

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

AIR FORCE INSTRUCTION 48-158

27 MARCH 2014

Aerospace Medicine

**OCCUPATIONAL EXPOSURE TO
HAZARDOUS CHEMICALS IN
LABORATORIES**



COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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RELEASABILITY: There are no releasability restrictions on this publication.

OPR: AFMSA/SG3PB

Certified by: AF/SG3
(Brig Gen Charles E. Potter)

Supersedes: AFOSHSTD48-22,
21 March 1994

Pages: 11

The purpose of this instruction provides the requirements for a Chemical Hygiene Plan (CHP), assigns responsibilities, and provides guidance for protecting workers from the health hazards presented by hazardous chemicals used in the laboratory work environment.

This instruction implements the Occupational Safety and Health Administration (OSHA) Standard Title 29 Code of Federal Regulations (CFR) 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, for Air Force laboratories that meet the definition of a laboratory in this instruction. The OSHA regulation and this instruction prescribe the minimum requirements for an effective chemical hygiene program for Air Force laboratories. Major Commands (MAJCOMs), Direct Reporting Units (DRUs), and Field Operating Agencies (FOAs) may not waive any of these requirements, but may supplement this instruction when additional or more stringent criteria are required. Request for Tier waivers must be submitted through the chain of command to the appropriate Tier waiver approval authority. Send comments and suggested improvements on AF Form 847, *Recommendation for Change of Publication*, through channels, to AFMSA/SG3PB, 7700 Arlington Blvd, Falls Church, VA 22042. Refer to AFI 33-360, *Publications and Forms Management*, for instructions on processing supplements, variances, and Tier waiver authority. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located in the Air Force Records Information Management System (AFRIMS). The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement the Air Force. Implementation of this AFI shall supersede, for laboratories, the requirements of all other OSHA

Health Standards contained in 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances*, except as noted in 29 CFR 1910.1450 (a) (2). Other requirements, such as the Occupational and Environmental Exposure Limits (OEELs) and the Occupational and Environmental Health Program are not altered for laboratory operations.

This instruction applies to laboratory operations, as defined in 29 CFR 1910.1450, performed by United States (US) civilian and military workers and direct hire foreign nationals (as established by the Status of Forces Agreements) of the Air Force, Air National Guard, and Air Force Reserve. Government-owned, contractor-operated (GOCO) laboratories within the continental United States (CONUS) or US territories shall implement 29 CFR 1910.1450. GOCO laboratories located outside the regulatory jurisdiction of the CONUS or the US territories that are not covered by the Occupational Safety and Health Act shall comply with this instruction in response to Federal Acquisition Regulation (FAR) 52.223-3, *Hazardous Material Identification and Material Safety Data* and Defense Federal Acquisition Regulation Supplement (DFARS), Clause 252. 233-7001, *Choice of Law Overseas*. Contracting Officers shall include this clause in the appropriate section of the contract.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include update of several references to align with updated publications and changes were made to organizational and individual responsibilities.

Chapter 1

PROGRAM OVERVIEW

1.1. Overview. This instruction only applies to uses of hazardous chemicals that meet the definition of Laboratory Use of Hazardous Chemicals (29 CFR 1910.1450 (b)). The definition typically encompasses educational, histopathology, clinical, and small experimental laboratories. It specifically excludes routine tests or operations that are part of, or adjunct to, a production operation. Therefore, this instruction usually does not apply to dental, pharmacy, nondestructive inspection (NDI), precision measurement equipment laboratories (PMEL), and quality control labs. This instruction does not apply to laboratory operations that rely solely on prepackaged, commercially-prepared kits. JBAIDS labs and most Bioenvironmental Engineering (BE) drinking water test procedures rely on these kits and, therefore, these laboratories would not be covered by this standard. Refer to the OSHA website for interpretation at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATION_S&p_id=20190.

1.2. Laboratories. In laboratories where this instruction applies, the requirements of AFI 90-821, *Hazard Communication*, do not apply.

1.3. Evaluation and Control. The evaluation and control of biological hazards associated with laboratory operations will be made in accordance with 29 CFR Part 1910.1030, *Bloodborne Pathogens*.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. Unit Commander. The unit commander (or equivalent) shall:

- 2.1.1. Have ultimate responsibility for the chemical hygiene program in the unit. (T-0)
- 2.1.2. Appoint a chemical hygiene officer (CHO). (T-0)

2.2. Chemical Hygiene Officer. The CHO shall:

- 2.2.1. Be an officer, non-commissioned officer (NCO) or civilian to act as CHO, an NCO will have attained a 7-level qualification (or equivalent for civilians) in an appropriate specialty. (T-2)
- 2.2.2. Develop, implement, and maintain the CHP. (T-0)
- 2.2.3. Develop protective measures with Bioenvironmental Engineering (BE). (T-1)
- 2.2.4. Monitor procurement, use, and disposal of chemicals. (T-0)
- 2.2.5. Routinely audit and document compliance with the CHP. (T-0)
- 2.2.6. Report the status of chemical hygiene program compliance to the laboratory supervisor as needed. (T-3)
- 2.2.7. Annually review and evaluate the effectiveness of the CHP and update it as necessary. The annual review must be documented on the CHP. (T-0)

2.3. Laboratory Supervisor. The Laboratory Supervisor has overall responsibility for the execution of the CHP in the laboratory. The Laboratory Supervisor may also be designated as the CHO. The Laboratory Supervisor shall:

- 2.3.1. Maintain an accurate hazardous material inventory. (T-1)
- 2.3.2. Ensure workers know and follow chemical hygiene procedures. (T-0)
- 2.3.3. Maintain adequate supplies of protective equipment. (T-0)
- 2.3.4. Routinely inspect chemical hygiene procedures and emergency equipment and ensure training and facilities are adequate. (T-0)
- 2.3.5. Provide workers with information and training to ensure they are apprised of the hazards of chemicals present in their area. (T-0)

2.4. Workers. Workers shall:

- 2.4.1. Maintain familiarity with the CHP and know how to access the CHP. (T-0)
- 2.4.2. Conduct laboratory operations according to procedures documented in the CHP. (T-0)

2.5. Bioenvironmental Engineering. BE shall:

- 2.5.1. Serve as the principal advisor and contact for chemical hygiene matters related to exposure determination, monitoring, notification, and control measures. (T-1)

2.5.2. Resolve questions regarding the definition of "laboratory" as it applies to AF facilities. BE may contact the USAF School of Aerospace Medicine, Occupational and Environmental Health Division (USAFSAM/OE) if further clarification is needed. (T-3)

2.5.3. Coordinate on both the draft and the final CHP and any subsequent changes. (T-2)

2.5.4. Assist the CHO in determining methods to detect the release of hazardous chemicals. (T-1)

2.5.5. Recommend control measures to protect workers from chemical hazards. (T-0)

2.5.6. Inform CHOs of changes and interpretations of laboratory requirements that might affect laboratory procedures. (T-1)

2.5.7. Evaluate potential chemical hazards and the adequacy of the CHP during routine assessments. (T-0)

2.5.8. Conduct worker exposure determinations and inform workers of monitoring results in writing within 15 working days after receipt unless more stringent requirements apply. (T-0)

2.6. Fire Prevention Offices. The Fire Prevention officials are the primary contacts for matters pertaining to explosion and fire hazards. Fire Prevention shall be requested to assist Laboratory Supervisors to develop training as appropriate. (T-3)

2.6.1. Coordinate on both the draft and the final CHP and any subsequent changes. (T-3)

2.7. Ground Safety Office. The Ground Safety officials are the primary contacts for matters pertaining to occupational safety hazards. Safety personnel shall be requested to assist Laboratory Supervisors develop training as appropriate. (T-3)

2.7.1. Coordinate on both the draft and the final CHP and any subsequent changes. (T-3)

2.8. Public Health (PH). PH serves as the primary contact for occupational health surveillance and monitoring IAW AFI 48-145. (T-2)

Chapter 3

GUIDANCE AND PROCEDURES

3.1. General Requirements. The elements of a complete laboratory safety and health program include: a written chemical hygiene plan, the appointment of a chemical hygiene officer, medical consultation/examination, worker information and training, mishap reporting, hazard identification through use of labels and Safety Data Sheets (SDS), hazard controls, record keeping, worker exposure determination and notification, and chemical selection.

3.2. Specific Requirements:

3.2.1. **Written CHP.** Each laboratory will maintain a tailored CHP. The CHP shall be readily available to all workers. The format for this plan should follow the outline in Appendix A of 29 CFR 1910.1450. Organizations with multiple laboratories may write a generic CHP with appendices specific to each functional area. The plan shall meet the requirements of 29 CFR 1910.1450 (e). (T-0)

3.2.1.1. Specific work practices and equipment to reduce hazards must be clearly outlined for all laboratory procedures. These measures may be included by reference if the reference is readily available for use by the laboratory workers.

3.2.2. **Appointment of a Chemical Hygiene Officer.** A qualified CHO will be assigned to develop, implement, maintain, and audit the CHP in accordance with 29 CFR 1910.1450 (e). A copy of the appointment letter will be provided to BE. (T-0)

3.2.3. **Medical Consultation and Medical Examinations.** Workers will be provided medical consultation and medical examinations under the circumstances listed in 29 CFR 1910.1450 (g). The installation Occupational Medicine (OM) consultant, or Aerospace Medicine Flight, if OM consultant is not present, will provide medical consultation and medical surveillance examinations (MSE) for personnel who work with hazardous chemicals IAW AFMAN 48-146, *Occupational and Environmental Health Program Management*. Medical opinions required by 29 CFR 1910.1450 (g) (4) will be documented as directed by AFI 48-145, *Occupational and Environmental Health Program*. (T-0)

3.2.3.1. Provisions for medical consultations and required MSE are detailed in AFMAN 48-146 and AFI 48-145. The Occupational and Environmental Health Working Group (OEHWG) determines clinical MSE requirements IAW 48-145, including pregnancy profiles IAW AFI 44-102, *Medical Care Management*.

3.2.3.2. The OEHWG, performs the function of a Chemical Hygiene Committee. If problems arise concerning the Chemical Hygiene Plan, they will be referred to the Aerospace Medicine Council (AMC) for resolution. When the AMC convenes to discuss chemical hygiene problems, the membership should be expanded to include the laboratory supervisor, CHO, and other representatives, as necessary. (T-0)

3.2.4. **Worker Information and Training.** Laboratory Supervisors will assure that workers are provided the following information and training which apprise them of the hazards present in their work area:

3.2.4.1. **Information:** (T-0)

- 3.2.4.1.1. Contents of 29 CFR 1910.1450. (T-0)
- 3.2.4.1.2. Location and availability of the Chemical Hygiene Plan. (T-0)
- 3.2.4.1.3. Signs and symptoms associated with exposures to hazardous chemicals. (T-0)
- 3.2.4.1.4. Location and availability of reference material such as safety data sheets on the hazards, safe handling, storage and disposal of hazardous chemicals within the laboratory. (T-0)
- 3.2.4.2. Training will include: (T-0)
 - 3.2.4.2.1. Methods and observations that may be used to detect the presence of hazardous chemicals. (T-0)
 - 3.2.4.2.2. Physical and health hazards of chemicals in the work area. (T-0)
 - 3.2.4.2.3. Measures workers can take to protect themselves from these hazards such as work practices, emergency procedures, and personal protective equipment. (T-0)
- 3.2.4.3. This training will be documented in accordance with AFI 91-202, para 1.5.21.4., *The US Air Force Mishap Prevention Program*. (T-2)
- 3.2.5. Mishap, Potential Mishap, or Occupational Overexposures. The Laboratory Supervisor shall report mishaps as required in AFI 91-204 and AFI 48-145. PH will provide the information required by 29 CFR 1910.1450 (g) (3) to the physician. When a private physician is used, the Laboratory Supervisor shall notify PH within 24 hours of a suspected or known overexposure of a civilian. PH will consult with the Chief of Aerospace Medicine or OM Consultant. The OEHWG Chairperson will request that the physician provide a written opinion as required in 29 CFR 1910.1450 (g) (4). (T-0)
- 3.2.6. Hazard Identification:
 - 3.2.6.1. Original containers of a hazardous chemical will be labeled according to 29 CFR 1910.1450 (h) (1). All other chemical containers in the laboratory, regardless of size or type, will be labeled with its contents. (T-0)
 - 3.2.6.2. SDSs will be maintained according to 29 CFR 1910.1450 (h) (1) (ii). (T-0)
 - 3.2.6.3. Provisions for dealing with chemical substances developed in the laboratory are contained in 29 CFR 1910.1450 (h) (2) (i), (ii), and (iii). (T-0)
- 3.2.7. Hazard Controls. BE will evaluate potential exposures to chemical hazards in laboratories and determine the need for controls. The hierarchy of controls will be used when making control recommendations IAW 48-145, para. 4.3.5.5.3.2. (T-0)
 - 3.2.7.1. Recommendations for administrative, engineering (e.g. laboratory-type hoods) and personal protective equipment will be provided by BE. This can be part of the routine assessment report or it can be accomplished during a special assessment. BE will routinely assess the effectiveness of all laboratory hoods at a frequency determined by BE. (T-1)
 - 3.2.7.2. BE will evaluate potential inhalation hazards and determine the need for respirators and if required, the type of respirators required. Respirators will be provided

according to 29 CFR 1910.1450 (i), and selected and used in accordance with AFOSH Std 48-137, *Respiratory Protection Program*. (T-0)

3.2.7.3. When the CHO becomes aware of new or modified laboratory operations that use new or existing chemicals, BE will be notified and an evaluation will be conducted as outlined in AFI 48-145. (T-1)

3.2.8. Record keeping. Records of worker monitoring, medical consultations, and examinations (29 CFR 1910.1450 (j)) will be maintained according to AFI 48-145. (T-0)

3.2.9. Worker Exposure Determination and Notification. Worker exposure determinations and notification shall comply with 29 CFR 1910.1450 (d). BE conducts worker exposure determinations whenever there is reason to believe that exposures to a substance that may exceed the action level and/or the OEEL IAW **paragraph 2.5.7** and **2.5.8**. If monitoring is required, notification may be either made individually or by posting results in an appropriate location that is accessible to workers. (T-0)

3.2.9.1. Provisions for occupational exposures to toxic and hazardous substances are presented in 29 CFR 1910, Subpart Z. Guidance outlined in 29 CFR 1910, Subpart Z should be considered for use as appropriate.

3.2.10. Chemical Selection. All potential adverse impacts (environmental, safety, health, etc.) shall be considered in the selection of any chemical. The selection and procurement of chemicals will follow requirements of AFI 32-7086, *Hazardous Materials Management*. (T-1)

THOMAS W. TRAVIS, Lieutenant General,
USAF, MC, CFS
Surgeon General

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

29 CFR 1910.1030, *Blood Borne Pathogen*, 3 April, 2012

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, 22 January, 2013

AFI 44-102, *Medical Care Management*, 20 January 2012

AFI 48-101, *Aerospace Medicine Enterprise*, 19 October 2011

AFI 48-145, *Occupational and Environmental Health Program*, 15 September 2011

AFI 91-202, *Air Force Mishap Prevention Program*, 5 August 2011

AFI 90-821, *Hazard Communication*, 27 January 2014

AFI 91-204, *Safety Investigations and Reports*, 12 February 2014

AFMAN 48-146, *Occupational and Environmental Health Program Management*, 9 October 2012

AFOSH Std 48-137, *Respiratory Protection Program*, 10 February 2005

DoDI 6055.1, *DoD Safety and Occupational Health (SOH) Program*, 19 August 1998

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AFI—Air Force Instruction

AMC—Aerospace Medicine Council

BE—Bioenvironmental Engineering

CFR—Code of Federal Regulations

CHO—Chemical Hygiene Officer

CHP—Chemical Hygiene Plan

CONUS—Continental United States

DRU—Direct Reporting Units

FAR—Federal Acquisition Regulation

FOA—Field Operating Agencies

GOCO—Government Owned, Contractor Operated

MAJCOM—Major Command

MSE—Medical Surveillance Examinations

PH—Public Health

NDI—Nondestructive Inspection

OEHWG—Occupational and Environmental Health Working Group

OEEL—Occupational and Environmental Exposure Limit

OM—Occupational Medicine

OSHA—Occupational Safety and Health Administration

PMEL—Precision Measurement Equipment Laboratories

SDS—Safety Data Sheet

Terms

Shall—Indicates a mandatory requirement.

Will—Indicates a mandatory requirement which expresses a declaration of intent, probability or determination.

Should—Indicates a preferred method of accomplishment.

May—Indicates an acceptable or satisfactory method of accomplishment.

Action Level—An exposure level that dictates active air monitoring, medical monitoring, and worker training. The Action Level for airborne exposures is typically one-half the Occupational & Environmental Exposure Limit for time-weighted average (TWA) exposures, except where 29 CFR 1910 Subpart Z designates a different concentration or where the statistical variability of sample results indicates that a lower fraction of the OEEL should be used as the Action Level.

Chemical Hygiene Officer (CHO)—All CHOs will have a detailed working knowledge of the operating procedures, chemical hazards, and precautions for the laboratory to which they are named CHO.

Hazardous Chemical—Any material which is a physical hazard or health hazard as defined in Federal Standard 313, *Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities*.

Hazards—Chemical laboratory hazards are divided into two categories: health hazards and physical hazards.

(i) **Health hazards**—Chemicals can produce health hazards from long-term (chronic) or short-term (acute) exposures, or both. Exposure to chemicals that present health hazards in a laboratory can occur through inhalation, ingestion, absorption through the skin, and skin surface contact. Health effects from these exposures vary from minor irritation and temporary illness to permanent organ damage and cancer.

(ii) **Physical hazards**—A chemical can present a physical hazard if it has one of the following properties: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid or solid); self-heating; corrosive to metal; gas under pressure; when in contact with water emits flammable gas; or combustible dust

Laboratory—A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale—means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials

Laboratory use of hazardous chemicals—means handling or use of such chemicals in which all of the following conditions are met: (i) Chemical manipulations are carried out on a "laboratory scale;" (ii) Multiple chemical procedures or chemicals are used; (iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and (iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Occupational and Environmental Exposure Limit (OEEL)—The OEEL is the most appropriate limit adopted from established recognized standards including, but not limited to, those in AFIs and AFOSH Standards, the latest edition of the *TLV® Booklet* published annually by the American Conference of Government Industrial Hygienists, 29 CFR 1910.1000 Tables Z-1, Z-2, and Z-3 and 40 CFR 141. OEELs are limits of exposure established to protect personnel from hazardous OEH threat exposures. OEELs apply to OEH threat exposures for individuals and/or similarly exposed groups of individuals.