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DOE-STD-1138-2007  
November 2007

# **DOE STANDARD**

## **INDUSTRIAL HYGIENE FUNCTIONAL AREA QUALIFICATION STANDARD**

DOE Defense Nuclear Facilities Technical Personnel



**U.S. Department of Energy  
Washington, D.C. 20585**

**AREA TRNG**

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# DOE-STD-1138-2007

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## DOE-STD-1138-2007

### APPROVAL

The Federal Technical Capability Panel consists of senior U.S. Department of Energy (DOE) managers responsible for overseeing the Federal Technical Capability Program. This Panel is responsible for reviewing and approving the Qualification Standard for Department-wide application. Approval of this Qualification Standard by the Federal Technical Capability Panel is indicated by signature below.



Karen L. Boardman, Chairperson  
Federal Technical Capability Panel

**DOE-STD-1138-2007**

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**DOE-STD-1138-2007**

**TABLE OF CONTENTS**

ACKNOWLEDGMENT ..... iii

PURPOSE ..... 9

APPLICABILITY ..... 9

IMPLEMENTATION ..... 10

EVALUATION REQUIREMENTS ..... 11

INITIAL QUALIFICATION, REQUALIFICATION, AND TRAINING ..... 12

DUTIES AND RESPONSIBILITIES ..... 13

BACKGROUND AND EXPERIENCE ..... 14

REQUIRED TECHNICAL COMPETENCIES ..... 15

APPENDIX A ..... 29

APPENDIX B ..... 31

**DOE-STD-1138-2007**

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# DOE-STD-1138-2007

## ACKNOWLEDGMENT

The Office of Health, Safety and Security is the sponsor for the Industrial Hygiene Functional Area Qualification Standard. The sponsor is responsible for coordinating the development and/or review of the Functional Area Qualification Standard (FAQS) by subject matter experts to ensure that the technical content of the standard is accurate and adequate for Department-wide application for those involved in industrial hygiene. The sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring that the FAQS is maintained current.

The following subject matter experts participated in the development and/or review of this qualification standard:

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**U.S. DEPARTMENT OF ENERGY  
FUNCTIONAL AREA QUALIFICATION STANDARD**

**INDUSTRIAL HYGIENE**

**PURPOSE**

DOE M 426.1-1A, *Federal Technical Capability Manual*, commits the Department to continuously strive for technical excellence. The Technical Qualification Program (TQP), along with the supporting technical qualification standards, complements the personnel processes that support the Department's drive for technical excellence. In support of this goal, the competency requirements defined in the technical qualification standards should be aligned with and integrated into the recruitment and staffing processes for technical positions. The technical qualification standards should form the primary basis for developing vacancy announcements, qualification requirements, crediting plans, interviewing questions, and other criteria associated with the recruitment, selection, and internal placement of technical personnel. The U.S. Office of Personnel Management (OPM) minimum qualifications standards will be greatly enhanced by application of appropriate materials from the technical FAQs.

The technical qualification standards are not intended to replace the OPM qualifications standards nor other Departmental personnel standards, rules, plans, or processes. The primary purpose of the TQP is to ensure that employees have the requisite technical competency to support the mission of the Department. The TQP forms the basis for the development and assignment of DOE personnel responsible for ensuring the safe operation of defense nuclear facilities.

**APPLICABILITY**

Industrial hygiene is the art and science of anticipation, recognition, evaluation, control and management of occupational health hazards. An industrial hygienist, through education and training, is that person whose duties are to advise on, administer, supervise, manage or perform professional and scientific work in industrial hygiene, including the identification and evaluation of conditions affecting the health and efficiency of employees or the public, the formulation and recommendation of measures to eliminate or control occupational health hazards, and the promotion of occupational health programs for instructing and motivating managers and employees in the prevention as well as correction of potential health hazards.

The Industrial Hygiene FAQs establishes common functional area competency requirements for all DOE industrial hygiene personnel who provide assistance, direction, guidance, oversight, or evaluation of contractor technical activities that could impact the safe operation of DOE's defense nuclear facilities. The technical FAQs has been developed as a tool to assist DOE program and field offices in the development and implementation of the TQP in their organization. For ease of transportability of qualifications between DOE elements, program and field offices are expected to use this technical FAQs without modification. Needed additional office/site/facility-specific technical competencies should be handled separately. Satisfactory and documented attainment of the competency requirements contained in this technical FAQs (see the Federal Technical Capability Program Directives and Standards page at

<http://www.hss.energy.gov/deprep/ftcp/directives/directives.asp> for an example of the Industrial Hygiene FAQs qualification card) ensures that personnel possess the minimum requisite competence to fulfill their functional area duties and responsibilities common to the DOE complex. Additionally, office/site/facility-specific qualification standards supplement this technical FAQs and establish unique operational competency requirements at the Headquarters or field element, site, or facility level.

It should be noted that the competency elements of management and leadership, general technical knowledge, regulations, administrative capability, and assessment and oversight are all embodied in the competencies listed in this Standard. All of the factors above have a bearing on safety. Although the focus of this Standard is technical competence, elements, such as, good communication, recognized credibility, ability to listen and process information, and the ability to guide an effort to get it right the first time are recognized as important aspects of safety.

## IMPLEMENTATION

This FAQs identifies the minimum technical competency requirements for DOE industrial hygiene personnel. Although there are other competency requirements associated with the positions held by DOE industrial hygiene personnel, this FAQs is limited to identifying the specific, common technical competencies required throughout all defense nuclear facilities. The competency requirements define the expected knowledge and/or skill that an individual must meet. Each of the competency requirements is further described by a listing of supporting knowledge and/or skill statements. The supporting knowledge and/or skill statements for each competency requirement are provided to challenge the employee in the breadth and depth of his/her understanding of the subject matter.

The terms “shall,” “must,” and “will” denote mandatory requirements in this Standard. “Should” denotes a recommended practice that is not required. “May” denotes an option.

The competencies identify a familiarity level, a working level, or an expert level of knowledge; or they require the individual to demonstrate the ability to perform a task or activity. These levels are defined as follows:

**Familiarity level** is defined as basic knowledge of or exposure to the subject or process adequate to discuss the subject or process with individuals of greater knowledge.

**Working level** is defined as the knowledge required to monitor and assess operations/activities, to apply standards of acceptable performance, and to recognize the need to seek and obtain appropriate expert advice (e.g., technical, legal, safety) or consult appropriate reference materials required to ensure the safety of DOE activities.

**Expert level** is defined as a comprehensive, intensive knowledge of the subject or process sufficient to provide advice in the absence of procedural guidance.

**Demonstrate the ability** is defined as the actual performance of a task or activity in accordance with policy, procedures, guidelines, and/or accepted industry or DOE practices.

## DOE-STD-1138-2007

Headquarters and field elements shall establish a program and process to ensure that DOE industrial hygiene personnel possess the competencies required of their position. That includes the competencies identified in this technical FAQs. Documentation of the completion of the requirements of the Standard shall be included in the employee's training and qualification record. Satisfactory attainment of the competency requirements contained in this technical FAQs may be documented using the example Industrial Hygiene FAQs qualification card that can be obtained from the Federal Technical Capability Program Directives and Standards page at <http://www.hss.energy.gov/deprep/ftcp/directives/directives.asp>.

Equivalencies should be used sparingly and with the utmost rigor and scrutiny to maintain the spirit and intent of the TQP. Equivalencies may be granted for individual competencies based on objective evidence of previous education, training, certification, or experience. Objective evidence includes a combination of transcripts, certifications, and in some cases, a knowledge sampling through a written and/or oral examination. Equivalencies shall be granted in accordance with the TQP Plan of the site/office/Headquarters organization qualifying the individual. When competencies are evaluated by a qualifying official or immediate supervisor who is not qualified in this FAQs, an individual who is qualified in the FAQs should be consulted before equivalencies are granted. In general, any industrial hygienist who is a Certified Industrial Hygienist (CIH) by the American Board of Industrial Hygiene (ABIH) should be granted equivalencies to competencies 1 through 17, 22, and 23 of this standard. The supporting knowledge and/or skill statements and mandatory performance activities should be considered before granting equivalency for a competency.

Training shall be provided to employees in the TQP who do not meet the competencies contained in the technical FAQs. Training may include, but is not limited to, formal classroom and computer-based courses, self-study, mentoring, on-the-job training, and special assignments. Departmental training will be based on appropriate supporting knowledge and/or skill statements similar to the ones listed for each of the competency requirements. Headquarters and field elements should use the supporting knowledge and/or skill statements as a basis for evaluating the content of any training used to provide individuals with the requisite knowledge and/or skill required to meet the technical FAQs competency requirements. Industrial hygiene courses offered by the educational and governmental institutions listed in Appendix A may be used to meet requirements of this standard.

## EVALUATION REQUIREMENTS

Attainment of the competencies listed in this technical FAQs shall be documented in accordance with the TQP Plan or Policy of the site/office/Headquarters organization qualifying the individual and the requirements in DOE M 360.1-1B, Federal Employee Training Manual, and DOE M 426.1-1A.

Competencies assigned the **Expert** level category are essential, core competencies for the position. The preferred method of demonstrating competence is via certification, as a CIH by the ABIH. Alternate methods are listed below, with a more detailed matrix of the applicability of suggested coursework presented in Appendix B:

Unless stated otherwise within the program or site TQP Plan, attainment of the competencies listed in the Industrial Hygiene FAQs should be evaluated and documented by a qualifying official or immediate supervisor (note: if the immediate supervisor is not an industrial hygienist, it is expected the supervisor will consult with a qualified industrial hygienist) using a combination

of the following methods.

- Satisfactory completion of a written examination
- Satisfactory completion of an oral examination
- Satisfactory accomplishment of an observed task or activity directly related to a competency
- Documented evaluation of equivalencies (such as certification by ABIH, an advanced degree by accredited industrial hygiene education program, or applicable experience in the field) without a written examination.

Field element managers/Headquarters program managers shall qualify candidates as possessing the basic technical knowledge, technical discipline competency, and position-specific knowledge, skills, and abilities required for their positions. Final qualification should be performed using one or a combination of the following methods:

- Satisfactory completion of a comprehensive written examination. The minimum passing grade should be 80 percent.
- Satisfactory completion of an oral examination by a qualified Senior Technical Safety Manager (STSM) or a qualification board of technically qualified personnel to include at least one qualified STSM.
- Satisfactory completion of a walkthrough of a facility with a qualifying official for the purpose of verifying a candidate's knowledge and practical skills of selected key elements.

Guidance for oral interviews and written exams is contained in DOE HDBK 1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*, and DOE HDBK 1080-97, *Guide to Good Practices for Oral Examinations*.

For oral examinations and walkthroughs, qualifying officials or board members should ask critical questions intended to integrate identified learning objectives during qualification. Field element managers/Headquarters program managers or designees should develop formal guidance for oral examinations and walkthroughs that includes:

- Standards for qualification
- Use of technical advisors by a board
- Questioning procedures or protocol
- Pass/fail criteria
- Board deliberations and voting authorization procedures
- Documentation process

## INITIAL QUALIFICATION, REQUALIFICATION, AND TRAINING

Qualification of Industrial Hygiene personnel shall be conducted in accordance with the requirements of DOE M 426.1-1A.

Managers or administrators may find it desirable to update the qualification requirements and competencies for industrial hygienists in their organizations. The process should be documented and include any new material added to the Industrial Hygiene FAQs since the individual's last qualification or requalification.

## DOE-STD-1138-2007

DOE industrial hygiene personnel shall participate in continuing education and training as necessary to improve their performance and proficiency, maintain certification, and ensure that they stay up-to-date on changing technology and new requirements. This may include courses and/or training provided by:

- DOE
- Other government agencies
- Outside vendors
- Educational institutions

Beyond formal classroom or computer-based courses, continuing training may include:

- Self-study
- Attendance at symposia, seminars, exhibitions
- Special assignments
- On-the-job experience

A description of suggested learning activities and the requirements for the continuing education and training program for the Industrial Hygiene FAQs are included in Appendix A of this document.

## DUTIES AND RESPONSIBILITIES

The following are the typical duties and responsibilities expected of personnel assigned to the Industrial Hygiene Functional Area:

- A. Maintain communication with Headquarters, field elements, regulatory agencies, the public, professional organizations, labor organizations, and other stakeholders.
- B. Inform DOE management of applicable industrial hygiene project status, activities, and issues.
- C. Plan, observe, and evaluate contractor performance involving industrial hygiene activities to ensure the adequacy and effectiveness of contractor programs such as:
  - Technical performance (e.g., adequacy of technical practices)
  - Plans, policies, and procedures
  - Management controls
  - Worker training and qualification programs
  - Occurrence reporting and corrective actions
  - Occupational health programs
- D. Develop, review, and assess industrial hygiene documentation.
- E. Resolve or facilitate the resolution of industrial hygiene issues.
- F. Develop, implement, and evaluate industrial hygiene strategic, project, and program plans.

## DOE-STD-1138-2007

- G. Promote the sharing of industrial hygienist-related information and technology.
- H. Conduct industrial hygiene evaluations of site-specific technology and practices.
- I. Evaluate the adequacy and effectiveness of Federal and contractor industrial hygiene programs implementation of Department Orders, Federal regulations, statutes, and codes, applicable state and local regulations, and consensus standards.
- J. Within the constraints of their authority, interpret requirements, standards, and guides, and their application.
- K. Participate as subject matter experts in Federal Employee Occupational Safety and Health (FEOSH) programs, site emergency response and emergency management programs, occupational medicine programs, and accident investigations in related subject areas.
- L. Develop, revise, and update industrial hygiene guidance and requirements.

Position-specific duties and responsibilities for industrial hygiene personnel are contained in their office/site/facility-specific qualification standard and/or position description.

## BACKGROUND AND EXPERIENCE

The OPM Qualification Standards Handbook establishes minimum education, training, experience, or other relevant requirements applicable to a particular occupational series/grade level, as well as alternatives to meeting specified requirements.

The preferred education and experience for industrial hygiene personnel are:

1. Education:

Bachelor of Science degree or higher in engineering, science, or a related discipline or meet the alternative requirements specified for engineers, or scientists in the OPM Qualification Standards Handbook. Masters degree (or above) in industrial hygiene or related occupational health professional disciplines.

2. Experience:

Industrial, military, Federal, State, or other directly-related background that has provided specialized experience in industrial hygiene. Specialized experience can be demonstrated through possession of the competencies outlined in this standard.

In general, recognition as a CIH by the ABIH should demonstrate equivalency to competencies 1 through 17, 22, and 23 of this standard.

## REQUIRED TECHNICAL COMPETENCIES

The competencies contained in this Standard are distinct from those competencies contained in the General Technical Base (GTB) Qualification Standard. All Industrial Hygiene personnel must satisfy the competency requirements of the GTB Qualification Standard prior to or in parallel with the competency requirements contained in this Standard. Each of the competency requirements defines the level of expected knowledge and/or skill that an individual must possess to meet the intent of this Standard. Each of the competency requirements is further described by a listing of supporting knowledge and/or skill statements that describe the intent of the competency statement(s).

**Note:** When regulations, DOE directives, or other industry standards are referenced in the FAQs, the most recent revision should be used. It is recognized that some industrial hygiene personnel may oversee facilities that utilize predecessor documents to those identified. In those cases, such documents should be included in local qualification standards via the TQP.

### Anticipation of Health Stressors Associated with the Workplace

#### 1. Industrial hygiene personnel shall demonstrate an expert level knowledge of health stressors that may be found in the workplace and the community.

##### Supporting Knowledge and/or Skills

- a. Discuss the following types of health stressors and provide examples of hazards that may be anticipated:
  - Chemical
  - Biological
  - Physical
- b. Describe how the following sources of information can be used to assist in the anticipation of health stressors:
  - Standards
  - Regulations
  - Standard texts and references
  - Material Safety Data Sheet (MSDS) of materials in site inventories

#### 2. Industrial hygiene personnel shall demonstrate an expert level of knowledge to anticipate and minimize exposure to health stressors during the planning and design phases of a work activity or from an operational description.

##### Supporting Knowledge and/or Skills

- a. Discuss how a review of the following can be used to anticipate and minimize exposure to potential health stressors:
  - Standard texts and references
  - Process/activity raw materials

## DOE-STD-1138-2007

- A description of process chemical reactions
  - Process/activity products and by-products
  - Process/activity equipment
  - Process/activity operating procedures
- b. In planning a work activity, recognize the potential ergonomic hazards that may result from the following:
- Configuration, design, and use of workplace equipment and tools
  - Repetitive motion tasks
  - Work/rest cycle
  - Temperature and other environmental extremes
- c. With support from a design engineer, read and interpret relevant portions of design drawings, plans, and specifications to anticipate and minimize exposure to identify potential health stressors.

### Recognition of Health Stressors Associated with the Workplace

- 3. Industrial hygiene personnel shall demonstrate a working level knowledge of study and observation methods required to recognize and evaluate potential workplace health stressors.**

#### Supporting Knowledge and/or Skills

- a. Discuss how the presence and use of existing control measures affect the evaluation of health stressors.
- b. Describe how the following sensory indications may help with the identification of exposures:
- Odor
  - Hearing
  - Sight
  - Touch

- 4. Industrial hygiene personnel shall demonstrate an expert level knowledge of occupational illnesses and their signs and symptoms and what their presence may indicate about past and current workplace exposure.**

#### Supporting Knowledge and/or Skills

- a. Discuss common signs and symptoms that may indicate an occupational illness or exposure.
- b. Discuss basic concepts of toxicology, including dose response relationship, routes of exposure, and other topics (e.g., synergism, potentiation, and hypersusceptibility).
- c. Discuss examples of workplace stressors and appropriate toxicological reference



## DOE-STD-1138-2007

material for disorders of the central nervous system, respiratory system, as well as skin, ear, liver, kidney, and other target organ effects. For example, discuss some of the following:

- Asbestosis
  - Mesothelioma
  - Pneumoconiosis
  - Dermatitis
  - Cumulative Trauma Disorder
  - Chronic Beryllium Disease
  - Dermatoses
  - Hypersensitivity Pneumonitis
  - Chronic Obstructive Lung Disease
  - Occupational Asthma
  - Bronchogenic Carcinoma
  - Glomerulonephritis
  - Cirrhosis of Liver
  - Jaundice
- d. Discuss the following basic epidemiological terms and provide examples of how each is used:
- Retrospective
  - Case control
  - Cohort
- e. Discuss how a health and safety complaint should be investigated.

### **5. Industrial hygiene personnel shall demonstrate the ability to recognize potential ergonomic and office health hazards.**

#### Supporting Knowledge and/or Skills

- a. Use accepted protocol to identify jobs with potential ergonomic problems.
- b. Recognize and evaluate the following potential ergonomic factors:
- Equipment/tool design and selection
  - Work layout
  - Visual displays
  - Work/rest cycles
  - Work area illumination and color
  - Human capacity/job demands
  - Requirement for manual handling
  - Alternative work schedules and shift work
- c. Recognize and evaluate the following with respect to indoor air quality:
- Temperature and humidity control

## DOE-STD-1138-2007

- Proper heating, ventilating, and air conditioning (HVAC) design and maintenance
- HVAC filter selection
- Risk communication skills
- Introduction of sources of air contaminants into the office environment
- Water leaks

### Evaluation of Health Stressors Associated with the Workplace

**6. Industrial hygiene personnel shall demonstrate a working level knowledge of data collection plans for collecting data that accurately reflect exposure conditions.**

Supporting Knowledge and/or Skills

- a. Discuss the following factors as they relate to sampling strategy:
- Usefulness of bulk samples
  - Degree to which operations being sampled are representative of normal conditions
  - Duration of sampling
  - Level of detection
  - Exposure control methods in use during sampling
  - Sample handling
  - Data recording and management
  - Sample chain of custody
  - Statistical significance of sample results
  - Exposure criteria and limits
  - Consent needs for biological samples
  - Uses and limitations of personal and area sampling

**7. Industrial hygiene personnel shall demonstrate a working level knowledge of sampling techniques.**

Supporting Knowledge and/or Skills

- a. Describe the significance of instrument calibration and operation and data collection methods during sampling.
- b. Describe how multiple exposures affect sampling techniques.
- c. Describe the factors (e.g., concentration, duration, frequency, placement of sample, altitude) that determine the adequacy of samples.
- d. Describe how environmental factors (e.g., wind, rain, temperature extremes) affect the need for further sampling.

**8. Industrial hygiene personnel shall demonstrate a working level knowledge of sample analysis, including the use of appropriate laboratory techniques.**

Supporting Knowledge and/or Skills

- a. Describe the following:
  - Selection of proper analytical instruments, techniques, and methods
  - Sensitivity and specificity of the analytical technique
  - Precision versus accuracy
  - Instrument bias
  - Interferences in sampling
  - Principles of instrument operation
- b. Discuss laboratory data recording requirements.
- c. Discuss the fundamentals of operating analytical equipment, including zeroing and the use of standards.
- d. Discuss the following laboratory concerns and their effect on sample results:
  - Quality assurance
  - Chain of custody (samples and results)
  - Equipment maintenance
  - Laboratory management
  - Laboratory certifications
  - Training
- e. Discuss the value and limitations of sampling during indoor air quality investigations for the following:
  - Environmental conditions
  - Chemical exposure
  - Bioaerosols

**9. Industrial hygiene personnel shall demonstrate an expert level knowledge of the analysis and interpretation of sample results.**

Supporting Knowledge and/or Skills

- a. Discuss how the following are used in the analysis of sampling results:
  - Mathematical and statistical computations
  - Units and conversions
- b. Discuss how the following affect the significance of exposures:
  - Selection of exposure criteria (e.g., action levels)
  - Individual susceptibility to identified hazards
  - Importance of non-occupational exposures

## DOE-STD-1138-2007

- Other occupational exposures
  - Biological sampling results
  - Worker population demographics (e.g., effect of aging on hearing acuity)
  - Confounding factors and additive effects of multiple exposures, synergistic or potentiating conditions
- c. Discuss the role that standards, guidelines, and legal requirements have on analyzing and interpreting results.
- d. Discuss the methods of sampling and their limitations for the following:
- Heat stress (ambient conditions and physiological monitoring)
  - Ergonomic hazards
  - Bioaerosols

### Control of Health Stressors in the Workplace

- 10. Industrial hygiene personnel shall demonstrate a working level knowledge of the methods used to educate people about how to protect themselves from health stressors.**

#### Supporting Knowledge and/or Skills

- a. Discuss the importance of the following as they relate to employee training in industrial hygiene:
- Regulatory training and educational content requirements
  - Qualifications and credibility of course instruction
  - Audience receptivity of educational/training materials, format, and classroom conditions
  - Audience educational level and language skills
  - Bottom-line goals of the education/training being provided
- b. List the fundamental assumptions of public and workplace risk communication, and explain in general both how risk should be explained to a non-technical audience and what should be avoided in risk communication.
- c. Identify the potential, non-occupational hazards associated with employees' lifestyle that may contribute to occupational illness.

- 11. Industrial hygiene personnel shall demonstrate an expert level knowledge of personal protective equipment (PPE) programs for controlling exposure, including their use and limitations.**

#### Supporting Knowledge and/or Skills

- a. Discuss when PPE is an acceptable and appropriate control mechanism.
- b. Discuss how to recognize when PPE is a necessary companion to other control measures.

## DOE-STD-1138-2007

- c. Discuss the selection, use, maintenance, limitations, and capabilities of respiratory equipment and other types of PPE (e.g., eye protection, protective clothing, personal hearing protection).
- d. Discuss how the properties of absorption, adsorption, and filtration mechanisms (respiratory protection) affect the selection of PPE.
- e. Describe the major elements of a hearing conservation program.
- f. Discuss limitations in the use of PPE.
- g. Discuss how regulations, standards, and certification procedures affect the use of PPE.
- h. Discuss the difficulties of optimizing PPE in a complex, multi-exposure environment.
- i. Discuss the use and limitations of PPE in a heat stress environment.

**12. Industrial hygiene personnel shall demonstrate a working level knowledge of the design of engineering measures to control exposure.**

Supporting Knowledge and/or Skills

- a. Discuss basic design principles for HVAC systems, including the following:
  - Local exhaust ventilation
  - Dilution ventilation
  - Air recirculation
  - Make-up air supply
  - Gloveboxes (design)
  - Exhaust cabinets (design and classification)
- b. Describe the design principles and performance of air filtration systems, and explain the roles they play in minimizing worker exposure to chemical and biological hazards.
  - High Efficiency Particulate Air (HEPA) filtration (filter testing and certification, design features)
- c. Discuss the interpretation and applicability of regulations and standards governing ventilation systems, such as the following:
  - DOE-HDBK-1169-2003 Nuclear Air Cleaning Handbook
- d. Describe the following environmental factors:
  - Atmospheric dispersion modeling
  - Control of hypo- and hyperbaric conditions
  - Psychometry

## DOE-STD-1138-2007

- e. Discuss the principles of isolation and enclosure as they relate to the following:
  - Noise
  - Air contaminants
  - Radiation
- f. Discuss the economic feasibility parameters of the following:
  - Engineering controls, including process change, substitution for less toxic material, and pollution prevention principles (including environmentally preferable purchasing)
  - Administrative controls
  - PPE
- g. Discuss how engineering controls may be implemented for each of the following:
  - Non-ionizing radiation
  - Ionizing radiation
  - Noise
  - Vibration
  - Repetitive motions
  - Lifting heavy objects
  - Biological hazards
  - Heat and humidity
  - Cold stress

**13. Industrial hygiene personnel shall demonstrate a working level knowledge of the design of administrative measures to control exposure or protect employees.**

Supporting Knowledge and/or Skills

- a. Describe how the following administrative measures may contribute to exposure control:
  - Substitute hazardous materials
  - Identify opportunities to reduce use of toxic materials during design reviews
  - Change work practices
  - Change operations and scheduling
  - Institute standard operating procedures
  - Reduce exposure time
  - Establish work/rest regimen for heat stress control
  - Encourage good personal hygiene practices
  - Promote and implement good housekeeping practices
- b. Discuss how the following may be needed to implement effective exposure control:
  - Medical surveillance of exposed employees
  - Medical removal protection for affected workers

## DOE-STD-1138-2007

- Pre-placement exams and periodic medical screening

### 14. Industrial hygiene personnel shall demonstrate a working level knowledge of the methods used to promote effective communication and control of hazards.

#### Supporting Knowledge and/or Skills

- a. Describe how to prepare a technical report.
- b. Discuss major recordkeeping requirements.
- c. Discuss how to ensure the implementation of preferred control measures (including the desired hierarchy of controls), alternatives, and/or interim control measures.
- d. Discuss development of a schedule for the implementation of control measures.
- e. Discuss how the occupational health aspects of a required task, and the imposition of controls and their related costs necessary for occupational health during the task, may affect management's prioritization of work or the completion of work that is affected by that task.

### Management of Industrial Hygiene Programs

### 15. Industrial hygiene personnel shall demonstrate an expert level knowledge of industrial hygiene programs.

#### Supporting Knowledge and/or Skills

- a. Describe the major components of sound industrial hygiene programs.
- b. Discuss management of industrial hygiene resources.
- c. Discuss the impact of legal requirements.
- d. Discuss the implications of noncompliance.
- e. Discuss how industrial hygiene programs relate to other environmental, safety, and health programs, and to the broad goals of protecting not only the worker, but also the public and the environment.
- f. Describe typical performance indicators and measures of success and completeness in an industrial hygiene program.
- g. Discuss the various types of industrial hygiene surveys (baseline, walkthroughs, periodic, etc).

### Professional and Ethical Issues

**16. Industrial hygiene personnel shall demonstrate a working level knowledge of professional and ethical issues.**

Supporting Knowledge and/or Skills

- a. Discuss legal issues affecting the practice of industrial hygiene, including confidentiality of medical data and restraint of trade (antitrust).
- b. Discuss ethical behavior in scientific data gathering and reporting.
- c. Discuss personal ethical behavior, including the following:
  - Misrepresentation of qualifications and credentials
  - Conflict of interest

**17. Industrial hygiene personnel shall demonstrate a familiarity level knowledge of the principal external committees, agencies, and associations relating to the field of industrial hygiene.**

Supporting Knowledge and/or Skills

- a. Describe the purpose and significance of the following:
  - American Industrial Hygiene Association (AIHA)
  - American Conference of Governmental Industrial Hygienists (ACGIH)
  - American Board of Industrial Hygiene (ABIH)
  - American National Standards Institute (ANSI)
  - American Society of Safety Engineers (ASSE)
  - American Society of Testing Materials (ASTM)
  - Center for Disease Control (CDC)
  - Environmental Protection Agency (EPA)
  - Factory Mutual (FM) or Underwriters Laboratories (UL)
  - Mine Safety and Health Administration (MSHA)
  - National Fire Protection Association (NFPA)
  - National Institute of Occupational Safety and Health (NIOSH)
  - National Institute of Health (NIH)
  - Occupational Safety and Health Administration (OSHA)

**18. Industrial hygiene personnel shall demonstrate the ability to evaluate the adequacy of local compliance or conformance with the following document sections:**

**10 CFR 850, *Chronic Beryllium Disease Prevention Program***

**10 CFR 851, *Worker Safety and Health Program***

**29 CFR 1910, *Occupational Safety and Health Standards*, such as the following:**

- Subpart C, *Reserved*



## DOE-STD-1138-2007

- Subpart G, *Occupational Health and Environment Control*
- Subpart H, *Hazardous Materials* (including 1910.120, *Hazardous Waste Operations and Emergency Response*)
- Subpart I, *Personal Protective Equipment*
- Subpart J, *General Environmental Controls* (including 1910.146, *Permit-required Confined Spaces*)
- Subpart K, *Medical and First Aid*
- Subpart Q, *Welding, Cutting, and Brazing*
- Subpart Z, *Toxic and Hazardous Substances*

### **29 CFR 1926, Safety and Health Standards, such as the following:**

- Subpart D, *Occupational Health and Environment Control*
- Subpart E, *Personal Protective and Life Saving Equipment*
- Subpart H, *Material Handling, Storage, Use, and Disposal*
- Subpart J, *Welding and Cutting*
- Subpart Y, *Recordkeeping*
- Appendixes A & B to Subpart Y, *Examples Of Conditions That May Restrict or Limit Exposure to Hyperbaric Conditions and Guidelines for Scientific Diving*
- Subpart Z, *Toxic and Hazardous Substances*

### **Other Federal Regulations, such as the following:**

- 10 CFR 830, *Nuclear Safety Management*
- 10 CFR 830, *Quality Assurance* (specially section 122)
- 10 CFR 835, *Occupational Radiation Protection*
- 29 CFR 1960, *Basic Program Elements for Federal Employees*
- 40 CFR 763, *Asbestos*
- 42 CFR 73, *Select Agents and Toxins*

### **Other Industrial hygiene-related technical standards, such as the following:**

- DOE-STD-6005-2001, *Industrial Hygiene Practices*
- DOE G 440.1-7A, *Implementation Guide for Use with 10 CFR 850, Chronic Beryllium Disease Prevention Program*
- DOE M 231.1-1A, *Environment, Safety and Health Reporting Manual*
- ANSI Z88.2, *Practices for Respiratory Protection*
- ANSI Z88, *Respiratory Protection, Respirator Use, and Physical Qualifications for Personnel*
- ANSI Z136.1, *Safe Use of Lasers*
- ANSI Z358.1, *Emergency Eyewash and Shower Equipment*
- ANSI C95.1, *Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz*
- ACGIH TLV Booklet, *American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*
- ANSI Z49.1, *Safety in Welding, Cutting and Allied Processes*

## DOE-STD-1138-2007

In general, industrial hygienists should be able to demonstrate the ability to research existing official interpretations (OSHA or DOE) on the application of standards and requirements.

### Supporting Knowledge and/or Skills

- a. Describe the purpose, scope, and application of the requirements or guidelines detailed in the listed document sections.
  - b. Discuss what constitutes acceptable contractor work performance consistent with the requirements or guidelines of the above regulations and technical standards.
  - c. Using selected sections from 29 CFR 1910, 29 CFR 1926, and technical standards, prepare an action plan that adequately outlines interviews and observations to conduct, and details documents to review, during an evaluation of contractor compliance or conformance against the requirements of the selected sections.
  - d. Using an appropriate level of coverage for demonstration purposes, evaluate contractor compliance with the requirements of selected sections of 29 CFR 1910, 29 CFR 1926, and technical standards. During this evaluation, demonstrate the ability to conduct interviews, make observations, and review documents properly.
  - e. Given data from an evaluation, analyze the results of the evaluation to determine contractor compliance or conformance with the requirements or guidelines.
  - f. Given the results from an analysis of contractor compliance or conformance, document and communicate the results to contractor and Department line management.
19. **Industrial hygiene personnel shall demonstrate the ability to determine the adequacy of local compliance or conformance with the industrial hygiene-related sections and/or requirements of DOE Orders such as the following:**
- DOE O 151.1C, *Comprehensive Emergency Management System*
  - DOE M 231.1-1A, *Environment, Safety and Health Reporting Manual*
  - DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*
  - DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*
  - DOE O 225.1A, *Accident Investigations*
  - DOE O 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*
  - DOE O 414.1C, *Quality Assurance*
  - DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*
  - DOE O 442.1A, *Department of Energy Employee Concerns Program*

Note: At some sites the earlier versions of DOE Orders may remain as contractual requirements.

### Supporting Knowledge and/or Skills

- a. Describe the purpose, scope, and application of the requirements or guidelines

## DOE-STD-1138-2007

detailed in the listed Orders and guides with respect to industrial hygiene.

- b. Discuss what constitutes acceptable contractor compliance and work performance consistent with the requirements and recommendations of the Orders and guides above.
- c. Using an appropriate level of coverage for demonstration purposes, evaluate contractor compliance with the requirements or guidelines of the selected Orders. During this evaluation, demonstrate the ability to conduct interviews, make observations, and review documents properly.
- d. Given data from an evaluation, analyze the results of the evaluation to determine contractor compliance or noncompliance with the requirements.
- e. Given the results from an analysis of contractor compliance or noncompliance, document and communicate the results to contractor and Department line management.

### Assessment and Appraisal Performance

- 20. Industrial hygiene personnel shall demonstrate a working level knowledge of assessment performance, including assessment planning, the use of field observations, employee interviews, and document reviews in the assessment of industrial hygiene performance.**

#### Supporting Knowledge and/or Skills

- a. Describe the role of an industrial hygienist with respect to oversight of contractor-operated DOE facilities and operations.
- b. Describe the assessment requirements and limitations associated with the Federal interface with contractor employees.
- c. Complete at least one assessment in accordance with the local DOE procedures, practices, and expectations. The scope of the assessment shall encompass site-specific methods of hazard analysis and employee exposure assessment.

### Assessment Report Preparation

- 21. Industrial hygiene personnel shall demonstrate the ability to prepare assessment reports that document assessment results, support assessment conclusions, and clearly communicate conclusions and recommendations for corrective action.**

#### Supporting Knowledge and/or Skills

- a. Distinguish between compliance-based and performance-based assessments.
- b. Complete an assessment appraisal report. The appraisal report shall be completed in the local DOE format or in accordance with local procedures, practices, and expectations. The report shall demonstrate specific knowledge of the site's methods of hazard analysis and employee exposure assessment.

**22. Industrial hygiene personnel shall demonstrate the ability to trend and analyze industrial hygiene-related information.**

Supporting Knowledge and/or Skills

- a. Identify and discuss the principal performance indicators that are normally used to review industrial hygiene performance and effectiveness.
- b. Trend and analyze relevant facility operations information and discuss the relationship of operations information to industrial hygiene performance.

**23. Industrial hygiene personnel shall demonstrate a working level knowledge of the interrelationship between quality assurance programs and industrial hygiene.**

Supporting Knowledge and/or Skills

- a. Describe how an industrial hygiene program may be evaluated for quality assurance activities, including the following:
  - Industrial hygiene program procedures
  - Sampling methods and chain of custody
  - Laboratory accreditation
  - Evaluation and maintenance of documentation
  - Independent verification
  - Technical staff qualifications

**24. Industrial hygiene personnel shall demonstrate the ability to apply recognized technical practices and guidance properly to DOE non-industrial or non-repetitive work activities.**

Supporting Knowledge and/or Skills

- a. Apply DOE Orders and standards logically and appropriately to environmental management and restoration sites.
- b. Apply industrial hygiene technical practices to the DOE Integrated Safety Management (ISM) initiative and its validations.
- c. Research and apply best management practices to emerging occupational health concerns that are not well regulated [Research and Development (R&D), nanotechnology].

APPENDIX A  
CONTINUING EDUCATION, TRAINING, AND PROFICIENCY PROGRAM

The following list represents suggested continuing education, training, and other opportunities that are available for DOE personnel after completion of the competency requirements in this technical FAQs. It is extremely important that personnel involved with this program maintain their proficiency primarily by regularly demonstrating their competency through on-the-job performance, supplemented with continuing education, training, reading, or other activities, such as, workshops, seminars, and conferences. The list of suggested activities was developed by the subject matter experts involved in the development of the FAQs and is not all-inclusive.

Based on the knowledge and experience of the subject matter experts, it is suggested that the following activities support the maintenance of proficiency in the Industrial Hygiene Functional Area after completion of the competencies in the Standard and other requirements of the TQP.

**LIST OF CONTINUING EDUCATION, TRAINING, AND OTHER ACTIVITIES**

1. Continuing technical education and/or training covering topics directly related to the industrial hygiene area as determined appropriate by management. This may include courses/training provided by DOE, other government agencies, outside vendors, or local educational institutions. Continuing training topics should also address identified weaknesses in the knowledge or skills of the individual personnel.
  - a. NIOSH EDUCATION CENTERS. A list of academic degree programs and research training opportunities, supported by NIOSH through university-based Education and Research Centers (ERCs), in the core areas of industrial hygiene, occupational health nursing, occupational medicine, and occupational safety, plus specialized areas relevant to the occupational safety and health field is found at NIOSH websites including at <http://www.cdc.gov/niosh/oeep/centers.html>.
  - b. OSHA TRAINING INSTITUTE. A list of course offerings provided by the OSHA Training Institute (OTI) and its Education Centers throughout the country are listed at OSHA websites including at <http://www.osha.gov/fso/ote/training/edcenters/index.html>.
  - c. ACCREDITED INDUSTRIAL HYGIENE PROGRAMS. A list of Accreditation Board for Engineering and Technology (ABET) accredited Industrial Hygiene programs is listed at the ABIH website at <http://www.abih.org/certified/applicants/ihprograms.html>.
2. Attend seminars, symposia, or technical meetings related to industrial hygiene.
3. Engage in self-study of new regulations, requirements, or advances related to industrial hygiene.
4. Participation in practical exercises such as emergency or operational drills, simulations, or laboratory-type exercises.
5. Specific continuing training requirements shall be documented in Individual Development Plans (IDPs).

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**APPENDIX B**  
**SUGGESTED COURSEWORK FOR EXPERT LEVEL**  
**COMPETENCIES MATRIX**

The preferred means of demonstrating **Expert** level competency is via certification, as a CIH by the ABIH. Alternative means may include completion of the suggested coursework indicated in the attached matrix as judged appropriate by the qualifying official.

EXPERT LEVEL COMPETENCY DESCRIPTION	Suggested Coursework
Competency 1. Industrial hygiene personnel shall demonstrate an expert level knowledge of health stressors that may be found in the workplace and the community.	Not Normally Appropriate (NNA)
Competency 2. Industrial hygiene personnel shall demonstrate an expert level of knowledge to anticipate and minimize exposure to health stressors during the planning and design phases of a work activity or from an operational description.	2.a. and 2.c. – NNA  2.b. – 40 hr ergonomic hazard/program course or equivalent
Competency 4. Industrial hygiene personnel shall demonstrate an expert level knowledge of occupational illnesses and their sign and symptoms and what their presence may indicate about past and current workplace exposure.	4.a., 4.b., and 4d – 40 hr Fundamentals of Industrial Hygiene course or equivalent  4.c. and 4.e. – NNA
Competency 9. Industrial hygiene personnel shall demonstrate an expert level knowledge of the analysis and interpretation of sample results.	9.a. – sampling strategy statistics course or equivalent  9.b., 9c, and 9d – NNA
Competency 11. Industrial hygiene personnel shall demonstrate an expert level knowledge of personal protective equipment (PPE) programs for controlling exposure, including their use and limitations.	11.a., 11.b., 11.c., 11.d., 11.f., 11.g., and 11.h. – NNA  11.e. – a hearing conservation program course or equivalent  11.i. – a course on thermal stress (may be addressed in 29 CFR 1910.120 courses)
Competency 15. Industrial hygiene personnel shall demonstrate an expert level knowledge of industrial hygiene programs.	15.a. – 40 hr Fundamentals of Industrial Hygiene course or equivalent  15.b., 15.c., 15.d., 15.e., 15.f., and 15.g. – NNA

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CONCLUDING MATERIAL

**Review Activity:**

CTA  
EM  
GC  
HS  
NNSA  
SC

**Field and Operations Offices:**

ORO  
ORP  
RL  
SRO

**Site Offices:**

Brookhaven Site Office  
Carlsbad Field Office  
Livermore Site Office  
Princeton Site Office  
Y-12 Site Office

**Preparing Activity:**

DOE-HS-11

**Preparing Activity Supporting Offices:**

Sandia Site Office  
NNSA Service Center  
Livermore Site Office  
RL  
WVDP

**Project Number:**

TRNG-0048