17, 2014
- Residential Electrical Systems – International Association of Arson Investigators, www.CFITrainer.net, July 17, 2014
- The Practical Application of the Relationship Between NFPA 1033 and NFPA 921 – International Association of Arson Investigators, www.CFITrainer.net, July 15, 2014
- Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 5-9, 2014
- Fire Investigator Scene Safety – International Association of Fire Investigators, Webinar, April 14, 2014
- How First Responders Impact the Fire Investigation – International Association of Arson Investigators, www.CFITrainer.net, April 8, 2014
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 14-16, 2013
- Fundamentals of Residential Building Construction – International Association of Arson Investigators, www.CFITrainer.net, June 13, 2013
- NFPA 1033 and Your Career – International Association of Arson Investigators, www.CFITrainer.net, June 11, 2013
- Electrical Safety – International Association of Arson Investigators, www.CFITrainer.net, June 7, 2013
- Using Resources to Validate your Hypothesis – International Association of Arson Investigators, www.CFITrainer.net, June 5, 2013
- Car Fires and Vehicle Ignition Analysis, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 8, 2013
- Defense Position to Fire Investigation (Anatomy of a Defense) – Forsyth County Emergency Services & Wait Law, PLLC, Winston-Salem, North Carolina, July 10, 2012
- Emergency Response to Railcar Incidents – Norfolk Southern Railway Company & DuPont, Raleigh, North Carolina, June 12, 2012
- California Emergency Management Agency (CalEMA) Safety Assessment Program (SAP) – National Council of Structural Engineers Associations, Webinar, May 18, 2012
- Writing the Initial Origin and Cause Report – International Association of Arson Investigators, www.CFITrainer.net, March 26, 2012
- Fire Protection Systems – International Association of Arson Investigators, www.CFITrainer.net, February 27, 2012
- Fire Dynamics Calculations – International Association of Arson Investigators, www.CFITrainer.net, February 14, 2012
- Understanding Fire Through the Candle Experiments – International Association of Arson Investigators, www.CFITrainer.net, February 13, 2012
- Charleston Sofa Superstore Fire – International Association of Arson Investigators, www.CFITrainer.net, February 9, 2012
- Documenting the Event – International Association of Arson Investigators, www.CFITrainer.net, February 9, 2012
- Fundamentals of Interviewing – International Association of Arson Investigators, www.CFITrainer.net, February 8, 2012
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 17-18, 2011



Professional Development (continued)

- The Fire Investigator & the 2011 NFPA 921 Changes – International Association of Arson Investigators, www.CFITrainer.net, July 18, 2011
- Residential Electricity for Fire Investigators – Fire Findings Laboratories, Benton Harbor, MI, April 13-14, 2011
- Digital Photography and the Fire Investigator – International Association of Arson Investigators, www.CFITrainer.net, April 6, 2011
- Explosion Dynamics – International Association of Arson Investigators, www.CFITrainer.net, April 6, 2011
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 18-20, 2010
- Wildland Fires Investigation – International Association of Arson Investigators, www.CFITrainer.net, September 28, 2010
- Ethics and the Fire Investigator – International Association of Arson Investigators, www.CFITrainer.net, September 28, 2010
- Evidence Examination: What Happens at the Lab? – International Association of Arson Investigators, www.CFITrainer.net, July 7, 2010
- Post-flashover Fires – International Association of Arson Investigators, www.CFITrainer.net, June 7, 2010
- A Ventilation-Focused Approach to the Impact of Building Structures and Systems on Fire – International Association of Arson Investigators, www.CFITrainer.net, June 7, 2010
- Basic Interviewing, Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 4, 2010
- Investigation and Repair of Fire-Damaged Framing – American Society of Civil Engineers, Webinar, March 4, 2010
- 2010 Business Environmental & Safety Training (BEST) Conference – Wake County Local Emergency Planning Committee (LEPC), Raleigh, NC, February 10, 2010
- 5th Congress on Forensic Engineering – American Society of Civil Engineers, Washington, DC, November 12-14, 2009
- Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 19-21, 2009
- Effective Investigation and Testimony – International Association of Arson Investigators, www.CFITrainer.net, September 30, 2009
- , September 29, 2009
- Hydrogen Cyanide in Fireground Operations - North Carolina State Fireman's Association, 122nd Annual Conference, Raleigh, NC, August 21, 2009
- Managing Transition – North Carolina State Fireman's Association, 122nd Annual Conference, Raleigh, NC, August 19, 2009
- Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 5-7, 2009
- Wood Solutions Fair – Woodworks for Non-Residential Construction, Raleigh, NC, February 24, 2009
- Forensic Fire Engineering Analysis – Society of Fire Protection Engineers, Annual Meeting, Charlotte, NC, October 16-17, 2008
- Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 5-9, 2008



Professional Development (continued)

Non-Destructive Testing of Roadway and Airfield Pavements – ASCE North Carolina Section, Eastern Branch Meeting, April 17, 2008
United States Fire Administration Incident Command System 400 – Morrisville Fire Department Fire/Rescue, Morrisville, NC, November 13, 2007, and December 3, 2007
Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 7-11, 2007
United States Fire Administration Incident Command System 300 – Wake County Public Safety Fire/Rescue, Fuquay-Varina, NC, April 13-24, 2007
Investigation of Gas and Electric Appliance Fires – Fire Findings Laboratories, Benton Harbor, MI, April 18-21, 2006
14th Annual National Expert Witness Conference – SEAK, Inc., Hyannis, MA, June 16-17, 2005
Expert Report Writing Workshop – SEAK, Inc., Hyannis, MA, June 15, 2005
Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 2-6, 2005
Fundamentals of Construction Safety – North Carolina State University, Raleigh, NC, June 28, 2004
Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 3-7, 2004
Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 5-9, 2003
Lightning 101 Seminar – Vaisala, Inc., Raleigh, NC April 30, 2003
Solving Water Intrusion and Mold Problems in North Carolina – Lorman Education Services, Raleigh, NC, July 30, 2002
Fire Investigation (NFPA 921) – Alamance Community College, Burlington, NC, February 20-22, 2002
Structural Condition Assessment of Existing Structures – American Society of Civil Engineers, Charlotte, NC, September 20-21, 2001
PC-CRASH Advanced Training Workshop – MacInnis Engineering Associates, Ltd., Vancouver, BC, August 31 & September 1, 2000
Advanced Investigative Approaches – International Association of Arson Investigators, NC Chapter, Burlington, NC, May 1-5, 2000
Arson Awareness for Firefighters – Maryland Fire and Rescue Institute, College Park, MD, February 21-22, 1998

Professional Registrations

Registered Engineer in Training in North Carolina – 1997
Licensed Professional Engineer in North Carolina – 2002
Licensed Professional Engineer in Virginia – 2002
Licensed Professional Engineer in South Carolina – 2010

Certifications

Fire/Arson Investigator (North Carolina Fire and Rescue Commission [NCFRC]) – 2003
Certified Fire and Explosion Investigator (NAFI [CFEI]) – 2006
Certified Fire Investigator (IAAI-CFI) – 2008



Certifications (continued)

Hazardous Materials Responder Level I, (NCFRC) – 1999
Firefighter Level II, (NCFRC) – 2003
Fire Officer Level I, (NCFRC) – 2003
Fire Instructor Level II, (NCFRC) – 2006
Fire Officer Level II (NCFRC) – 2007
Disaster Service Worker Volunteer, State of California Safety Assessment Program (CalEMA) – 2012 (not currently maintained)

Professional Associations

American Society of Civil Engineers (ASCE)
National Fire Protection Association (NFPA)
Society of Fire Protection Engineers (SFPE)
Chi Epsilon, National Civil Engineering Honor Society
Salamander, Fire Protection Engineering Honor Fraternity
International Association of Arson Investigators (IAAI)
North Carolina Chapter of the International Association of Arson Investigators (NCIAAI)
National Association of Fire Investigators (NAFI)
Order of the Engineer
American Institute of Steel Construction (AISC)

Publications

McGraw, J. Robert McGraw, Jr., *Flammability and Dehydration of Painted Gypsum Wallboard Exposed to Fire Heat Fluxes*, MS Thesis, University of Maryland - College Park, 1998.
Mowrer, F. W. and McGraw, Jr, J. R., “Flammability of Painted Gypsum Wallboard Subjected to Fire Heat Fluxes,” *Interflam '99 – Proceedings of the eighth international conference*, 1999.
McGraw, J. Robert McGraw, Jr., and Mowrer, F. W., “Flammability and Dehydration of Painted Gypsum Wallboard Subjected to Fire Heat Fluxes,” *International Association for Fire Safety Science (IAFSS) – Proceedings of the sixth international symposium*, 1999.

