

A STRUCTURED SYSTEM FOR FIRE INVESTIGATOR SAFETY  
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Fire investigators respond to various residential, commercial, and industrial fire scenes on a daily basis. If not managed properly, these incidents can pose numerous potential safety and health hazards to personnel. Evaluating hazards and assessing the relative risks associated with the investigation of fires are critical to the successful management of any investigation. Although most investigators recognize the initial need for preliminary tasks such as preserving and protecting the scene, many overlook the basic safety and health considerations for preventing potential injury, exposure, or death due to hazardous conditions and substances.

### **STANDARDS COVERING INVESTIGATORS' HEALTH AND SAFETY**

Fire investigator health and safety is one of the most neglected areas of training throughout the fire investigation community; few organizations consider it a priority. The chapter on safety and health hazards in National Fire Protection Association (NFPA) 921, Guide for Fire and Explosion Investigations, contains only limited information concerning the health and safety risks associated with the investigation of fires and explosions, and it does not offer organizations specific guidance for developing a comprehensive occupational safety and health program for compliance with Occupational Safety and Health Administration (OSHA) regulations. Furthermore, the training programs, workshops, and seminars sponsored by professional trade associations, educational institutions, and state and local membership organizations seldom include presentations that adequately address this issue.

NFPA 1500, Standard on Fire Department Occupational Safety and Health Program has had a profound impact on fire service operations in recent years. Although it is directed primarily at fire departments, it is an excellent guide for law enforcement organizations that want to develop or evaluate the effectiveness of their safety and health programs. The standard contains chapters on risk management, training and education, vehicles, equipment and drivers, protective clothing and equipment, emergency operations, safety standards, medical and physical requirements, fitness and wellness programs, and critical incident stress programs. The standard specifies the minimum requirements for occupational safety and health programs and presents safety guidelines for preventing accidents, injuries, and exposures while engaged in fire service operations and activities.<sup>1</sup>

NFPA 1033, Standard on Professional Qualifications for Fire Investigator, addresses several safety-related job performance requirements for investigators. It requires that investigators inspect and assess the exterior and interior areas of fire scenes prior to initiating an investigation so that physical and other potential hazards that may cause injury, illness, or death can be identified. The investigator should also consider the effects that fires and explosions may have on the building's structural integrity to prevent injury from collapse.

### **HAZARDS ABOUND**

Despite the scientific and technological advances made in the field of fire investigation during the past several years, investigators still have to perform their basic duties in areas that contain numerous safety and health hazards that may cause personal injury, illness, exposure or death. Many investigators have been diagnosed with disabling and debilitating injuries and chronic illnesses that surfaced days, months, and years after fire scene investigations were completed. Although investigators typically begin their investigation into the origin and cause of fires after fire suppression and overhaul have been completed, they face many of the same safety and health hazards firefighters face. Investigators should begin thinking about their personal safety immediately on being notified of an incident and during their response to the scene. This "safety mindset" is an important step in identifying hazards and preventing injuries, illnesses, and fatalities. Lack of experience, information, standard operating procedures (SOPs), and adequate training, as well as complacency, can jeopardize investigators, who may inadvertently be exposed to hazards that may adversely affect their health several months or years after exposure. Therefore, investigators must take all appropriate protective actions at every fire scene.

Some of the physical hazards investigators may face on the scene include the following: damaged structural members/falling debris; ignition sources; broken glass, nails, or torn metal; holes in floors; hanging light fixtures; exposed (energized) electrical wiring (underground, overhead, and residential services); damaged electrical appliances or equipment (e.g., transformers, service panels, electric ranges, and refrigerators); damaged natural gas/propane lines; high noise levels; environmental factors (e.g., weather conditions such as extreme cold and lightning storms); loose flooring or steps, slippery surfaces, and protruding objects; unsecured objects that can fall from elevated surfaces (e.g., building contents, equipment, chimneys, and brick walls); confined spaces; “booby-traps” or secondary incendiary or explosive devices; and standing water (including missing manhole covers caused by flooding conditions).

Assume that all scenes are potentially hazardous until a comprehensive hazard and risk assessment proves otherwise. Complete a thorough exterior and interior hazard and risk assessment before entering the scene. Some investigators incorrectly assume that because the fire has been extinguished, fire investigation is less hazardous than fire suppression. However, it is well documented that fire scenes pose greater toxicological hazards to personnel after suppression activities have been completed because of incomplete combustion and the liberation of extremely toxic substances. As an example, investigators may be subjected to combustion gases and smoke, oxygen-deficient atmospheres, and toxic or hazardous airborne dust concentrations (some of which are potentially carcinogenic) as they disturb debris during their investigation. These conditions exist at virtually all fire scenes, and investigators may face serious injuries, exposure, or death unless they wear proper protective clothing and respiratory protection devices.

*Caution:* Most atmospheric hazards are insidious and may be present for several hours or days after overhaul has been completed. Always consider fire scene atmospheres hazardous until appropriate monitoring techniques have verified that it is safe to enter with a minimum level of personal protective clothing and equipment (PPE). In addition, investigators may be exposed to the hazards of heavy equipment that may be in the area; they may have their vision, hearing, or mobility impaired by PPE, and they may suffer physiological and physical stress such as heat stress. All of the potential physical hazards should be identified as part of the initial survey of the scene so they can be properly addressed.

Electrocution is another potential hazard. It may result from a variety of sources, including but not limited to overhead power lines; downed electrical wires; buried cables; and damaged cords, appliances, and equipment. Electrical equipment used on-site may also pose a hazard to personnel. Low-voltage equipment with ground-fault interrupters and watertight, corrosion-resistant connecting cables should be used to prevent the potential for accidental electrocution.

Lightning is a potential hazard during outdoor operations, particularly for personnel handling metal containers or equipment. Monitor weather conditions, and suspend work during electrical storms. OSHA 29 CFR §1910.136 describes proper clothing and equipment for protection against electrical hazards. As investigators, you have a duty to comply with all regulations and standards applicable to fire scene operations; you must be able to recognize potential hazards and must be careful while conducting your investigation.

## **FIRE SCENE RISK ASSESSMENT AND MANAGEMENT MODEL<sup>0</sup>**

Personnel safety is the most important consideration in determining the appropriate strategy and tactics to be employed to safely and effectively investigate an incident. The Fire Scene Risk Assessment and Management Model<sup>0</sup> is an example of a structured system you can apply to all fire scene investigations to help ensure personnel safety. It is a standard approach that incorporates the basic elements of a hazard and risk assessment, which should be completed in a logical manner. At some incidents, investigators may have to delay, reorder, or complete investigative activities simultaneously. This model is to be viewed as a flexible guideline, not a rigid rule. Organizations should decide what works best for them and then develop SOPs and operational guidelines for investigators based on those principles.

Using this five-step structured system offers several benefits, including the following:

- It recognizes that all fire incidents present potential safety and health hazards to *all* personnel present at the scene, especially investigators.
- It emphasizes the importance of basic safety guidelines to prevent potential injuries or exposures.
- It provides a standard system that can be modified to accommodate changes based on the magnitude or nature of the incident.
- It reflects the philosophy that the safety of personnel is always the number one priority and that investigators will not perform any task unless it can be performed safely.

*Note:* Investigators should consciously identify all investigative tasks to be completed at the scene and evaluate their hazards, risks, and potential consequences *prior* to taking action.

### Step 1: Recognition (**Asking the Right Questions**)

You must be able to identify the potential safety and health hazards and problem areas as quickly as possible before entering the scene to initiate a preliminary investigation. Resist the tendency to “rush in” and solve the problem at all costs, especially at incidents where explosives or hazardous materials may be involved and where the best strategy may be to do nothing until the hazards can be mitigated and the scene declared “safe” to enter. To the extent feasible, take ample time to stop, look, and listen before committing yourself to a course of action.

**Assess the relative risks and the measures that can be implemented to safely manage or eliminate them. This initial assessment is the most critical step in the hazard and risk assessment process. The inability to identify the hazards present sets the stage for potential injury, exposure, and death. You should also consider designating a safety officer to specifically monitor investigators’ safety and health and to enforce compliance with applicable safety and health regulations, standards and policies. Investigators must be able to gather information from the on-scene incident commander and incident safety officer so that a safety evaluation of the scene can be conducted to determine the extent of the hazards present and the appropriate measures needed to protect personnel.**

#### **Ask questions such as the following:**

- Is an incident management system in effect?
- Where is the command post located?
- Are any obvious physical hazards present? Has the scene been evaluated for various safety hazards such as:
  - How old is the structure? What is the occupancy type? What is the type of construction? Is there a potential for a structural collapse; if so, has a collapse zone been established? Where are the collapse zones located? Where are heavy loads such as air-conditioning units and large pieces of furniture located? (Newer structures may be constructed of inexpensive building materials that may increase the risk of building collapse. Closely examine floors and load and nonload bearing walls to identify potential areas of failure.)
  - Are hazardous materials present on-site; if so, what are their specific locations? Have hazard-control zones (i.e., perimeter) been established?
  - Are there chemical or biological hazards?
  - What about other potential health risks?
  - What is the status of gas and electrical services? (*Note:* If there is any doubt as to the status of building utility services, consult with company representatives or building engineers to ensure that the appropriate disconnect procedures have been completed.)
- What type of weather is expected? High winds, storms, and extreme cold may adversely affect the structure’s condition.
- What level of personal protective clothing is being worn? What tools would be appropriate for the scene?
- What level of respiratory protection is required?
- Has any air monitoring been conducted?
- Has anyone been injured or suffered any adverse health effects during fire suppression activities?
- Has everyone on the scene been told about the hazards present?
- Are sufficient resources available to perform the required tasks?

### Step 2: Evaluation (**Obtaining Accurate Information**)

After you have collected the initial hazard information during the recognition phase, attempt to corroborate the information so you can adequately evaluate the potential for injury, illness, or exposure and determine what safety precautions are required. You can best accomplish this by interviewing witnesses, building owners/occupants, fire department personnel, law enforcement officials, and any other individuals who were on the scene prior to your arrival and who may have relevant information. Verify the hazard information you receive by comparing it with technical references, material safety data sheets (MSDSs), and air monitoring results (if available). All this information is critical to developing a Site Safety Plan.

Develop a Site Safety Plan specific to investigator activities before you begin work on the scene to ensure the highest possible degree of safety and prevent accidental injuries, exposures, and deaths. The Site Safety Plan must provide measures for controlling or eliminating hazards. Developing a written Site Safety Plan helps ensure that all safety aspects are thoroughly considered before you enter the scene to begin an investigation. Modify the plan as needed for every stage of site operations, and revise it whenever you obtain new information concerning site hazards.

All responsible parties on-scene who are familiar with the site and its potential safety and health hazards should be involved in developing the Site Safety Plan. At a minimum, the plan should do the following:

- Identify key personnel and alternates responsible for site safety.
- Describe the risks associated with the site operations conducted.
- Describe the protective clothing and equipment to be worn by personnel.
- Describe any site-specific medical surveillance / medical monitoring requirements.
- **Describe the program for periodic air monitoring, personnel monitoring, and environmental sampling, if needed.**
- **Describe the actions to be taken to address existing hazards to make the site less hazardous.**
- **Define site-control measures, and include a site map.**
- **Establish decontamination procedures for personnel and equipment.**
- Set forth the site's standard operating procedures (SOPs). SOPs are those activities that can be standardized and where checklists can be used. These procedures should be given in writing to all personnel, who should be briefed on their use.

### Step 3: Implementation (**Doing the Right Thing**)

Once the recognition and evaluation phases have been completed and a Site Safety Plan has been prepared, you are ready to enter the scene to complete your preliminary investigation within the framework of the incident management system. During this phase, you should perform a “reality check” and ask the following questions before implementing your operational plan:

- Is it worth it?
- Will people want to do it?
- Will people be physically able to do it?
- Should people actually do it?
- Are there sufficient resources available to safely do it?

This is a critical step because it offers one last safety check to avoid potential safety- and health-related problems. Although you may have successfully completed the first two steps in this process, it does not necessarily mean that personnel should be committed to a course of action. Personnel must be physically capable of performing the required tasks, must have been adequately trained and certified in the use of PPE and equipment, and must be willing to do what is asked of them. Under no circumstances should investigators be forced to perform an activity or succumb to peer pressure and compromise their personal safety to accomplish an objective.

#### Step 4: Verification (**Measuring Progress**)

While conducting scene examinations, constantly verify and evaluate progress to determine if any changes may be warranted or if activities need to be terminated for safety reasons. For example, fire scene atmospheres may change and should be monitored periodically to determine if the level of personal protective clothing and equipment (PPE) should be changed. The investigation into the origin and cause of an incident may disturb debris or uncover hazardous substances that pose substantial health risks to personnel, who may have to be evacuated from the area. Verify the recorded air-monitoring results before you use them as the basis for selecting the proper level of PPE.

#### Step 5: Termination (**Sharing Information**)

Termination is basically the process of documenting the results of the investigation and should include, at a minimum, the following types of information:

- hazardous substances(s) involved;
- resources involved (i.e., personnel, equipment, etc.);
- contributing factors leading to injuries, illnesses, exposures, or death;
- documentation of injuries, exposures, or fatalities;
- personal protective clothing and equipment;
- briefing to share results and recommendations;
- level of training and certification; and
- incident action plan.

Of particular importance are the documentation of all injuries, exposures, and fatalities and the dissemination of any pertinent follow-up information such as recommendations to prevent similar events in the future and improved safety procedures. All personnel must be accounted for before securing site operations. An incident debriefing session should be conducted for all personnel involved in the investigation. Investigators should also ensure that all PPE is reserviced, inspected, and returned to the proper locations.

As an investigator, you must be vigilant in recognizing and identifying potential safety and health hazards. You must develop a “safety sense” and always assume that all fire scenes present safety and health hazards that need to be identified so you can take proper protective measures. The first few minutes at the scene of a fire or an explosion are the most important for investigators in terms of assessing potential safety and health hazards and identifying the appropriate personal protective measures and equipment. All investigators have a responsibility to recognize potential physical, chemical, and biological hazards while working at fire scenes to prevent accidental injuries, exposures, or deaths to themselves and others. However, your organization is responsible for establishing adequate safety and health policies, procedures, and programs; providing appropriate training; and complying with all applicable federal, state and local occupational safety and health regulations. Above all else, remember that your personal safety is the number one priority at any incident!

#### Endnote

1. Refer to Appendix B of NFPA 1500, Fire Service Occupational Safety and Health Program Worksheet, for guidance in evaluating current safety and health programs, for assistance in developing new programs for investigators, and to assist in compliance with applicable safety and health regulations and standards.

Note: Additional safety and health information for investigators may be obtained from the book, Safety and Health Guidelines for Fire and Explosion Investigators, First Edition, published by Fire Protection Publications (Oklahoma State University).