



**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.

Firefighter (former Deputy Chief/Assistant Chief/Captain), Swift Creek Fire Department, Wake County, – February 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. Managed assigned project budget responsibilities.

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.

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

*Providing Engineering Analysis, Investigation, and Inspection Solutions.*

March 6, 2019

## J. Robert McGraw, Jr., P.E., C.F.I., C.F.E.I.

### Professional Development

- Understanding Undetermined – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://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](http://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](http://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](http://www.CFITrainer.net), September 14, 2017
- Basic Electricity – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), September 12, 2017
- Investigating Natural Gas Systems – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), July 12, 2017
- Residential Natural Gas Systems – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://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](http://www.CFITrainer.net), June 13, 2016
- The HAZWOPER Standard – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), June 13, 2016
- NFPA 70: National Electrical Code (NEC): Conductor Sizing (2014) – National Fire Protection Association, [www.nfpa.org](http://www.nfpa.org), June 13, 2016
- NFPA 70: National Electrical Code (NEC): Equipment Grounding and Bonding (2014) – National Fire Protection Association, [www.nfpa.org](http://www.nfpa.org), June 9, 2016
- NFPA 70: National Electrical Code (NEC): Overcurrent Protection (2014) – National Fire Protection Association, [www.nfpa.org](http://www.nfpa.org), June 9, 2016
- NFPA 70: National Electrical Code (NEC): General Installation Requirements (2014) – National Fire Protection Association, [www.nfpa.org](http://www.nfpa.org), June 3, 2016



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### Professional Development (continued)

- Introduction to the 2014 NFPA 70 NEC: National Electrical Code – National Fire Protection Association, [www.nfpa.org](http://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](http://www.nfpa.org), September 17, 2015
- Introduction to Evidence – International Association of Arson Investigators, [www.CFITrainer.net](http://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
- Physical Evidence at the Fire Scene – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), July 17, 2014
- Residential Electrical Systems – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://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](http://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](http://www.CFITrainer.net), June 13, 2013
- NFPA 1033 and Your Career – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), June 11, 2013



**Professional Development (continued)**

Electrical Safety – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), June 7, 2013

Using Resources to Validate your Hypothesis – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://www.CFITrainer.net), March 26, 2012

Fire Protection Systems – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 27, 2012

Fire Dynamics Calculations – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 14, 2012

Understanding Fire Through the Candle Experiments – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 13, 2012

Charleston Sofa Superstore Fire – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 9, 2012

Documenting the Event – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 9, 2012

Fundamentals of Interviewing – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), February 8, 2012

Fire Investigative Approaches – International Association of Arson Investigators, NC & SC Chapters, Myrtle Beach, SC, October 17-18, 2011

The Fire Investigator & the 2011 NFPA 921 Changes – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://www.CFITrainer.net), April 6, 2011

Explosion Dynamics – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://www.CFITrainer.net), September 28, 2010

Ethics and the Fire Investigator – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), September 28, 2010

Evidence Examination: What Happens at the Lab? – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), July 7, 2010

Post-flashover Fires – International Association of Arson Investigators, [www.CFITrainer.net](http://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](http://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



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### Professional Development (continued)

- 5<sup>th</sup> 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](http://www.CFITrainer.net), September 30, 2009
- Arc Mapping Basics – International Association of Arson Investigators, [www.CFITrainer.net](http://www.CFITrainer.net), September 29, 2009
- Hydrogen Cyanide in Fireground Operations - North Carolina State Fireman's Association, 122<sup>nd</sup> Annual Conference, Raleigh, NC, August 21, 2009
- Managing Transition – North Carolina State Fireman's Association, 122<sup>nd</sup> 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
- 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
- 14<sup>th</sup> 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



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## **Professional Development (continued)**

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**

Certified Fire Investigator (North Carolina Fire and Rescue Commission [NC-CFI]) – 2003

Certified Fire and Explosion Investigator (NAFI [CFEI]) – 2006

Certified Fire Investigator (IAAI-CFI) – 2008

Certified Hazardous Materials Responder Level I, (NCFRC) – 1999

Certified Firefighter Level II, (NCFRC) – 2003

Certified Fire Officer Level I, (NCFRC) – 2003

Certified Fire Instructor Level II, (NCFRC) – 2006

Certified Fire Officer Level II (NCFRC) – 2007

Disaster Service Worker Volunteer, State of California Safety Assessment Program (CalEMA) – 2012

Fire Investigator Technician (CFRC) – 2017

## **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.

