

**American Industrial Hygiene Association  
Industrial Hygienists' Role and Responsibilities  
In Emergency Preparedness and Response  
White Paper**

**1. Executive Summary**

Industrial Hygienists are a vital resource for governmental agencies, private response organizations, and Local Emergency Planning Committees (LEPCs) providing a wide range of health, safety and environmental health expertise to responders, support staff, and the surrounding community. Regardless of the event point in an incident, such as pre-planning, the emergency response, or the consequence management phases, Industrial Hygienists' broad professional experience, training, and educational background provide planners, incident commanders, and community leaders with effective methods to identify, manage, and ultimately, control risks associated with natural disaster, hazardous material accidents, and terrorism events.

**2. Background**

a. AIHA has developed formal alliances with the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), and other organizations to comprehensively address worker health and safety. These relationships are key to protecting responders, and the community in response to a significant emergency.

a. Under the National Response Plan (NRP), Section II (Planning Assumptions and Considerations), the first incident management priority is to "save lives and protect the health and safety of the public, responders, and recovery workers." An IH can meet this priority because of his/her daily professional experience in anticipating, recognizing, evaluating and controlling workplace hazards.

b. NIOSH and the Rand Corporation conducted joint research on ways to protect emergency responders in response to the events of September 11<sup>th</sup> 2001. In Volume 3 of this report, several key recommendations were made, which directly call on the unique skills and academic backgrounds of Industrial Hygienists:

(1) Develop assessment methods, checklists, guidelines and standards to assist in hazard monitoring among multiple agencies.

(2) Develop credentialing systems better suited to major disaster response operations.

(3) Develop minimum standards for safety and health training for all responders involved in disaster response operations.

(4) Develop guidelines for selecting protective equipment to use in the early phase of a response.

(5) Develop guidelines for estimating the safety equipment requirements for disaster response operations.

(6) Effectively address the issue of safety implementation at a response as part of a multi-agency effort.

(7) Provide on-site safety training.

(8) Improve long-term surveillance of responders' health following a major response.

(9) Build an integrated safety function into an Incident Command System.

(10) Develop a group of highly trained safety managers to facilitate coordination at a major incident.

(11) Improve joint exercises and training by incorporating realistic safety and health issues.

(12) Develop a common terminology for disaster safety and health issues and processes for use during response operations.

c. Under the Occupational Safety and Health Act of 1971, an employer is responsible for providing a healthy and safe work environment for its employees. In a response, the incident commander is the employer with a significant responsibility to a large number of "employees", from various private sector and governmental agencies, to ensure that they are properly protected from very often uncharacterized and dangerous environments. With this Act and a variety of health and safety regulatory standards and industry consensus guidelines, an IH can provide technical subject matter expertise to help ensure that the risks of the operations are effectively managed.

d. In an incident response, Industrial Hygienists are expected to function within the designated Incident Command System, as specified by the National Incident Management System (NIMS).

### 3. **Industrial Hygienists' Role in Emergency Preparedness and Response**

a. Many governmental agencies and private organizations provide unique assets and support to a response operation. Therefore, Industrial Hygienists employed with these agencies or private entities are required to meet their organization's mission and goals as related to emergency preparedness and response.

b. Industrial Hygienists must be extremely flexible in their technical competencies, and have broad professional experience in order to contribute successfully to the strategic and tactical objectives of an incident.

c. Below are key roles that Industrial Hygienists may fill in a response and/or planning role:

- (1) Safety Officer
- (2) Assistant Safety Officer
- (3) Safety Coordinator - Joint Field Office (JFO) Coordination Staff
- (3) Technical Specialist - Industrial Hygienist
- (4) Technical Specialist - Air Monitoring Group Supervisor/Member
- (5) Technical Specialist - Field Observer for Safety Officer
- (6) Technical Specialist - Health and Safety Trainer (e.g., HAZWOPER)
- (7) Technical Specialist - Respiratory Protection Program Manager
- (8) Technical Specialist - Risk Assessor/Hazard Analyst
- (9) Other Applicable Duties as Assigned by the incident commander.

#### **4. Specific Incident Command Functions Industrial Hygienists Can Fill in Emergency Preparedness and Response**

a. Industrial Hygiene professionals have and continue to bring a wealth of health and safety competencies and skills to incident planning and response efforts. The NIOSH/RAND Corporation's recommendations effectively outline these functions, which Industrial Hygienists have developed, applied, and continue to improve upon in many types of occupational settings:

##### **b. IH Function#1: Participate in Pre-Planning for a Major Incident.**

(1) One of the Industrial Hygienist's recognized functions is to anticipate occupational health hazards under general industry. This same function applies to pre-planning for an emergency event

(2) The industrial hygienist's function in Pre-planning is to help define the types of disasters likely to be encountered, identify the specific hazards as a result of those disasters, identify the immediate agency or firm's response, and the hazards associated with those response actions.

**c. IH Function#2: Develop and Implement Exposure Assessment Methods to Identify and Prioritize Hazards During the Incident Response & Consequence Management Phases of an Operation.**

(1) Industrial Hygienists understand the importance of studying various processes, identifying the various health and safety hazards (e.g., chemical or physical hazards) associated with those processes, and prioritizing the risks.

(2) The Exposure Assessment Strategies Technical Committee of AIHA has developed a textbook method for the IH practitioner to use in identifying and prioritizing various hazards, and ultimately, characterizing responders and support staff in the form of Similar Exposure Groups (SEGs).

(3) Using SEGs, IHs can effectively monitor those hazards and establish controls in a response and planning mode to minimize or prevent those hazards from affecting incident response personnel.

(4) Exposure assessment methods should include the use of various mathematical models to estimate worker exposure at an incident (e.g., box method), and the use of dispersion models (e.g., Cameo, EPICODE, HOTSPOT) to determine community exposures adjacent and/or downwind of an incident. Other mathematical models should be used to determine appropriate ventilation requirements in enclosed spaces including purge times and minimum air volume rates to control chemical releases.

**d. IH Function#3: Develop and Implement Monitoring Methods to Track Response Personnel's Exposures during the Incident Response & Consequence Management Phases of an Operation.**

(1) Various air, bulk, dermal, biological and direct-reading instrumentation monitoring methods are used by Industrial Hygienists to characterize hazardous exposures encountered by response and support personnel.

(2) In developing these monitoring methods, there are many environmental, legal, and scientific criteria to consider. These criteria are familiar domains for Industrial Hygienists. For example, certain chemical exposures may be best characterized using direct-reading instrumentation, but in order to form a legal basis for actual human

exposures, Personal Breathing Zone (PBZ) methods may have to be used. In addition, the behavior of airflow and the existence of other contaminants can determine the appropriate monitoring and analytical methodology to use.

(3) Industrial Hygienists understand the capabilities and limitations of chemical, biological, and radiological direct-reading instrumentation. Direct-reading instrumentation is prone to false readings due to interferences, or cross-reactivity with similarly structured chemical or biological agents. In addition, direct-reading instrumentation can be affected by temperature, humidity, and moisture presence, which are likely factors in an incident site.

(4) Industrial Hygienists understand the correct application and use of various types of biological monitoring methods and the significance of toxicological and metabolic pathways in assessing exposure and absorption of chemicals into the body.

(5) Finally, Industrial Hygienists are capable of using a variety of dermal exposure monitoring methods to characterize the exposure of responders to toxic chemicals by skin contact. Skin disorders, due to industrial chemical or particulate agents, are still one of the leading occupationally reported illness in general industry because the skin is the largest organ in the body. Therefore, the risk for skin exposure is significantly higher than inhalation or ingestion.

**e. IH Function#4: Interpret Data from Sampling Activities and from Direct-Reading Instrumentation Appropriately.**

(1) Data in the field cannot or should not be taken at face value without proper analysis. Exposure data from a response operation should be interpreted in light of current toxicological data, the specific activity during which the exposure data were obtained, current exposure compliance levels, current recommended exposure guidelines, and the potential for long-term health effects.

(2) Industrial Hygienists can determine, after consulting with various governmental and consensus standards organizations, the appropriate exposure guidelines to use in interpreting the field data. Currently, there are Emergency Response Planning Guidelines (ERPGs) established by the AIHA, Ambient Exposure Guideline Levels (AEGs) established by the EPA in cooperation with the Centers for Disease Control and Prevention (CDC), while federal and state OSHA agencies have occupational exposure limits (OELs). In addition, professional organizations such as the American Conference of Governmental Industrial Hygienists have recommended Threshold Limit Values (TLVs). The data from all of these organizations are reviewed by an IH in order to determine the appropriate standard to use for comparison. This comparison, then, becomes the basis for determining if responder and support staff are significantly exposed to various chemical and physical agents.

**f. IH Function#5: Advise, Develop, and Implement the Appropriate Elimination Controls of Chemical, Biological or Physical Hazards.**

(1) Based upon the exposure data, Industrial Hygienists can advise the Command and General Staff, and the incident commander on ways to ideally eliminate or reduce the hazards at an incident. These characterized hazards could be the consequence of the incident type (e.g., natural disaster or terrorism), or hazards brought into the incident from response organizations.

(2) Examples of eliminating a hazard in an incident response may include identifying and substituting safer chemicals for use in decontaminating personnel and/or equipment.

**g. IH Function#6: Advise, Develop, and Implement the Appropriate Engineering Controls to Minimize Exposure to Chemical, Biological or Physical Agent Hazards.**

(1) If Industrial Hygienists determine, after proper staff coordination with the Planning and Operations Sections, that certain hazards cannot be eliminated from an incident site, engineering controls such as barriers, general ventilation, or local exhaust ventilation should be considered.

(2) In industrial operations, Industrial Hygienists have and continue to focus on these types of controls for a variety of processes.

**h. IH Function#7: Advise, Develop, and Implement Appropriate Safe Work Practices and Administrative Controls to Minimize Exposures.**

(1) In many incidents, chemical, biological or physical hazards are not easily eliminated or reduced to safe levels in areas of responders' activities. Therefore, Industrial Hygienists must develop effective work practices for responders and support staff to protect themselves from these hazards.

(2) Industrial Hygienists can, also, work effectively with Operations and Planning Section Chiefs on administrative controls such as specific training prior to commencing work, or a work shift that minimizes the amount of time that personnel are exposed to those hazards. Planning considerations to develop work practice and administrative controls should include the toxicological properties, the routes of exposures, the quantitative exposure levels, and the long-term health effects associated with those chemical, biological, or physical agents.

**i. IH Function#8: Advise, Develop, and Implement the Appropriate Personal Protective Equipment (PPE) to Minimize Exposures.**

(1) Industrial Hygienists continue to conduct research and consult with many industrial and standards organizations on the appropriate PPE to be worn for protection against chemical, biological, and physical agents.

(2) For chemical hazards, Industrial Hygienists understand the importance of chemical permeability and durability of protective clothing.

(3) In addition, PPE implementation requires training, a maintenance program, and a set of guidelines in order to maximize the PPE's protective characteristics. Industrial Hygienists implement these types of programs daily in many occupational settings.

**j. IH Function#9: Advise, Develop, and Implement Personnel Decontamination Procedures.**

(1) Depending upon the type, and extent of a chemical, biological or physical agent release, decontamination procedures can vary significantly from one response to another.

(2) An Industrial Hygienist can advise, develop, and implement decontamination procedures for response personnel based upon the type of agent (s) involved, the level of contamination at an incident, the type of response operation involved, and the exposure risks to response personnel and the surrounding area. AIHA, for example, is working on a new decontamination guideline for Personal Protective Equipment.

**k. IH Function#10: Advise, Develop, and Implement Remediation Activities for a Facility.**

(1) During the consequence management phase of an operation, remediating facilities and adjacent properties affected by a chemical, biological or physical agent are significant issues. The question “how clean is clean?” has an environmental, legal and public health consequence to both the surrounding community, and the workers normally operating in that facility.

(2) Industrial Hygienists, using various exposure monitoring, sampling methodologies, mathematical modeling, and risk assessment techniques can advise, develop, and implement effective remediation plans to address a facility owner and a community’s concerns regarding the cleanliness and safety of a facility after major recovery operations.

(3) In addition, remediation activities require an assessment of the type of Personal Protective Equipment to use, which may be significantly different from during the emergency response phase. An Industrial Hygienist can advise on the different PPE requirements for remediation activities.

**l. IH Function#11: Advise, Develop, and Implement a Respiratory Protection Program.**

(1) One of the key lessons learned from September 11th, 2001 was the lack of standard respiratory protection among the various response organizations. No consistent

Incident Command Site Safety Plan was developed either addressing or enforcing one set of respiratory protection guidelines.

(2) Industrial Hygienists can develop one, effective program applicable to an entire incident site based upon characterized or uncharacterized atmospheres.

(3) In addition, as learned from September 11th, 2001 where many laborers have not been issued or trained on respiratory protection, IHs can develop the proper training program on site, to include proper qualitative or quantitative fit-tests and fit-checks.

**m. IH Function#12: Effectively Develop Site Safety Plans and Execute Key Incident Command Staff Functions.**

(1) Site Safety Plans, critical within the first few hours of an incident response, inform responders and support staff of the significant hazards and ways to control them. Industrial Hygienists develop such plans of varying complexity as part of various occupational settings.

(2) As professionals, many Industrial Hygienists are knowledgeable about the types of meetings (e.g., Tactical, Planning, and Operations Briefs) associated with executing an effective National Incident Management System. Based upon the characterized hazards or unknown factors in an incident, Industrial Hygienists can advise the Unified Command, General and Command staffs of those hazards and ways to incorporate health and safety practices into an Incident Action Plan.

(3) Within a National Incident Management System (NIMS), Industrial Hygienists can act as a technical liaison with medical and designated technical specialists on safety and occupational health issues. This liaison activity also involves advising on Environmental Health issues such as potable water, food service sanitation, berthing sanitation, and waste management, particularly when responders and support staff must live in less than ideal living conditions while engaged in a prolonged response operation.

**n. IH Function#13: Perform Health and Safety Field Compliance Actions.**

(1) Many Industrial Hygienists have served as on-site Safety Officers or Compliance Officers of federal and state OSHA agencies. This experience brings valuable skills to an incident commander ensuring that safe work operations are occurring.

(2) Compliance actions should be based on standardized Safety and Health guidelines specific to that incident, as outlined in a Site Safety Plan.

(3) Industrial hygienists may be called on to advise the incident commander on Federal OSHA, or state agencies, enforcement issues, related to health and safety issues on-site.

**o. IH Function#14: Perform Variety of Health and Safety Training on-site.**

(1) On-site safety and health training **IS NO SUBSTITUTE** for pre-emergency training skills such as 24-Hour Emergency Response Technician or Specialist training. On-site safety and health training advises response and support staff on the current and specific hazards and required controls for a particular incident.

(2) Industrial Hygienists, involved in ascertaining, characterizing, and evaluating the various hazards in an incident, are great assets to train current or new response personnel, prior to commencing work, on those hazards and ways to control them. This includes conducting "tail-gate" safety briefings with various Divisions, Groups, or Strike Teams, as required.

**p. IH Function#15: Effectively Communicate Risks Based Upon Complex Scientific and Field Data.**

(1) Communicating risks to response and support personnel, as well as to the media, is key, and Industrial Hygienists understand this importance.

(2) Because most Industrial Hygienists are field practitioners, they are skilled in relating laboratory and direct-reading instrumentation results to workers and their supervisors.

(3) In addition, in an incident response operation, Industrial Hygienists can effectively communicate the exposure risks to the community through the media. This risk communication is extremely vital in order to prevent unnecessary concern from the surrounding community, but also, effectively address the community's concerns. This, in turn, can require an Industrial Hygienist to develop other monitoring methods to characterize hazards of particular public concern.

**q. IH Function#16: Incident Investigations Involving Safety or Acute Chemical, Biological or Physical Agent Exposures.**

(1) During either a response or consequence management phase of an operation, responders or support staff may be involved in various mishaps related to safety or short-term exposures to various agents at the site.

(2) Industrial Hygienists are trained to conduct these investigations, possibly as part of a forensics investigation, because of their advanced training in sampling, familiarization with industrial processes, and experience in dealing with Cause-and-Effect forms of analysis. This includes familiarization with various health and safety regulations and recommended guidelines.

## **5. Guidance on Minimum Qualifications and Professional Competencies for Industrial Hygienists to Perform in Emergency Planning and Response.**

a. AIHA recommends that, at a minimum, industrial hygienists involved in emergency planning and response should meet minimum competency requirements in the areas of IH Specialty, Safety Specialty, Emergency Response/Planning, and Individual Professional Skills in order to effectively serve in a response. These requirements specifically include the following areas:

### **b. IH Specialty Skills**

(1) Plan and conduct exposure assessment to include the determination of similar exposure groups based upon health hazard and risk ratings;

(2) Plan, advise, and evaluate adequacy of ventilation controls;

(3) Plan and conduct air sampling for both area and personal breathing zone monitoring in accordance with NIOSH and OSHA Sampling Methodologies;

(4) Determine adequacy of Chemical Protective Clothing (CPC) based upon the type of chemical(s) involved, the environmental conditions that the CPC will be used, and interpretation and evaluation of manufactures' permeation data;

(5) Properly select, train, and fit-test response personnel on various Respiratory Protection devices in accordance with OSHA regulatory standards;

(6) Describe toxicological effects and reference recognized and approved guidance on immediate medical treatments involving common Toxic Industrial Chemicals (TICs), chemical warfare, biological warfare, and radiological agents;

(7) Correctly interpret laboratory and field direct-reading instrumentation data involving airborne chemical levels at the incident by comparing them to the appropriate emergency response guideline level (e.g., AIHA Emergency Response Planning Guideline or EPA Acute Exposure Guideline Levels (AEGLs), or OSHA PEL, or ACGIH TLV);

(8) Describe the capabilities and limitations of various direct-reading instruments for chemical and radiological agents;

(9) Describe the capabilities and limitations of biological agent sampling technologies such as immunoassay, and polymerase chain reaction (PCR).

(10) Describe various biological and dermal exposure monitoring methods, their capabilities, and limitations.

**c. Safety Specialty Skills**

- (1) Understand the basics of fall protection requirements;
- (2) Understand the basics of trenching safety requirements;
- (3) Understand and be able to implement Permit Confined Space Entry requirements;
- (4) Understand the basic safety requirements involving demolition and construction;
- (5) Understand the basics of traffic safety plans at an incident area;
- (6) Understand the basic safety requirements involving material handling, particularly involving heavy lift equipment.

**d. Environmental Health Specialty Skills.**

- (1) Understand basics of drinking water quality methods and standards;
- (2) Understand basics of waste management requirements (e.g., medical waste, hazardous waste, and human waste management);
- (3) Understand basics of living/berthing sanitation issues;
- (4) Understand basic food service sanitation;

**e. Emergency Response/Planning Skills.**

- (1) Describe and effectively apply the National Incident Management System (NIMS);
- (2) Describe and implement the NIMS process of developing an Incident Action Plan;
- (3) Describe and implement the method of effectively developing a Site Safety Plan.
- (4) Describe aspects of the National Response Plan, and applicable state/agency response plans.

**f. Individual Professional Skills**

(1) Able to physically and mentally work long hours at an incident after traveling many hours;

(2) Effective computer skills in using word, spreadsheet, and internet software;

(3) Organize a deployment kit, which includes personal (e.g., clothing, toiletries), and professional (e.g., reference books/reference CD, laptop, required IH monitoring equipment if needed) items;

(4) Good organizational skills such as filing important documents (e.g., air monitoring logs);

(5) Effective communication skills to relay complex scientific data into understandable terms for the incident staff, response personnel, and the public;

(6) Resourceful and takes initiative.

5. **Summary:** Industrial Hygienists play a significant role in protecting the lives of our nation's response personnel, its support staff, and the surrounding community. Industrial Hygienists' technical expertise in occupational and environmental health and safety issues are applicable to a variety of natural disasters, hazardous chemical, biological or radiological releases, and terrorism events. Industrial Hygienists can effectively identify and control risks during Pre-Planning, Emergency Response, and Consequence Management Phases of an incident.

6. **Initiatives by the American Industrial Hygiene Association.**

a. Founded in 1939, the American Industrial Hygiene Association (AIHA) is the premier association of occupational and environmental health and safety professionals. AIHA's 12,000 members play a crucial role on the front line of worker health and safety every day. AIHA produces books, consumer brochures, conferences and other opportunities to learn more about occupational and environmental safety. For more information, go to [www.aiha.org](http://www.aiha.org).

b. Through the appointed Emergency Preparedness and Response (EPR) Task Force, established in 2005, AIHA will focus the on the following objectives:

(1) Identify educational and training opportunities, through its Professional Development Courses, Symposiums, and Distance Learning venues, involving critical EPR tasks related to IH functions.

(2) Advise and develop alliances with organizations related to Emergency Planning and Response (e.g., local AIHA Sections, Local Emergency Planning Committees, National Fire Protection Association).

(3) Recommend EPR tasks, critical to the development of health and safety guidelines for both its members and outside response organizations, to the appropriate AIHA Technical Committees.

**References:**

1. NIOSH/RAND, *Protecting Emergency Responders, Volume 3: Safety Management in Disaster and Terrorism Response*, DHHS (NIOSH) Publication Number: 2004-144, 2004.
2. *National Response Plan*, 2004, Department of Homeland Security.

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