



## ***INSTRUCTION & TRAINING PROGRAMS***

### **Vehicle Fire Investigation**

Students completing this program will have a working knowledge of how to complete a vehicle fire investigation. The program begins in the class room with the latest training in accordance with NFPA 921 (2014 edition) and ends with the practical application of this knowledge with real fires in real vehicles.

### **Fire Investigation Documentation**

Students completing this course will have a working knowledge of how to properly document a fire scene and prepare a written technical report surrounding the origin and cause of the fire. Students will also learn sketching, diagramming, note taking, fire scene photography and interview techniques.

### **Explosion Investigation**

Students completing this course will have a working knowledge of how to investigate and analyse an explosion scene. Students will be able to render opinions as to the origin, cause, responsibility or prevention of such incidents.

The following topics are covered:

- Identification of an explosion scene
- Understanding the difference between deflagration and detonation
- Explosion Dynamics
- Types of explosions
- Identifying Low Order and High Order damage
- Explosion Effects
- Positive Pressure and Negative Pressure wave
- Seated vs. non-Seated explosions
- Identification of Multiple Explosions
- Explosives
- Scene Safety
- Evidence identification, documentation and collection
- Search Techniques
- Examination of the explosion scene
- Force Vectors
- Analyzing Fuel Source, Ignition and cause
- Case studies
- Explosion demonstrations
- Practical evolution involving a simulated explosion scene

## **Fire Dynamics**

This workshop introduces investigators to fire and explosion dynamics as it applies to origin and cause determinations. Participants will acquire a working knowledge of fire science and be able to apply this knowledge to assess possible ignition mechanisms, burn patterns, and analyze fire spread. Ignition sequence concepts will be discussed with a focus towards identifying competencies of the heat source in the context of the first fuel ignited.

This workshop will also explore the interpretation and limitations of the physical evidence from a fire scene. Participants will develop an understanding of fire dynamics within compartments, including compartment fire behavior, heat transfer, pre- and post-flashover conditions, and heat release rate curves. These fundamental concepts will be linked to fire pattern development and how patterns can be accurately used in determining the area of origin. Current research related to the inappropriate and appropriate uses of fire damage

## **Computer Fire Modelling for Fire investigation**

Fire modeling can be separated into two broad categories, physical and mathematical fire modeling. Physical fire modeling has been around since the dawn of man and consists of burning objects to evaluate their effects. Study of fire phenomena by utilizing mathematics began in the early 1940's. Mathematical fire modeling can further be arranged into three categories based on the types of calculations performed, including: hand calculations, zone models, and computational fluid dynamics models. A general discussion of each type of modeling is presented in this paper. Computer fire modeling has been used to design and analyze fire protection systems (i.e. sprinkler systems, detection systems), evaluate the effects of fire on people and property, estimate fire risks, and assess postfire reconstruction. This paper focuses on the use of computer fire models for fire investigation purposes and provides a detailed discussion on the input data needed for fire modeling, available education and training, and its application in analyzing fire dynamics. Specifically, the use of computer fire models in validating or refuting an origin hypothesis by comparison of fire patterns was studied.

## **Failure Analysis**

How to use fire dynamics in the testing of origin and cause hypotheses. Also, a presentation of the state of the art documentation examples will be provided through case studies.

## **Electrical Fire Investigation**

This seminar is designed to give fire investigators a working understanding of how electricity works and the common causes of failures resulting in electrical fires. Students will learn how to properly document fires involving electrical components, evidence collection and preservation and arc mapping procedures.

## **Wildland Fire Investigation**

This program introduces the student to the principles and practices of wildland fire investigation through both classroom and practical exercises.

## **Report Writing**

Students will receive instruction on how to write a technical fire investigation report. This program is offered in house and online.

## **Scientific Method Use, application and Gap Analysis for Origin Determination**

The fire investigation industry is considered to be lagging behind the rest of the forensic science fields in its assessment

of the performance of methodological approaches and conclusions drawn by practitioners within the field. Despite the best efforts of certifying bodies and industry members, there are still many unknowns within the profession.

This course will present practical uses of the scientific method as it relates to Origin Determination. Several recommended practices have been identified and formatted to reflect the scientific method as utilized in NFPA 921. In addition, where practical, a gap analysis has been on these processes with recommendations provided.

### **NFPA 921 and NFPA 1033 Updates**

Update and description of the newest fire investigation standards and guidelines for the fire investigation profession for the United States and Canada.

### **Heat and Flame Vector Analysis**

- Origin Determination Tool

Case studies are used on how to appropriately apply a heat and flame vector analysis for origin determination.

### **Fire Patterns Research**

- Use of Damage for Origin Determination

Over forty full-scale research burns into the nature of fire effects and fire patterns in compartment fires were conducted at the research facility of Eastern Kentucky University. These tests demonstrate a remarkable resemblance of fire effects and patterns in minimal variable testing methods.

### **Vehicle Fire Pattern Burn Study**

These test burns were conducted to address: (a) reproducibility of patterns in minimal variable testing methods, and (b) reaffirmation of standard vehicle fire pattern analysis methodologies, such as heat and flame vector analysis.

### **Development and Assessment of a decision support framework for enhancing the forensic analysis and interpretation of fire patterns**

Addresses the issues with fire investigation and presents a hypothesis to standardize the analysis of fire patterns. The aim is to develop and implement into practice a decision support framework that will assist forensic fire investigators in assessing the efficacy of fire burn patterns as reliable indicators of the area of fire origin.

This will be facilitated by the evaluation of visible and measurable fire patterns in the context of the fire environment wherein the pattern was developed. Ultimately, the framework will incorporate easy to apply tools, including check-list type forms for use on scene, supported by a software-based system that can be run in the laboratory or office to help investigators connect key observational and measured data to increase the reliability of pattern interpretation.

### **Use of Damage in Fire Investigation: a review of fire pattern analysis, research and future direction**

Fire investigators have historically relied upon damage as a means to conclude where a fire originated. This review evaluates the historical and current literature on the topic, with a specific emphasis towards the research conducted over the past eighty years related to fire patterns. The concept of fire patterns for this review has been broken into four components that better assist in evaluating their effectiveness in determining an area of origin. The first component evaluated is the ability to assess the varying degree of fire damage along the surfaces of the compartment and contents. Next, the ability to identify clusters of damage was evaluated. Interpretation of the causal factors for the generation of the fire patterns was next appraised. Finally, the availability of processes using fire patterns in determining an area of origin was assessed. This deconstruction of the problem provides a gap analysis of the processes present and areas where future work is needed. A seven step reasoning process for evaluating damage for determining the area of origin, along with a new definition for the term fire pattern is proposed.

## **A New Method for the Characterization of the Degree of Fire Damage to Gypsum Wallboard for Use in Fire Investigations**

The development of a degree of fire damage scale for gypsum wallboard, implementation of a new method of characterizing fire damage, and evaluation of the reliability of this new method are discussed. The method was evaluated by comparing degree of fire damage assessments of a novice group with and without the method, and against expert assessments. Thirty-nine “novice” raters assessed damage to a gypsum wallboard surface, completing 66 ratings, first without the method, and then again using the method. The inter-rater reliability was evaluated for ratings of damage without and with the method, and was also compared to an average “expert” rating of damage with the method. Results indicate that the novice raters were more reliable in their analysis of the degree of fire damage to the gypsum surface when using the method, and that when using the method, novices do not rate damage levels significantly differently than the experts.

## **Ignition Potential of Common Fuels by Residential Electric Range Cooktops**

A study was conducted to evaluate the competency of several types of electric cooktop ranges igniting a variety of common kitchen items. Four types of electric cooktop ranges were tested including a ceramic-glass cooktop range, an electric coil cooktop range, an electric coil cooktop range with cast iron plate installed, and an electric coil cooktop range with a temperature-limiting control sensor. The latest research was reviewed to select a representative sample of fuels commonly noted as the first fuel ignited in kitchen fires. The nine selected fuels included cardboard (pizza box), a cotton dish towel, a roll of paper towels, a pan of canola oil, a pan of vegetable oil, a nylon short turn spatula (cooking utensil), a kitchen appliance (toaster), a plastic storage container, and a pan of corn oil.

## **Fire Investigation Origin Determination Survey**

The fire investigation industry is considered to be lagging behind the rest of the forensic science fields in its assessment of the performance of methodological approaches and conclusions drawn by practitioners within the field. Despite the best efforts of certifying bodies and industry members, there are still many unknowns within the profession. As such, the researchers have collected a large survey of demographics to formulate a picture of our industry with regards to experience, age, employment, training, and opinions regarding methodology within the industry. In addition to these demographics, the researchers collected data regarding area of origin determination both with and without measurable data (depth of char, calcination) to evaluate its effectiveness when applied without an on-site scene examination. This permitted the comparison of the demographics and accuracy in determining the most important hypothesis in fire investigations, the area of origin. It is shown that 73.8% of the participants without measurable data and 77.7% with measurable data accurately determined the area of origin. Thus, the total percentage of participants choosing the correct area increased 3.9% with the inclusion of measurable data as part of the given. Additional selected outcomes from this research are presented within this paper.

## **Water-based Fire Protection Systems**

Covering the operation, inspection, testing and maintenance of wet, dry, pre-action and deluge water based systems and components based upon NFPA 13 and NFPA 25.

## **Fire Alarm Systems**

Courses addressing design, operation, inspection, testing and maintenance of Fire alarm systems, initiating devices, detection, notification and other components per NFPA 72 and NFPA 70.

## **Fire Pumps**

Covering the operation, inspection, testing and maintenance of vertical/horizontal electrically/combustion engine driven fire protection pumps per NFPA 25 and NFPA 20.

## **Fire Extinguishers**

Covering the use, inspection, testing, refill, and maintenance of wet chemical, dry chemical, gaseous and water agent extinguishers per NFPA 10 and OSHA 1910.157.

## **Firefighting Strategy, Tactics and Officers' Courses**

Municipal and Industrial Fire Brigade strategy and tactics for paid and volunteer departments.

## **Fire Codes and Fire Codes Inspection**

Training on the use of the applicable Fire and Life Safety codes and their application to the built environment. Focus on inspection techniques, use of technology and real world application.

## **OSHA Record-keeping**

OSHA 1904 injury and illness recordkeeping requirements, systems and application.

## **OSHA Ergonomics**

Inspection, Auditing, Identification and safety plan development addressing work related Musculoskeletal Disorders (MSDs) in the work place and methods to protect the employee from exposure and injury in the fields of construction, general industry, medical related and other fields of employment.

## **OSHA Blood Borne Pathogens**

OSHA 1010.1030 training on Inspection, Auditing, Identification and safety plan development regarding places of employment which present potential exposure to blood borne pathogens and body fluids.

## **OSHA 1910 General Industry Courses**

Inspection, Auditing, Identification and safety plan development addressing a wide range of topics found under the 1910 general industry standard.

## **OSHA 1926 Construction Courses**

Inspection, Auditing, Identification and safety plan development addressing a wide range of topics found under the 1926 construction industry standard.

## **OSHA 1910 and 1926 Safety Program Development**

dynamics as it applies to origin and cause determinations. Participants will acquire a working knowledge of fire science and be able to apply this knowledge to assess possible

## **Joint Commission Compliant Hospital Incident Command System "HICS"/NIMS**

National Incident Management System training and exercises for the medical care industry.

## **Joint Commission Compliant Hospital Disaster Preparedness, Response and MCI Business Continuity, Emergency Management and Emergency Planning**

## **Hazardous Materials Workplace Safety Planning, Emergency Planning and Emergency Response Training Course**

covering the requirements of NFPA 472 and 1910.120 related to Municipal Fire Departments and Private Fire Brigades and other response agencies and organizations, as well as Occupational Safety plans and training related to work places with hazardous materials.



