



**CONTROLLING EXPOSURES TO HAZARDOUS
MATERIALS**

NOTICE: This publication is available digitally on the SAF/AAD WWW site at: <http://afpubs.hq.af.mil>. If you lack access, contact your Publishing Distribution Office (PDO).

OPR: HQ AFMOA/SGPA
(Lt Col Skip Edwards)
Supersedes AFOSH Std 48-8, 1 December 1995

Certified by: HQ AFMOA/SGP
(Maj Gen Charles H. Roadman II)
Pages: 43
Distribution: F

This standard establishes the Occupational Exposure Limits (OELs) for airborne chemical concentrations to which nearly all Air Force personnel may be exposed throughout their careers without adverse health effects. These limits will be interpreted using the procedures presented in this standard. Major commands (MAJCOMs), direct reporting units (DRUs), and field operating agencies (FOAs) may not waive any of these requirements, but may supplement this standard when additional or more stringent criteria are required. Conflicts in guidance between this standard and other Air Force or federal directives will be reported through the MAJCOM, Direct Reporting Unit (DRU), and FOA surgeons to HQ AFMOA/SGPA, 170 Luke Avenue, Suite 400, Bolling AFB DC 20332-5113. Refer to Air Force Instruction 91-301, *Air Force Occupational Safety, Fire Prevention and Health (AFOSH) Program* [formerly Air Force Regulation (AFR) 127-12] for instructions on processing supplements and variances.

The OELs apply to workplace exposures to hazardous materials in occupations performed by United States civilian and military employees and direct hire foreign nationals (as established by Status of Forces Agreements) of the Air Force, Air National Guard, and Air Force Reserve. OELs do not apply to evaluations of community air pollution, exposures for more than 24 hours, protection of the fetus, hypersensitive personnel, or protection of nursing mothers' milk. Other standards, such as Short-Term Public Emergency Guidelines (SPEGLs), have been developed to address emergency exposure to the general public. Several of these limits are included in attachment 2. SPEGLs shall not be used for occupational exposures.

The basic elements of an occupational exposure program are contained in Occupational Safety and Health Administration (OSHA) standard 29 Code of Federal Regulations (CFR) 1910 Subpart Z, *Toxic and Hazardous Substances*. All elements of Air Force exposure prevention programs shall be at least as stringent as those outlined by OSHA. The specific requirements outlined below are based on the 29 CFR 1910 Subpart Z requirements at the time of publication. Should additional OSHA requirements be published that are more stringent than any portion of this standard, the OSHA requirements shall apply to that portion of the standard. If other AFOSH Standards exist for specific hazardous materials, the provisions in those standards will take precedence over similar requirements in this standard, if they are more stringent.

The attachments of this standard implement OSHA 29 CFR 1910 Subpart Z requirements for specific substances used in Air Force operations. Both the OSHA standard and this AFOSH Standard together prescribe the minimum requirements for evaluating and preventing hazards to workers using these materials in Air Force workplaces.

Government-owned, contractor-operated (GOCO) operations within the continental United States (CONUS) or United States (US) territories shall implement 29 CFR 1910 Subpart Z. GOCO operations located either outside the regulatory jurisdiction of the CONUS or in US territories not covered by the Occupational Safety and Health Act shall comply with this standard in response to Federal Acquisition Regulation Clause 52. 223-9004. Contracting officers shall include this clause in the appropriate section of the contract.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

This revision consolidates the provisions that were in AFOSH Standard 161-3, 20 Jun 1977; AFOSH Standard 161-5, 30 Jun 1977; AFOSH Standard 161-7, 7 Jun 1977; AFOSH Standard 161-13, 26 Dec 1979; and AFOSH Standard 161-16, 3 Dec 1982. It implements the occupational health standards in 29 CFR 1910 and 29 CFR 1926 for exposures to hazardous materials by assigning responsibilities for the tasks mandated by the standard and it supplements these standards by adding Air Force specific definitions and interpretations. This version has eliminated most of the specific procedures from the text of the standard; it incorporates these procedures by referring directly to the citations in the 29 CFR 1910 and 29 CFR 1926 regulations, AFOSH Standard 127-31, AFOSH Standard 127-32, AFOSH Standard 127-68, AFOSH Standard 48-1, AFOSH Standard 161-2, AFOSH Standard 48-17, AFOSH Standard 161-21, and AFOSH Standard 161-22; it has added attachments for emergency exposure limits, exposure limits for fuels and additives, and monitoring procedures for exposure to anesthesia; it incorporates the expanded OSHA standards for vinyl chloride, inorganic arsenic, benzene, coke oven emissions, cotton dust, 1,2-dibromo-3-chloropropane, acrylonitrile, ethylene oxide, formaldehyde, lead, hydrazine, and asbestos that were either not included in previous AFOSH Standards or were obsolete due to revision in the OSHA standard; it provides for implementation of new standards when they are published by the OSHA and the implementation of exposure limits when they are published by the American Conference of Governmental Industrial Hygienists (ACGIH) to maintain the currency of the standard without the need to revise the text. A (/) indicates revisions from the previous edition.

1. Hazards/Human Factors.

1.1. Hazards:

1.1.1. Health hazards are caused by exposure to levels of hazardous materials that can produce toxic effects. These exposures can be long-term (chronic), short-term (acute), or both. A single material can produce chronic effects that are very different from the acute effects.

1.1.2. OELs are used to define hazardous inhalation exposures to chemical substances so these hazards can be controlled or eliminated. The mere presence of a hazardous material does not create a hazard. An exposure must include a source, a pathway and a receiver. If the pathway is

interrupted or controlled so the receiver's exposure is less than the OEL, then a health hazard does not exist for most workers in that situation.

1.1.3. Occupational exposure can occur through inhalation, ingestion, skin contact, and skin absorption. The potential for skin absorption is noted on the Permissible Exposure Level (PEL) and Threshold Limit Value (TLV) tables with an "S" or "skin designation." If the skin is not reliably protected from materials known to be absorbed through the skin, the comparison of breathing zone air-sample results to the OELs are not valid indicators of exposure.

1.2. Human Factors:

1.2.1. There are several misconceptions that must be overcome when conducting training on hazardous materials. Training programs must portray hazardous materials in a straightforward manner explaining the chronic and acute effects without causing undue alarm.

1.2.2. At one extreme, the belief that a worker can always sense harmful exposures is incorrect. Levels that produce chronic effects are often at concentrations which are below levels that cause odor or irritation. These substances, which are known as having "poor warning properties," can only be detected through external means.

1.2.3. On the other hand, some materials have a very bad reputation and are often viewed with unwarranted fear. All chemicals can be used safely if the proper precautions are followed.

1.2.4. Although OELs are established to protect most workers, they may not be sufficiently low to prevent health effects in hypersensitive individuals. Workers who suspect they are affected by a material must be evaluated by a physician under the direction of the Aerospace Medicine Council.

2. Responsibilities.

2.1. HQ AFMOA/SGPA. HQ AFMOA/SGPA will inform the base Bioenvironmental Engineering Flight through the MAJCOM/SG of impending changes in OELs, in OSHA requirements, and in implementing instructions.

2.2. Headquarters SG. The MAJCOM, DRU, and FOA surgeon resolves questions regarding specific interpretations of this standard as they apply to facilities within the command and monitors all BE contacts with OSHA. For bases outside the CONUS, the MAJCOM, DRU, and FOA Bioenvironmental Engineer (BEE) serves as the OSHA Area Director for occupational health issues.

2.3. Unit Commander. The unit commander, director, or functional manager has the ultimate responsibility for providing workplaces free from exposures to hazardous materials that exceed the OEL.

2.4. Supervisor. The supervisor of operations where exposures greater than an OEL or action level can occur has overall responsibility for enforcing the provisions of this standard and, where required by this standard, shall:

- Establish and control access to regulated areas.
- Institute engineering controls and work practices to maintain employee exposures below the OEL.
- Establish a respiratory protection program, when required.
- Supply adequate and appropriate Personal Protective Equipment (PPE) to employees.

- Provide training to employees so they can recognize the potential hazards of their materials and can take specific measures to avoid hazardous exposures.
- Notify Ground Safety, BE and Public Health (PH) of mishaps and suspected overexposures involving hazardous materials.
- Refer pregnant personnel employed by the Air Force for fetal protection counseling from PH.
- Ensure employees complete occupational exams, where required.
- Ensure employees comply with work practices established to reduce exposures.
- Ensure work practices used to control hazards are written and available.

2.5. Employee. The employee shall comply with work practices established to reduce exposures, use PPE as required, and report any suspected hazardous exposures to the supervisor.

2.6. Bioenvironmental Engineering (BE). BE will:

- Maintain a current and complete set of OSHA standards and inform supervisors of changes and interpretations of these standards that affect the workplace operations.
- Conduct exposure monitoring and inform employees and supervisors of results.
- Determine whether regulated areas are needed and establish the boundaries for these areas.
- Recommend feasible controls to reduce employee exposure below the OEL.
- Recommend the appropriate PPE when engineering and work practice controls are not yet installed or are not feasible to control the exposures.
- Test the fit of respirators and train the users who are enrolled in the respiratory protection program.
- Evaluate employee Hazard Communication training and emergency response procedures for chemical incidents at least annually.
- Initiate and maintain employee exposure records according to AFOSH Standard 48-17, Standardized Occupational Health Program.
- Investigate mishaps and suspected overexposures involving hazardous materials.

2.7. Aerospace Medicine Council (AMC). AMC will:

- Determine the initial, routine, and termination medical surveillance protocols and arrange physical examinations when required.
- Decide the appropriate adjustment to OEL-TWAs for extended workshifts as recommend by BE, and provide liaison with civilian physicians when required.
- Determine occupational health training requirements.
- Review illness and injury trends, examination result trends, and epidemiological studies done by PH.
- Plan intervention strategies to prevent and control hazards suggested by the trends and studies.

2.8. Base Ground Safety and Fire Prevention. These officials are the primary contacts for matters pertaining to explosion and safety hazards with hazardous materials.

2.9. Public Health (PH). PH will:

- Arrange and conduct training for supervisors on the potential health hazards for hazardous materials identified as presenting potential health risks by BE.

- Advise supervisors of occupational health training they must provide to their workers.
- Provide Hazard Communication training to all new supervisors as required by AFOSH Standard 161-21, Hazard Communication.
- Collect, analyze, and correlate occupational illness data and examination results using sound epidemiological principles to identify trends and target interventions.
- Initiate occupational illness investigations.
- Monitor scheduling, completion, results and trends for both initial and periodic medical examinations.

3. General Requirements:

3.1. Basic Program Elements. The basic elements of an occupational exposure program for hazardous materials require the efforts of several base agencies.

3.1.1. BE monitors the exposure, interprets the results, recommends compliance measures, and reports exposure results to the workers, supervisors, PH, and Aerospace Medicine Council.

3.1.2. The supervisor of the affected workplace initiates requests for engineering measures; enforces control procedures to reduce exposures; ensures workers are trained in hazard recognition and protection; and ensures workers complete occupational exams prescribed by the Aerospace Medicine Council.

3.1.3. The base medical facility provides medical surveillance to monitor the affected workers.

3.2. Expanded Standards. Expanded standards for specific substances are outlined in separate sections following 29 CFR 1910.1000. Exposure programs for these substances require strict adherence to the mandatory procedures contained in the expanded standards. Most of the expanded standards are addressed in the attachments to this standard. When OSHA adopts additional expanded standards, Air Force operations will comply with the added requirements and BE will monitor compliance.

4. Specific Requirements:

4.1. Airborne Exposure Monitoring. BE will conduct initial and periodic exposure evaluations as outlined in AFOSH Standard 48-17. When potentially hazardous occupational exposures are identified, BE will sample the airborne concentrations in the breathing zone of one or more workers who represent a homogeneous group of potentially exposed workers.

4.1.1. Screening and Compliance Samples. Initial screening samples may be collected and analyzed by any method that has a recognized Sampling and Analytical Error (SAE) or Coefficient of Variability (CV). These screening samples should evaluate the worst case scenario of exposure for each potential hazard to a homogeneous exposure group. If the upper confidence limit (UCL) of a screening sample exceeds the action level, additional sampling should be done using compliance procedures. Compliance procedures are indirect sampling methods consistent with methods published by OSHA or National Institute for Occupational Safety and Health (NIOSH). These samples will be analyzed in a laboratory certified by the American Industrial Hygiene Association unless the MAJCOM, DRU, or FOA SG allows the use of a specific non-certified laboratory.

4.1.2. Sample duration. Samples will be collected for durations that represent each applicable OEL. Peak exposure periods during a work day will be evaluated for OEL-Cs or excursion limits,

whichever is appropriate. OEL-STEL samples will be collected for 15 minute periods when possible. The average exposure for the entire shift will be evaluated for OEL-TWAs and Action Levels. Compliance samples for OEL-TWAs should be collected for at least 7 hours in an 8-hour shift. BE must ensure that the sample volume and sample duration provide meaningful results; these may need to be adjusted based on the minimum detection levels of the analytical laboratory.

4.1.3. Reporting Sample Results. When sample results that represent worker exposure are received from the analytical laboratory, BE will interpret them and report the results to the affected workers within 15 calendar days, except where 29 CFR 1910 Subpart Z requires a shorter reporting period. The 15-day period begins when all results have been received for samples that have been taken in the workplace under investigation.

4.1.4. Characterization Strategy. BE will develop a strategy for sampling each exposure group until enough days have been sampled to reliably characterize each exposure. Exposures will be characterized as less than the action level, between the action level and the OEL-TWA, or greater than an OEL. The characterization of the exposure will be reported to the Aerospace Medicine Council as outlined in AFOSH Standard 48-17.

4.1.5. Periodic Sampling. BE will sample periodically during processes that have been characterized as producing exposures between the action level and the OEL. Unless 29 CFR 1910 Subpart Z requires more frequent sampling, BE will conduct compliance sampling for these processes at least once each year. For processes previously characterized as either below the action level or above the OEL, BE will annually validate that the process procedures have not changed since the characterization was made and the assigned exposure levels are still representative of worker exposures.

4.2. Determination of OEL. BE shall determine the OEL using the most stringent limits from these three references: OSHA PELs, ACGIH TLVs, and other AFOSH Standards. If none of these references provide a limit to use, BE will request guidance through the MAJCOM/SG to HQ AFMOA/SGPA.

4.2.1. The OEL-TWA should be adjusted for workshifts that exceed 8 hours of exposure. The Aerospace Medicine Council will determine the appropriate adjustment using models such as the "Brief and Scala Model" or the "OSHA Model" discussed in *Patty's Industrial Hygiene and Toxicology*.

4.2.2. Multiple chemical exposures to a group of similarly exposed workers will be combined using the formula in the 29 CFR 1910.1000 (d) (2). The sum of the fractional exposures will be combined for substances that have similar toxicological effects. Ordinarily substances that affect the same target organ or system will be combined unless there is clear evidence that the effects are not additive.

4.2.3. Excursion limits are not intended to be used as OELs. Exposures in excess of these limits indicate potential variations in exposure which should be further evaluated to verify compliance with the OEL-TWA. The concept behind this approach is that in a well controlled process exposure, excursion should be held within reasonable limits to gain confidence in determining the variability of day-to-day exposures. When toxicological data for a specific substance are available to establish a OEL-STEL or OEL-C, this value takes precedence over the excursion limit regardless of whether it is more or less stringent.

4.3. Regulated Areas:

4.3.1. BE defines a regulated area where needed to prevent exposure to a hazardous material. BE describes the limits of each regulated area in writing to the supervisor.

4.3.2. A regulated area shall be established:

- Where 29 CFR 1910 or 29 CFR 1926 requires such a regulated area, for example areas where known carcinogens that have no OEL are used;
- In areas where exposures to known or suspect human carcinogens exceed the OEL;
- In areas where personal protective equipment is required to avoid skin or eye contact hazards;
- In areas where respiratory protection must be worn to prevent exposure; and
- In any other area where a hazardous exposure could occur if access is not controlled.

4.3.3. The supervisor establishes the regulated area and allows only those workers who are trained and protected to enter the area. The supervisor shall maintain a record or log of each entry into each regulated area that has been established to control exposures to confirmed human carcinogens or when a log or record is required by 29 CFR 1910 or 29 CFR 1926. BE will review this record or log each year and retain a copy for the casefile.

4.4. Methods of Compliance.

4.4.1. Evaluation of Feasibility. BE will determine whether engineering controls, administrative controls, work practices or personal protective equipment are feasible to reduce the exposures to levels less than the OEL. Where exposures exist that can be feasibly controlled, the BE reports the recommended actions to the supervisor and the supervisor acts on these recommendations. All recommendations and the actions taken to incorporate these compliance measures will be tracked as outlined in Air Force Instruction (AFI) 91-301, *Air Force Occupational and Environmental Safety, Fire Prevention and Health (AFOSH) Program*.

4.4.2. Control of Carcinogens. Exposures to confirmed carcinogens and suspect human carcinogens will be kept to a minimum. Workers who are exposed to confirmed human carcinogens without a published OEL will be equipped to eliminate the exposure to the fullest extent possible. When a published OEL for a confirmed or suspected human carcinogen exists, worker exposure will be controlled to levels that are as low as practical below the OEL or eliminated where practical.

4.5. Engineering Controls. Engineering controls such as material substitution, process substitution, isolation, enclosure, barriers, and local exhaust ventilation will be used to the greatest extent feasible to control exposures to hazardous materials. Refer to AFI 91-301 (para 17.4.3) for a description of abatement priority.

4.6. Administrative Controls. When work schedules or limitations are established to rotate workers for the purpose of maintaining exposure TWAs less than the OEL, the supervisor will keep verifiable records of the schedules or limitations in effect. These records will be kept on file for at least one year. Worker rotation shall not be used to control TWA exposures for human carcinogens or when prohibited by a specific OSHA standard.

4.7. Work Practice Controls. Work practice controls used to reduce exposure to hazardous materials will be institutionalized in an operating instruction. These controls include specific techniques, operational methods, and equipment that maintain the concentrations below the OEL.

4.8. Respiratory Protection.

4.8.1. BE will evaluate potential inhalation hazards and determine the need for respirators and, if required, the type of respirators. The type of respirator will be selected according to the most appropriate level of protection found in AFOSH Standard 48-1 (formerly AFOSH Standard 161-1), *Respiratory Protection Program*, and in 29 CFR 1910, Subpart Z.

4.8.2. Respirators may be used as interim measures whenever engineering or work practice control measures are not feasible.

4.8.3. Whenever respirators are used the supervisor will establish a respiratory protection program that conforms to the most stringent requirements found in AFOSH Standard 48-1 and 29 CFR 1910, Subpart Z.

4.9. Emergencies. In workplaces where hazardous materials are used, the supervisor will coordinate the emergency procedures for the immediate area with ground safety and BE or the hazardous materials emergency planning team established by AFI 32-4002, *Hazardous Materials Emergency Planning and Response Compliance*.

4.10. Medical surveillance.

4.10.1. Employees who are exposed to hazardous materials at levels greater than the action level for more than 25 days per year, who wear respiratory protection, or who have a significant potential for exposure through skin absorption will be provided initial, periodic, and termination medical surveillance, as appropriate or required by 29 CFR 1910 or 29 CFR 1926.

4.10.2. If there is a lack of statistical confidence in the sampling data or other concerns for the occupational health of a group of workers, the AMC will decide if medical surveillance is warranted.

4.10.3. The local Aerospace Medicine will provide medical consultation and examinations for Air Force personnel as outlined in AFI 48-101, *The Aerospace Medicine Program*, (formerly AFR 161-33) and AFOSH Standard 48-17, *Aerospace Prevention Program*. Medical opinions on a worker's fitness or limitations will be documented on an AF Form 2770.

4.10.4. Civilian employees shall receive initial, periodic, and termination medical examinations from the local Air Force medical facility where the facility can support these examinations. If the medical facility cannot support these examinations they will be performed by a local medical facility at no cost to the employee.

EDGAR R. ANDERSON, JR., Lt General, USAF, MC
Surgeon General

Attachment 1

GLOSSARY OR REFERENCES, ABBREVIATIONS, ACRONYMS AND TERMS

References

AFI 91-301, *Air Force Occupational and Environmental, Safety, Fire Prevention and Health (AFOSH) Program.*

(Formerly AFR 127-12).

AFI 48-101, *Aerospace Medicine Program.* (Formerly AFR 161-33).

AFI 32-4002, *Hazardous Materials Emergency Planning and Response Compliance..*

AFOSH Standard 127-31, *Personal Protective Equipment.*

AFOSH Standard 127-32, *Emergency Showers and Eyewash Units.*

AFOSH Standard 127-68, *Chemical Safety.*

AFOSH Standard 48-1, *Respiratory Protection Program.*

AFOSH Standard 48-2, *Engineering Control Program for Airborne Occupational Exposures.*

AFOSH Standard 48-17, *Aerospace Prevention Program.*

AFOSH Standard 161-21, *Hazard Communication.*

AFOSH Standard 48-22, *Occupational Exposure to Hazardous Chemicals in Laboratory Operations.*

American Conference of Governmental Industrial Hygienists (ACGIH). *Threshold Limit Values for Chemical Substances*

and Physical Agents and Biological Indices, published annually by the ACGIH.

American National Standard Institute (ANSI).Z88.2, *Practices for Respiratory Protection.* (Not required by user)

American Industrial Hygiene Association. *Emergency Planning Guidelines.* (Not required by user)

Federal Standard (FED-STD). FED-STD 313, *Federal Standard, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Governmental Activities.* (Not required by user)

National Research Council, *Emergency and Continuous Exposure Limits for Selected Airborne Contaminants*, Volumes 1

through 8. (Not required by user)

OSHA Publication 2077, *General Industry Standards and Interpretations.*

OSHA Standard 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances.*

OSHA Standard 29 CFR 1910.1000, *Air Contaminants.*

OSHA Standard 29 CFR 1910.1001, *Asbestos.*

OSHA Standard 29 CFR 1910.1002, *Coal Tar Pitch Volatiles.*

OSHA Standard 29 CFR 1910.1003, *4-Nitrobiphenyl.*

OSHA Standard 29 CFR 1910.1004, *alpha-Naphthylamine*.
OSHA Standard 29 CFR 1910.1006, *Methyl Chloromethyl Ether*.
OSHA Standard 29 CFR 1910.1007, *3,3'-Dichlorobenzidine*.
OSHA Standard 29 CFR 1910.1008, *bis-Chloromethyl Ether*.
OSHA Standard 29 CFR 1910.1009, *beta-Naphthylamine*.
OSHA Standard 29 CFR 1910.1010, *Benzidine*.
OSHA Standard 29 CFR 1910.1011, *4-Aminodiphenyl*.
OSHA Standard 29 CFR 1910.1012, *Ethyleneimine*.
OSHA Standard 29 CFR 1910.1013, *beta-Propiolactone*.
OSHA Standard 29 CFR 1910.1014, *2-Acetylaminofluorene*.
OSHA Standard 29 CFR 1910.1015, *4-Dimethylaminoazobenzene*.
OSHA Standard 29 CFR 1910.1016, *N-Nitrosodimethylamine*.
OSHA Standard 29 CFR 1910.1017, *Vinyl Chloride*.
OSHA Standard 29 CFR 1910.1018, *Inorganic Arsenic*.
OSHA Standard 29 CFR 1910.1025, *Lead*.
OSHA Standard 29 CFR 1910.1027, *Cadmium*.
OSHA Standard 29 CFR 1910.1028, *Benzene*.
OSHA Standard 29 CFR 1910.1029, *Coke Oven Emissions*.
OSHA Standard 29 CFR 1910.1044, *1,2-Dibromo-3-chloropropane*.
OSHA Standard 29 CFR 1910.1045, *Acrylonitrile*.
OSHA Standard 29 CFR 1910.1047, *Ethylene Oxide*.
OSHA Standard 29 CFR 1910.1048, *Formaldehyde*.
OSHA Standard 29 CFR 1910.1050, *Methylenedianiline*.
OSHA Standard 29 CFR 1926.62, *Lead*.
OSHA Standard 29 CFR 1926.1101, *Asbestos*.

John Wiley and Sons, Inc. *Patty's Industrial Hygiene and Toxicology*, 2nd Edition, Volume 3a, Chapter 6, New York (1985).

Abbreviations and Acronyms

A—Confidence Limit Factor

ACGIH—American Conference of Governmental Industrial Hygienists

AFI—Air Force Instruction

AFMOA—Air Force Medical Operations Agency

AFOSH—Air Force Occupational and Environmental Safety, Fire Prevention and Health

AFR—Air Force Regulation

AIHA—American Industrial Hygiene Association

ALARA—As Low as Reasonably Achievable

AMC—Aerospace Medicine Council

ANSI—American National Standard Institute

BE—Bioenvironmental Engineering Flight

BLEVE—Boiling Liquid Expanding Vapor Explosion

BUN—Blood Urea Nitrogen

CAS—Chemical Abstract Service

CFR—Code of Federal Regulations

CONUS—Continental United States

CV—Coefficient of Variability

d—Factor for centerline

DOT—Department of Transportation

DRU—Direct Reporting Unit

EEGL—Emergency Exposure Guidelines

| **EGME**—Ethylene Glycol Monomethyl Ether

ERPG—Emergency Response Planning Guidelines

FED STD—Federal Standard

FEV—Forced Expiratory Volume

| **FEV1**—Forced Expiratory Volume, 1 second

FOA—Field Operating Agency

FVC—Forced Vital Capacity

GOCO—Government Owned, Contractor Operated

GT—Glutamyl Transpeptidase

| **HTH**—Brand name for powdered chlorine

LCL—Lower Confidence Limits

LEL—Lower Exposure Limit

MAJCOMS—Major Commands

MMH—Monomethyl Hydrazine

n—Number of samples

NIOSH—National Institute for Occupational Safety and Health
OEL—Occupational Exposure Limits
OEL-C—Occupational Exposure Limits-Ceiling
OEL-STEL—Occupational Exposure Limits-Short Term Exposure Limit
OEL-TWA—Occupational Exposure Limits-Time Weighted Average
OSHA—Occupational Safety and Health Administration
PEL—Permissible Exposure Limit
PH—Public Health
PPE—Personal Protective Equipment
PPM—Parts per million
SAE—Sampling Analytical Error
SGOT—Serum Glutamic Oxaloacetic Transaminase
SPEGL—Short Term Public Emergency Guidelines
TLV—Threshold Limit Value
US—United States
UCL—Upper Confidence Limit
UDMH—Unsymmetrical Dimethyl Hydrazine

Terms

Acceptable Ceiling Concentration—An exposure limit listed in 29 CFR 1910.1000, Table Z-2. An exposure shall not exceed the "acceptable maximum peak" in Table Z-2 at any time.

Action Level—An airborne exposure level that dictates active air monitoring, medical monitoring, and employee training. The Action Level is one-half the Occupational Exposure Limit for time-weighted average (OEL-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 OEL should be used as the Action Level.

Breathing zone—The location where exposure is measured. The breathing zone is located forward of the shoulders within 9 inches of the nose and mouth. Breathing zone measurements are taken beneath a welder's helmet or face piece but outside of any respiratory protective devices.

Carcinogens.—Hazardous materials that stimulate the formation of cancer. A material will be treated as a confirmed human carcinogen when one of the references below categorizes it as follows:

- "Known to be a carcinogen" in the National Toxicology Program (NTP), *Annual Report on Carcinogens* (latest edition);
- Group 1 by the International Agency for Research on Cancer (IARC), *Monographs* (latest edition);
- "Carcinogen" in 29 CFR 1910 Subpart Z; or

- Category A1 by the American Conference of Governmental Industrial Hygienists (ACGIH) *Threshold Limit Values for Chemical Substances ...* (latest edition).

A suspected human carcinogen is a substance that is suspected to induce cancer based on either limited epidemiological evidence or demonstration of carcinogenesis in one or more animal models. A material will be treated as a suspected human carcinogen when one of the references below categorizes it as follows:

- “Reasonably anticipated to be a carcinogen, “possible carcinogen, or “probable carcinogen” in the National Toxicology Program (NTP), *Annual Report on Carcinogens* (latest edition);
- Group 2A or 2B by the International Agency for Research on Cancer (IARC), *Monographs* (latest edition);
- “Potential carcinogen” in 29 CFR 1910 Subpart Z; or
- Category A2 by the American Conference of Governmental Industrial Hygienists (ACGIH) *Threshold Limit Values for Chemical Substances ...* (latest edition).

For the purpose of Hazard Communication, both confirmed and suspected human carcinogens are treated as carcinogens. A mixture is considered to be a carcinogen if it contains a carcinogenic component with a concentration of 0.1 percent or greater.”

Ceiling Limit (OEL-C)—The limit for an employee’s exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, the OEL-C will be evaluated during the worst-case 15-minute exposure period.

Coefficient of Variation (CV)—For an air sampling method, the CV is the standard deviation of the sampling and analytical error divided by the mean of the sample results. The CV is used to calculate the confidence limits for sampling. OSHA uses the term sampling and analytical error (SAE) to account for the total variation or error in the method.

Confidence Limits—The upper confidence limit (UCL) and lower confidence limit (LCL) are the boundaries for a single sample or a series of samples that have a specified probability (usually 95 percent) of including the true value of the level of exposure.

Definitions—Refer to 29 CFR 1910 Sub part Z and the *Threshold Limit Values for Chemical Substances and Physical Agents* (TLV Booklet) published by the American Conference of Governmental Industrial Hygienists (ACGIH) for definitions with the following additions:

Evaluating Physician—A physician who evaluates an occupational exposure and determines the need for a hands-on physical exam and any laboratory testing.

Examining Physician—A physician conducting a hands-on physical examination of a patient.

Excursion Limits—Control limits based on statistical rather than purely toxicological considerations. They apply to exposures for which there are no OEL-Short Term Exposure Limits, OEL-Cs , or acceptable ceiling concentrations. See, ACGIH *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* for further explanation.

Expanded Standards—Sections of 29 CFR 1910 Subpart Z following 29 CFR 1910.1000. Each of these OSHA standards discusses a specific substance and has specific requirements that apply where these substances are used.

Exposure—Exposure occurs when an employee is subjected to a hazardous material through any of these

routes: inhalation, ingestion, skin contact, or skin absorption. Airborne exposures are specified as the duration and concentration of hazardous materials measured in the breathing zone of an individual worker without regard for personnel protective equipment used by the worker.

Hazardous materials—Materials that pose a hazard and require a Material Safety Data Sheet as defined in FED-STD 313, *Federal Standard, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Governmental Activities*.

Homogeneous Exposure Group (HEG)—A group of workers having similar exposures to either a single hazardous material or a set of hazardous materials which affect the same target organ. The group is homogeneous in the sense that the probability of exposure is similar for all members of the group over a period of time. During a single day, however, the exposures may be very different for each member of the group. An HEG is formed from the members of a unit or organization that do similar tasks at similar frequencies and duration using similar techniques and materials.

Laboratory and Laboratory Operations—See AFOSH Standard 161-22, *Occupational Exposure to Hazardous Chemicals in Laboratory Operations*, and 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in laboratories*, for definitions.

May—Indicates an acceptable or satisfactory method of accomplishment.

Occupational Exposure Limit (OEL)—The limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentrations, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the *American Conference of Government Industrial Hygienists*, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-hour work shift except where 29 CFR 1910 Subpart Z allows 40-hour averages. Exposure during work shifts that exceed 8 hours must be adjusted before applying an OEL.

Permissible Exposure Limit (PEL)—The regulatory exposure limit established by OSHA. PEL values are published in the 29 CFR 1910.1000, Table Z-1, *Final Rules Limits*, other tables cross-referenced in the *Final Rules Limits*, and in 29 CFR 1910.1001 through 1910.1099 series for specific substances. OELs shall be at least as stringent as PELs.

Regulated Area—An area under the supervisor's control where entry and exit are restricted and controlled to prevent exposure to hazards. An area shall be established when a requirement in 29 CFR 1910 or 29 CFR 1926 exists, or when BE determines that employees entering the area might be exposed to a hazard unless access is controlled.

Shall—Indicates a mandatory requirement.

Short-Term Public Emergency Exposure Guideline (SPEGL)—An acceptable peak concentration for unpredicted, single, short-term emergency exposures of the general public. These limits do not apply to occupational exposures.

Short Term Exposure Limit (OEL- STEL)—A time-weighted exposure for a 15 minute (or shorter) period which shall not be exceeded during the work day. The definition of STEL is different in 29 CFR 1910.1000 (a) (5) (ii) and in the TLV Booklet. The definition must correspond to the reference being cited. As with other OELs, OEL-STELs are the most stringent limits found in the latest TLV Booklet, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances.

Should—Indicates a preferred method of accomplishment.

Threshold Limit Values—(TLVRs) Exposure guidelines published annually by the American Conference of Governmental Industrial Hygienists (ACGIH) in *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*. TLVRs are employed as OELs when they are more stringent than the OSHA PELs.

Time-Weighted Average (OEL-TWA)—Eight-hour average concentration for which the average is mathematically adjusted for the duration of exposure. The method for calculating OEL-TWAs is shown in 29 CFR 1910.1000 (d) and in the TLV Booklet.

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

Attachment 2

EMERGENCY EXPOSURES GUIDELINES

Emergency exposure guidelines have been developed for non-routine exposures of the general public. SPEGLs and Emergency Exposure Guidelines (EEGLs) developed by the National Academy of Science, Committee on Toxicology, will be the preferred emergency exposure level. Where SPEGLs EEGLs are not available, American Industrial Hygiene Association (AIHA) Emergency Response Planning Guidelines (ERPGs) will be used. ACGIH TLVs and OSHA PELs are the limit of last choice for emergency evacuation of personnel. In no case shall 20 percent of the lower explosive limit (LEL) be exceeded. The most recent updates of guidelines from these organizations will be used. The following are example guidelines for common Air Force chemicals.

A2.1. SPEGLs and EEGLs. The National Academy of Science, Committee on Toxicology, has evaluated the SPEGL/EEGLs for the following compounds. These limits apply to short-term, non-occupational exposures from unpredicted emergencies. SPEGLs/EEGLs represent rare exposures in a worker's lifetime. SPEGLs also account for human variability in the general population and represent a risk based on one event in 10,000 exposed persons as required by the U.S. Environmental Protection Agency in the Superfund Amendments and Reauthorization Act, Title III.

Table A2.1. Exposure Guidelines.

SPEGL (ppm)			SPEGL (ppm)		
Material	1-hour	24-hour	10-min	1-hour	24-hour
Ammonia				100	100
Carbon Monoxide			1500	400	50
Chlorine				3	50
Hydrogen chloride	1	1	100	20	20
Ethylene oxide				20	1
Fluorine			15	7.5	
Hydrazine	2	.08			
Mono-methyl hydrazine	24	1			
Dimethyl hydrazine	24	1			
Nitrogen dioxide	1	.1		1	.04
Nitrogen tetroxide				1	.04
Sulfur dioxide			30	10	5

A2.2. AIHA ERPGs. AIHA ERPGs are intended as 1-hour exposure limits for effects on the general public. ERPG-1 is the allowable concentration for mild transient effects or objectionable odor (discomfort). ERPG-2 is the concentration for serious health effects or impaired ability to take protective action (disability). ERPG-3 is the allowable concentration for life-threatening effects (death). These multiple levels can be used by the on-scene commanders to evacuate people to different distances. As an example, the commander can decide to evacuate occupants of a housing area outside a cordon where concentrations are less than the ERPG-1 because of the desire to minimize public reaction. At the same time the commander may leave critical operations within the ERPG-1 cordon. A current list of ERPGs should be maintained by contacting the AIHA. The following are examples of ERPGs.

Table A2.2. Exposure Guidelines.

Substance	ERPGs		
	ERPG-1	ERPG-2	ERPG-3
Ammonia	25 ppm	200 ppm	1000 ppm
Chlorine	1 ppm	3 ppm	20 ppm
Fluorine	5 ppm	20 ppm	50 ppm
Hydrogen fluoride	5 ppm	20 ppm	50 ppm

A2.3. The Department of Transportation (DOT) Emergency Response Guide book. This guidebook uses various guidelines in calculating the initial evacuation distances. They use the following hierarchy, depending on availability: AIHA ERPG-2s, SPEGLs, STELs, Ceiling TLVs, EEGs, and TLV-TWAs. If none of these guidelines are available, concentrations lethal to 50 percent (LC 50) and none (LC 0) of an experimental population are used to estimate a hazardous dose.

A2.3.1. BE personnel advising the on-scene commander must keep in mind that the ACGIH TLV-TWAs are allowable concentrations to which nearly all workers may be exposed without adverse effect. These limits assume exposed workers are healthy adults with no previously existing medical conditions. If the assumptions are not valid for the situation, BE should recommend alternative evacuation distances to the on-scene commander.

A2.3.2. The guidelines have other limitations. They are considered useful for the first 30 minutes of an incident and do not apply if the material is on fire. If the spilled material is on fire, the toxic hazard may be less important than the combustion by-products, explosion hazard, or boiling liquid expanding vapor explosion (BLEVE) hazard.

A2.3.3. BE should be thoroughly familiar with the background information in the latest version of the DOT Emergency Response Guidebook. This book is commonly used by emergency response forces in the initial phase of an incident. BE should work closely with the senior fire official or hazard materials team representative when evaluating and recommending evacuation distances.

Attachment 3

EXPOSURE TO FUELS AND ADDITIVES

A3.1. This policy on exposure to fuels and additives supplements the published OELs for components of fuels such as benzene and additives such as ethylene glycol monomethyl ether. Exposure to benzene will be maintained at levels below the OEL as described in attachment 6 in accordance with 29 CFR 1910.1028. Samples for JP-4 vapor should include a separate analysis for the benzene component as a matter of standard practice.

A3.2. OELs for JP-4. In the absence of other published standards or technical reports from the Armstrong Laboratory, the OELs for JP-4 will be based on the calculated additive effects of multiple vapors (total hydrocarbons):

- The OEL-TWA is 700 mg/m³ (200 ppm).
- The OEL-STEL is 1050 mg/m³ (300 ppm).
- Some compounds in JP-4 may be readily absorbed by the intact skin. The skin will be protected from exposure.

A3.3. OELs for JP-8. In the absence of other published standards or technical reports from the Armstrong Laboratory, the OELs for JP-4 will be based on the calculated additive effects of multiple vapors (total hydrocarbons):

- The OEL-TWA is *350 mg/m³ (52 ppm).
- The OEL-STEL is *1800 mg/m³ (267 ppm).
- Some compounds in JP-8 may be readily absorbed by the intact skin. Since JP-8 does not easily wash off the skin, The skin will be protected from exposure.

NOTE:

The standards quoted are draft recommendations made by the Committee on Toxicology. Final recommendations are not expected until completion of peer review in May 1995.

A3.4. Ethylene Glycol Monomethyl Ether Concentrations In Fuel. (EGME) concentrations are usually found in the range of 0.1 to 0.15 percent.

- Those concentrations are typically insignificant. In the bottom water of fuel tanks and around fuel filters, however, EGME can become very concentrated.
- Airborne levels of EGME must be measured separately during fuel filter change-out and during fuel cell or fuel tank operations where water separation is likely to occur.

A3.5. Diethylene Glycol Monomethyl Ether Concentrations In Fuel. (DiEGME) is a fuel system icing inhibitor which year round and concentrations are usually found in the range of 0.1 to 0.15 percent.

- Those concentrations are typically insignificant. In the bottom liquid of fuel tanks and around fuel filters, concentrations can be very concentrated.
- Airborne levels of DiEGME must be measured separately during fuel filter change-out and during fuel cell or fuel tank operations where water separation is likely to occur.

A3.6. Benzene Exposure. Although the proportion of benzene in JP-4 fuel is typically less than 1 percent (less than 0.1% or approximately 50 ppm for JP-8), the benzene exposure can be significant. Each fuel sample should include an analysis for the benzene component.

Attachment 4

MONITORING EXPOSURE TO ANESTHESIA

This attachment describes the monitoring procedure for assessing exposure to anesthetic gases.

A4.1. Anesthetic Gases And Vapors With Published Standards. Where anesthetic gases and vapors have a published OEL, BE will sample the air in the breathing zones in accordance with the requirements specified in paragraph 4 of the basic standard in the area where anesthetic gases are used or are likely to become airborne. These samples will be collected in accordance with the requirements specified in paragraph 4 of the basic standard and compared with the OEL.

A4.2. Anesthetic Gases And Vapors Without Published Standards. For anesthetic gases and vapors that have no published standard, control limits will be used to assess the process.

A4.2.1. BE will:

- Collect either personal or area samples.
- Establish a baseline using at least 4 sets of samples that are collected using the same method and calculate the control limits for the baseline results.
- Conduct routine sampling in the same manner as described in 4.1.5. of this standard.
- Compare the results of the routine samples with the control limits to determine if there have been significant changes in the exposure.
- Coordinate with maintenance and workplace personnel whenever sample results are statistically different from the baseline results to determine the cause.

A4.2.2. Control limits are different from confidence limits; they are used to see if process parameters are significantly different from the baseline parameters. Two types of control limits can be used to determine statistical significance.

A4.2.2.1. One type of control limit looks for shifts in the mean versus the mean of the baseline results (X-bar). X-bar is the average of the four sets of baseline sample results.

A4.2.2.2. The other type of control limit looks for shifts in the range versus the range of the baseline results (R-bar). The range is the lowest result subtracted from the highest result in each set. R-bar is the average of the ranges of the four sets of baseline sample results.

A4.2.2.3. The number of samples (n) will be the same for each of the baseline and the routine sets of data.

A4.2.3. To determine the upper control limits (ULs), calculate X-bar and R-bar.

A4.2.3.1. Calculate the UL for the average of the baseline data:

$$UL = X\text{-bar} + (A) (R\text{-bar})$$

Table A4.1. ULR For The Average Baseline Data.

Where:	A	n	A	n	A	n
	1.88	2	0.73	4	0.48	6
	1.02	3	0.58	5	0.42	7

A4.2.3.2. Calculate the **ULR** for the range of the set of sample results:

$$\text{ULR} = (d) (\text{R-bar})$$

Table A4.2. ULR For The Range of The Sample Results.

Where:	d	n	d	n	d	n
	3.27	2	2.28	4	2.00	6
	2.57	3	2.11	5	1.92	7

A4.2.4. If the average for a set of samples is greater than the UL or if the range for a set of samples is greater than the **ULR**, then these samples are significantly different from the baseline results. BE, medical maintenance personnel, and operators will investigate the cause and implement actions to correct any problems that are uncovered that may have led to the significantly higher sample results.

Attachment 5

STANDARDS FOR CARCINOGENS WITHOUT PELS

This attachment implements the expanded standards for carcinogens listed in 29 CFR 1910.1003 through 29 CFR 1910.1016 that have no PEL or OEL. The provisions apply to operations where one of the substances listed is manufactured, processed, repackaged, released, handled, and stored. The specific requirements do not apply to laboratory operations as defined in AFOSH Standard 161-22.

The standards for human carcinogens with no PEL at the time of publication are listed below. As additions and deletions are promulgated by OSHA, they are automatically incorporated when the changes appear in 29 CFR 1910.

4-Nitrobiphenyl	29 CFR 1910.1003
Alpha-Naphthylamine	29 CFR 1910.1004
Methyl chloromethyl ether	29 CFR 1910.1006
3,3'-Dichlorobenzidine	29 CFR 1910.1007
Bis-chloromethyl ether	29 CFR 1910.1008
Beta-Naphthylamine	29 CFR 1910.1009
Benzidine	29 CFR 1910.1010
Aminodiphenyl	29 CFR 1910.1011
Ethyleneimine	29 CFR 1910.1012
Beta-Propiolactone	29 CFR 1910.1013
2-Acetylaminofluorene	29 CFR 1910.1014
4-Dimethylaminoazobenzene	29 CFR 1910.1015
N-Nitrosodimethylamine	29 CFR 1910.1016

A5.1. Definitions: See each expanded standard for the definitions that apply uniquely to that standard. For clarity in this attachment, the term "29 CFR 1910.10xx" is used to discuss the specific sections in 29 CFR 1910 Subpart Z that outline the requirements for the carcinogenic substances. Each of these sections has the same numbering sequence for paragraphs; therefore, the procedures for all these sections are discussed by referring to the relevant paragraph number in 29 CFR 1910.10xx.

A5.2. Responsibilities: In addition to the responsibilities listed in the body of this AFOSH Standard, the following apply to this attachment:

²BE will submit the required reports through the installation commander to the OSHA Area Director when required.

- The supervisor shall maintain a log of personnel entering into regulated areas and develop written emergency procedures.

A5.3. General Requirements: It is Air Force policy to reduce exposure to confirmed human carcinogens to levels as low as practicable. The substances in this appendix do not have an OSHA PEL; the emphasis is on evaluating the control procedures rather than exposure levels.

A5.4. Specific Requirements:

A5.4.1. Regulated Areas. The supervisor of the area where one of the substances in 29 CFR 1910.10xx is used will coordinate with BE to determine, which categories apply to the processes used in the area:

²An isolated system.

- A closed system operation.
- An open vessel system operation.
- Transfer from a closed system, charging or discharging point operations, or otherwise opening a closed system.
- Maintenance and decontamination activities.

A5.4.2. Regulated Areas Requirements. The supervisor shall control the regulated area as required by the provisions in paragraph (c) of 29 CFR 1910.10xx and for the category of the operation. Personal protective equipment shall comply with AFOSH Standard 127-31 and AFOSH Standard 48-1.

A5.4.3. Employee Identification. The supervisor will maintain a log of the name, time of entry, and time of exit for each person who enters the regulated area. BE will collect these logs during the annual survey and will place a copy into the casefile each year.

A5.4.4. Emergency Procedures.

A5.4.4.1. The supervisor shall develop an emergency response and evacuation plan that includes the provisions outlined in paragraph (d) (2) of 29 CFR 1910.10xx. This plan will be coordinated with ground safety and BE or the hazardous materials emergency planning team established by AFI 32-4002.

A5.4.4.2. If an incident occurs, the supervisor will contact the ground safety office and BE as soon as practical. BE will investigate the accident and determine the adequacy of the decontamination actions, and the AMC will define the medical surveillance activities. BE will report the incident to the installation commander, the MAJCOM BEE, and to the nearest OSHA Area Director as required by paragraphs (d) (2) and (f) (2) of 29 CFR 1910.10xx.

A5.4.5. Hygiene. The supervisor will ensure that facilities and practices shall comply with paragraph (d) (3) of 29 CFR 1910.10xx.

A5.4.6. Contamination Control. BE will review contamination control procedures each year to determine if they comply with paragraph (d) (4) of 29 CFR 1910.10xx. These surveys will be documented

according to AFOSH Standard 48-17. The surveys will include a review of the signs and labels to determine if they comply with paragraph (e) of 29 CFR 1910.10xx.

A5.4.7. Training. PH will review the supervisor's training to ensure it includes each of the elements in 29 CFR 1910.10xx, paragraph (e) (5). The supervisor shall ensure that only the workers who have completed all of the training elements are allowed to enter the restricted area. Personnel from BE, PH, fire department, and safety are allowed to enter the area to review health and safety procedures. The supervisor shall maintain written documentation of the training program for inspection by ground safety, PH, BE, or OSHA. The training will apprise the workers of the hazards present in their work area, how to avoid them, and the medical surveillance program. The supervisor conducts and documents this training on an AF Form 55, *Employee Safety and Health Record* or equivalent.

A5.4.8. Reports. When an operation results in the establishment of a regulated area according to paragraph 4.2. above, BE will file a report through the installation commander with the nearest OSHA Area Director as described in paragraph 29 CFR 1910.10xx (f) (1). The MAJCOM, DRU, or FOA BEE will be informed of the nature of the report before it is forwarded. At bases outside the CONUS, the MAJCOM, DRU, and FOA BEE performs the function of the OSHA Area Director with respect to hazardous material exposures.

A5.4.9. Medical Surveillance.

A5.4.9.1. Employees assigned or being assigned duties that require them to enter a regulated area will be provided initial, periodic, and termination medical surveillance as outlined in 29 CFR 1910.10xx, paragraph (g). The local Aerospace Medicine will provide medical consultation and examinations as outlined in AFI 48-101 and AFOSH Standard 48-17 for Air Force personnel when specified by 29 CFR 1910.10xx, paragraph (g).

A5.4.9.2. Medical opinions required by 29 CFR 1910.10xx, paragraph (g) (2) (iii) will be documented on an AF Form 2770.

A5.4.9.3. Civilian employees shall receive initial, periodic, and termination medical examinations from the local Air Force medical facility where the facility can support these examinations.

A5.4.10. Recordkeeping. Records of employee monitoring, medical consultations, and examinations outlined in 29 CFR 1910.10xx, paragraph (g) (2) will be maintained according to AFOSH Standard 48-17.

Attachment 6

SELECTED EXPANDED STANDARDS

This appendix implements the expanded 29 CFR 1910 standards for substances listed below. All of these standards, except cotton dust, control substances that are confirmed or suspected to be carcinogens at the time of publication. As additional substances with PELs are promulgated by OSHA, they will be automatically incorporated into this attachment at the time when the changes appear in 29 CFR 1910 unless a specific AFOSH Standard addresses the changes.

Vinyl Chloride	29 CFR 1910.1017
Inorganic Arsenic	29 CFR 1910.1018
Cadmium	29 CFR 1910.1027
Benzene	29 CFR 1910.1028
Coke Oven Emissions	29 CFR 1910.1029
Cotton Dust	29 CFR 1910.1043
1,2-Dibromo-3-chloropropane	29 CFR 1910.1044
Acrylonitrile	29 CFR 1910.1045
Ethylene Oxide	29 CFR 1910.1047
Formaldehyde	29 CFR 1910.1048
Methylene Dianiline	29 CFR 1910.1050

The provisions apply to operations where one of these substances is manufactured, processed, used, repackaged, released, handled, or stored. The specific requirements do not apply to laboratory operations as defined in AFOSH Standard 161-22. See the introductory paragraph in each standard for an explanation of the scope and application that applies to the specific material.

A6.1. Definitions: See each expanded standard for the definitions that apply uniquely to that standard. The OEL, as defined in attachment 1, governs exposure control.

A6.2. Responsibilities: In addition to the responsibilities discussed in paragraph 2, the following are added for these expanded standards:

²The supervisor will establish a compliance program, control the regulated area, develop written emergency procedures, and maintain a list of authorized personnel when required.

- BE will provide observation of sampling procedures for employee representatives when requested and forward required reports to the OSHA Area Director when required.

A6.3. General Requirements: Controls shall be implemented to keep exposures to confirmed human carcinogens as low as reasonably achievable below the OEL and to keep exposures to suspected human carcinogens at the lowest practical level.

A6.4. Specific Requirements:

A6.4.1. **Required Elements.** The required elements outlined below give specific guidance that may or may not apply to every substance on the list. Before implementing the element, review the expanded standard to see if the paragraph applies to the substance being used.

A6.4.2. **Exposure Monitoring.** BE will conduct initial and periodic exposure evaluations as outlined in the appropriate expanded standard and in AFOSH Standard 48-17.

A6.4.3. **Regulated Areas.** BE determines the extent of the regulated area where employees might be exposed to levels greater than the OEL. BE advises the supervisor in writing of areas where the OEL is either exceeded or can reasonably be expected to be exceeded. The supervisor establishes a regulated area as described in the appropriate expanded standard.

A6.4.4. **Notification of Use.** BE will notify the OSHA Area Director through the installation commander if the expanded standard requires notification of use of a specific material.

A6.4.5. **Methods of Compliance.** BE determines whether engineering controls and work practices are feasible to reduce the exposure levels as discussed in the appropriate expanded standard. The supervisor shall write and maintain the status of the compliance program as required by the relevant expanded standard and by AFI 91-301.

A6.4.6. Respiratory Protection.

A6.4.6.1. BE evaluates potential inhalation hazards and determines the need for and type of respirator using the guidelines in the appropriate expanded standard. If required, BE will recommend the type of respirator based on the most stringent protection factor found in the appropriate expanded standard and AFOSH Standard 48-1.

A6.4.6.2. The supervisor establishes a respiratory protection program according to AFOSH Standard 48-1.

A6.4.6.3. Before wearing the respirator or working in the regulated area, the employee shall be trained and fitted with a respirator.

A6.4.7. **Protective Clothing and Equipment.** BE will recommend the appropriate protective clothing and equipment according to the requirements outlined in the expanded standard and AFOSH Standard 127-31. The supervisor will provide the required clothing and equipment and enforce its use.

A6.4.8. **Emergencies.** The supervisor will coordinate a written response plan that complies with the expanded standard through BE and the ground safety office or the hazardous material emergency planning team established by AFI 32-4002.

A6.4.9. **Hygiene Facilities and Housekeeping.** The supervisor will ensure that hygiene facilities and housekeeping procedures, when required, meet the minimum requirements of the appropriate expanded standard.

A6.4.10. **Training.** The supervisor will ensure training complies with the minimum requirements of the expanded standard, AFI 91-301, and either AFOSH Standard 161-21 for non-laboratory operations or AFOSH Standard 161-22 for laboratory operations. PH will review the appropriateness of the training annually.

A6.4.11. **Medical Surveillance:**

A6.4.11.1. PH will identify employees who are or will be exposed to levels of confirmed carcinogens exceeding the action level so they will be provided initial, periodic, and termination medical surveillance.

A6.4.11.2. The Aerospace Medicine Council will ensure the examinations comply with the minimum requirements of each expanded standard. PH will ensure that medical opinions required by the expanded standards are documented on an AF Form 2770.

A6.4.11.3. When a worker involved in a mishap seeks medical attention from a private physician, the Aerospace Medicine Council will request that physician to provide a written opinion as required in the expanded standard.

A6.4.12. **Signs and Labels.** BE will assist the supervisor to ensure that signs and labels comply with the specifications in the applicable expanded standard and AFOSH Standard 161-21.

A6.4.13. **Recordkeeping.** Records of employee monitoring, medical consultations, and examinations outlined in the expanded standard will be maintained according to AFOSH Standard 48-17. The retention of these records must meet the minimum requirements in the expanded standard.

A6.4.14. **Observation Procedures.** When observation of employee monitoring is requested as described in the expanded standard, BE will assure that the observer is appropriately protected.

A6.4.15. **Reports.** BE will forward the reports required by some of the expanded standards through the installation commander to the OSHA Area Director. The MAJCOM, DRU, and FOA BEE will be informed of the nature of the report before it is made. BE will notify workers as required by sending each affected employee an individual copy of the notification.

A6.4.16. **Hazardous Operations Procedures.** When required by an expanded standard to have a specific hazardous operations procedure, the supervisor will coordinate these with BE, ground safety, and the fire department.

Attachment 7

OCCUPATIONAL EXPOSURE TO LEAD

This attachment implements 29 CFR 1910.1025 and 29 CFR 1926.62. Occupational exposure to lead is covered by either 29 CFR 1910.1025 or 29 CFR 1926.62. Exposures to lead that may occur during construction work are covered by 29 CFR 1926.62; all other work is covered by 29 CFR 1910.1025.

A7.1. Definitions: See 29 CFR 1910.1025, paragraph (b), or 29 CFR 1926.62, paragraph (b), and attachment 1 of this standard for definitions. The OEL governs exposure control; however, 29 CFR 1926.62, paragraph (d)(2), mandates protection of employees during assessment of exposure in construction work. See 29 CFR 1910.1025, paragraph (c)(2), or 29 CFR 1926.62, paragraph (c)(2), for exposure durations greater than 8 hours.

A7.1.1. Construction Work: Construction, alteration, repair, or renovation activities that disturb in-place lead-containing materials. For the purposes of lead exposure, this definition does not include routine cleaning and repainting (such as minor surface preparation and repainting of housing units between occupants or at scheduled intervals) where there is insignificant damage, wear, or corrosion of existing lead-containing paint, coatings or substrates.

A7.2. Responsibilities: In addition to the responsibilities discussed in paragraph 2 of this standard, the following are added for lead exposure.

A7.2.1. The Aerospace Medicine Council (AMC). The AMC will:

- Establish medical surveillance protocols that meet the requirements of 29 CFR 1910.1025, paragraph (j), or 29 CFR 1926.62, paragraph (j), to include use of a laboratory approved by OSHA to conduct blood lead level analysis. The list of laboratories approved by OSHA is contained on the OSHA CD-ROM.
- Develop specific procedures to ensure workers who receive medical examinations and biological monitoring for lead are provided with a copy of the physician's written medical opinion required by 29 CFR 1910.1025, paragraph (j)(3)(v) or 29 CFR 1926.62, paragraph (j)(3)(v), and biological monitoring results as required by 29 CFR 1926.62, paragraph (j)(2)(iv), or 29 CFR 1910.1025, paragraph (j)(2)(iv).
- Develop specific procedures to advise workers of their right to a second opinion under the multiple physician review mechanism outlined in 29 CFR 1910.1025, paragraph (j)(3)(iii) or 29 CFR 1926.62, paragraph (j)(3)(iii). Patient Administration will arrange for a second medical examination when requested by the worker.
- Resolve any differences in medical findings from the multiple physician review process.
- Periodically, (at least annually) review the status of the lead program (exposure assessment, education, medical monitoring, etc.) to ensure compliance with Air Force, OSHA, and Environmental Protection Agency (EPA) standards.

A7.2.2. Bioenvironmental Engineering (BE). BE will:

- Determine the presence of lead-based paint utilizing OSHA valid test methods for construction work which involves federally employed workers, to include self-help projects. Self-help projects which have the potential to disturb lead-based paint (i.e., generate lead-containing respirable dust) will not be permitted.

- Review all contract design construction projects and sample results for potential health hazards associated with lead.
- Verify that a “competent person” as defined in 29 CFR 1910.1025, paragraph (b), or 29 CFR 1926.62, paragraph (b), performs frequent and regular inspections of construction job sites, materials, and equipment.
- Ensure subsequent Federal, State, and Local regulations governing lead assessment and abatement projects are followed.
- Assist the workplace supervisor in determining whether projected work is excluded from the scope and application of either 29 CFR 1910.1025 or 29 CFR 1926.62.
- Provide health/technical evaluation of contract specifications and contractor proposals to ensure proposed worker protection measures are appropriate for the contracted effort as defined in the contract specifications.
- Attend pre-construction meetings and evaluate construction plans to address health issues.

A7.2.3. Workplace Supervisor. The workplace supervisor will:

- Establish and implement a written compliance program to the extent required by 29 CFR 1910.1025, paragraph (e)(3), or 29 CFR 1926.62, paragraph (e)(2). BE will assist in the review of the plan and provide final approval.
- Notify BE whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the OEL.
- Establish procedures that encourage employees follow good work practices such as described in 29 CFR 1926.62, Appendix B (construction work only).
- Function as the “competent person” and perform frequent and regular inspections of job site, materials, and equipment (construction work only).
- Coordinate with BE to determine whether the projected work is excluded from the scope and application of 29 CFR 1926.62, paragraph (a) (construction work only).

A7.2.4. Public Health (PH). PH will provide occupational health education and training to the workplace supervisor concerning lead hazards according to the requirements of OSHA’s Hazard Communication Standards, 29 CFR 1910.1200 and 29 CFR 1926.59 to work areas where the exposure is at or above the action level for any one day or who are subject to exposure to lead compounds which may cause skin or eye irritation.

A7.2.5. Civilian Personnel Office. The base civilian personnel office will establish procedures for employees removed from the work area according to the medical removal plan will be protected as outlined in 29 CFR 1910.1025, paragraph (k), or 29 CFR 1926.62, paragraph (k).

A7.3. Specific Requirements:

A7.3.1. Exposure Assessment. BE will conduct initial and periodic exposure assessments as outlined in 29 CFR 1910.1025, paragraph (d), or 29 CFR 1926.62, paragraph (d), and document initial and subsequent exposure determinations according to AFOSH Standard 48-17.

A7.3.2. Protection of Employees During Period of Exposure Assessment in Construction

Work. With respect to the lead related tasks listed in 29 CFR 1926.62, paragraph (d)(2), where lead is present, until BE performs an employee exposure assessment as required in 29 CFR 1926.62, paragraph (d), and documents that the employee performing any of the listed tasks is not exposed above the OEL, the supervisor shall treat the employee as if the employee were exposed above the OEL and shall implement appropriate employee protective measures as described in paragraph (d)(2). BE will be consulted for respiratory protection requirements according to AFOSH Standard 48-1, Respiratory Protection.

A7.3.3. Employee Notification. Within 5 working days after receipt of monitoring results, BE shall notify each employee in writing of the results which represent that employee's exposure. The employee notification shall be written as required by 29 CFR 1910.1025, paragraph (d)(8), or 29 CFR 1926.62, paragraph (d)(8).

A7.3.4. Methods of Compliance.

A7.3.4.1. Engineering and Work Practice Controls. BE determines whether engineering controls and work practices are feasible to reduce the exposure levels as discussed in 29 CFR 1910.1025, paragraph (e) or 29 CFR 1926.62, paragraph (e). Where exposures exist that can be feasibly controlled, BE reports the recommended actions to the supervisor for action. The actions taken to incorporate these compliance measures will be tracked as outlined in AFI 91-301, Air Force Occupational, Safety, Fire Prevention and Health (AFOSH) Program.

A7.3.4.2. Compliance Program. The supervisor shall write and maintain the compliance program as required by 29 CFR 1910.1025, paragraph (e)(3), or 29 CFR 1926.62, paragraph (e)(2). For construction work, the written plan need not be unique to each worksite, provided all the elements required by 29 CFR 1926.62, paragraph (e)(2)(ii), are specific to the conditions at the job site. This program will be revised and updated at least every 6 months to reflect the current status of the program.

A7.3.5. Respiratory Protection.

A7.3.5.1. BE will select the appropriate respirator for affected employees as specified in 29 CFR 1910.1025, paragraph (f), or 29 CFR 1926.62, paragraphs (d)(2) and (f).

A7.3.5.2. Whenever respirators are issued or used, the workplace supervisor will establish a respiratory protection program according to AFOSH Standard 48-1. Additionally, supervisors will ensure that workers are trained and fitted with a respirator by BE before working in an operation where lead exposure exceeds the OEL or using the respirator.

A7.3.6. Protective Clothing and Equipment. When protective equipment or clothing is needed for protection, BE will recommend the appropriate protection. The supervisor will provide it and enforce its use, handling, and laundering according to the requirements outlined in 29 CFR 1910.1025, paragraph (g), or 29 CFR 1926.62, paragraph (g), and AFOSH Standard 127-31, Personnel Protective Equipment.

A7.3.7. Hygiene and Housekeeping. The supervisor of areas where the workers are exposed to lead at levels more than the OEL will establish hygiene practices and facilities that comply with 29 CFR 1910.1025, paragraph (h) and (i), or 29 CFR 1926.62, paragraph (h) and (i). The BE survey will review compliance with these paragraphs.

A7.3.8. Medical Surveillance.

A7.3.8.1. Medical surveillance and biological monitoring will be provided as outlined in 29 CFR 1910.1025, paragraph (j), or 29 CFR 1926.62, paragraph (j), as a minimum. The examining physician shall make available the following information to the employee at the conclusion of each examination required by this paragraph:

A7.3.8.1.1. Results of biological monitoring as required by 29 CFR 1910.1025, paragraph (j)(2)(iv), or 29 CFR 1926.62, paragraph (j)(2)(iv).

A7.3.8.1.2. Physician's medical opinion as required by 29 CFR 1910.1025, paragraph (j)(3)(v), or 29 CFR 1926.62, paragraph (j)(3)(v).

A7.3.8.1.3. The employee's right to a second medical opinion as required by 29 CFR 1910.1025, paragraph (j)(3)(iii), or 29 CFR 1926.62, paragraph (j)(3)(iii).

A7.3.8.2. Employees will be provided with written copies of biological monitoring results within five days of receipt of results, and written medical opinions as required by 29 CFR 1910.1025, paragraph (j)(2)(iv) and (j)(3)(v), or 29 CFR 1926.62 paragraphs (j)(2)(iv) and (j)(3)(v), according to local procedures developed by the Aerospace Medicine Council.

A7.3.8.3. Patient Administration will arrange for employee access to a second medical opinion at no cost to the employee. Employees should be given the opportunity to choose from a different Air Force physician, a list of reputable civilian physicians, or any other physician so desired by the employee. Civilian employees are authorized regular occupational health screening and follow-up, as indicated in AFR 168-6, Persons Authorized Health Care, Health Benefits, Charges and Billing Procedures, paragraph 1-11(I).

A7.3.9. Employee Information and Training.

A7.3.9.1. Supervisors of all operations in which there is a potential exposure to airborne lead at any level shall train the employees on information concerning lead hazards according to the requirements of 29 CFR 1910.1025, paragraph (l)(1)(i) or 29 CFR 1926.62, paragraph (l)(1)(i), OSHA'S Hazard Communication Standard for the construction industry, 29 CFR 1926.59, and AFOSH Standard 161-21, Hazard Communication.

A7.3.9.2. Supervisors shall institute a training program for and ensure the participation of all employees subject to exposure to lead at or above the action level or for whom the possibility of skin or eye irritation exists, to the extent required by 29 CFR 1910.1025, paragraph (l), or 29 CFR 1926.62, paragraph (l).

A7.3.9.3. Supervisors of operations that subject employees to exposure to lead at or above the action level or for whom the possibility of skin or eye irritation exists shall maintain a copy of 29 CFR 1910.1025 or 29 CFR 1926.62 and this AFOSH Standard readily accessible in the workplace for employee review.

A7.3.10. Signs. BE will assist the supervisor in identifying the appropriate location to post signs as required by 29 CFR 1910.1025, paragraph (m), or 29 CFR 1926.62, paragraph (m).

A7.3.11. Recordkeeping. Records of exposure assessment, medical surveillance, medical removals and objective data for exemption for initial monitoring requirements outlined in 29 CFR 1910.1025, paragraph (n), or 29 CFR 1926.62, paragraph (n), will be maintained according to AFR 168-4 and AFOSH Standard 48-17.

A7.3.12. Observation of Monitoring. When observation of employee monitoring is requested as described in 29 CFR 1910.1025, paragraph (o), or 29 CFR 1926.62, paragraph (o), BE will ensure that the observer is appropriately protected.

A7.4. References: In addition to the references listed in attachment 1 of this standard, the following standards and publications are relevant to this attachment:

A7.4.1. 29 CFR 1910.1025, Lead; General Industry.

A7.4.2. 29 CFR 1926.62, Lead; Construction Work.

A7.4.3. 40 CFR 745, Lead; Requirements for Lead-based Point Activities (Proposed, 2 Sep 94)

A7.4.4. US Department of Housing and Urban Development, "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing," (Clearance Draft 16 May 94)

A7.4.5. HQ USAF/CC Policy Letter, "Air Force Policy and guidance on Lead-Based Paint in Facilities," 24 May 93.

A7.4.6. Armstrong Laboratory Technical Report, AL/OE-TR-1993-0175, "Lead Exposure Hazard Management Guide," Dec 93.

Attachment 8

OCCUPATIONAL EXPOSURE TO HYDRAZINE

This attachment implements additional requirements for protecting Air Force personnel from exposure to hydrazine. It applies to all missile, aircraft, and spacecraft systems and operations using hydrazine [Chemical Abstract Service (CAS) number 000302012 in concentrations greater than 0.1 percent] as a monopropellant or as a component in the fuel mixture. It does not apply to substituted hydrazines such as unsymmetrical dimethyl hydrazine (UDMH) and monomethyl hydrazine (MMH). The specific requirements in this attachment supplement the requirements for suspected human carcinogens found in the standard. The specific requirements do not apply to laboratory operations.

A8.1. Definitions: See attachment 1 of this standard for definitions. The OEL governs exposure control. The following definitions are added for hydrazine:

- **Controlled Area.** A controlled area is either a regulated area or a temporary restricted area.
- **Temporary Restricted Area.** Temporary restricted areas are established in an unregulated area where either an accidental release of hydrazine has occurred or where a closed hydrazine system is being maintained such that there is an increase in potential for exposure.

A8.2. Responsibilities: In addition to the responsibilities discussed in paragraph 2 of this standard, the following are added for the program for controlling exposures to hydrazine.

A8.2.1. BE will evaluate the adequacy of the procedure to control exposures in temporary restricted areas established for F-16 aircraft in the event of an in-flight emergency.

A8.2.2. The supervisor will inform BE of anticipated changes in equipment or procedures that could affect the potential for exposure to hydrazine.

A8.3. Specific Requirements:

A8.3.1. Exposure Monitoring. BE will conduct exposure evaluations at least every six months for regulated areas. These evaluations may be either sampling or a verification that the methods and controls are essentially the same as during the initial samples. During the first 12 months when F-16 aircraft are assigned to a base, BE will sample the exposure at least once a quarter. If the levels exceed the action level, the quarterly monitoring program may be extended.

A8.3.2. Methods of Compliance. When liquid hydrazine is present, work practices will be implemented to limit exposure via inhalation, skin absorption, and ingestion. The organization that uses the hydrazine will coordinate these practices with BE and then publish written instructions.

A8.3.2.1. The supervisor will ensure that only persons designated to work in the area and personnel from PH, safety, BE, or the fire department enter the controlled area.

A8.3.2.2. There will be an emergency shower and eyewash in the controlled area for flushing the eyes or skin of a person who has contacted the liquid hydrazine. These devices will be permanently installed in fixed facilities but may be temporary devices in temporary restricted areas.

A8.3.2.3. There will be a means of decontaminating protective clothing that comes into contact with liquid hydrazine with a 5 percent solution of chlorine to prevent the spread of contamination.

A8.3.2.4. No smoking, eating, drinking, application of cosmetics, or storage of materials for consumption will be allowed in a controlled area.

A8.3.3. Respiratory Protection.

A8.3.3.1. Respiratory protection will not be used in lieu of proper engineering controls and work practices. BE will notify the MAJCOM BEE if proper engineering controls and work practices do not reduce personnel exposure to below the OEL.

A8.3.3.2. The type of respirator used will conform with the minimum protection factor requirements in AFOSH Standard 48-1 and 29 CFR 1910, Subpart Z, with the following exception. Designated rocket propellant gas masks may be used for military unique operations for exposures less than 50 times the OEL. Applicable technical orders such as, T.O. 1F-16A-2-49GS-00-1 should be consulted for additional information.

A8.3.3.3. The rocket propellant gas mask will not be used to enter controlled areas that have, or are suspected to have, unknown concentrations of hydrazine.

A8.3.3.4. The end-of-life indicator on the rocket propellant gas mask does not adequately respond to hydrazine. The maximum use time is 8 hours; supervisors will enforce procedures to replace the canisters before the canisters have been exposed for 8 hours, without regard to whether the mask is being worn.

A8.3.3.5. In the event of a hydrazine leak during air transportation, the crew should use aircraft oxygen masks in the positive pressure mode.

A8.3.4. Protective Clothing and Equipment. The skin must be protected from exposure to liquid hydrazine and vapors greater than the OEL. When equipment or clothing is needed for protection, BE will recommend the appropriate protection. The supervisor will provide it and enforce its use, handling, decontamination, and laundering.

A8.3.5. Medical Surveillance.

A8.3.5.1. Workers whose work entails a risk of exposure to hydrazine in controlled areas will be included in the medical surveillance program. Workers who may infrequently enter a controlled area, such as fire fighters, will not normally be included in the medical surveillance program for hydrazine.

A8.3.5.2. If an unusual or emergency situation subjects a worker to probable exposure to hydrazine, the individual should be given a special purpose examination.

A8.3.5.3. The AMC will evaluate the potential for exposures for situations other than in controlled areas and emergency situations to determine the appropriate medical surveillance.

A8.3.5.4. Types of Medical Evaluations :

A8.3.5.4.1. Preplacement Evaluations: Preplacement evaluations will be completed before the worker enters a controlled area. The scope and content of this evaluation will be determined by the Occupational Health Working Group (OHWG) and evaluating physician at the time this evaluation is needed. A competent health care provider will evaluate each worker; if the health provider is a non-physician, a physician will review the findings.

A8.3.5.4.2. Periodic Evaluations : Periodic evaluations will be performed at least annually for employees enrolled in a medical surveillance program for hydrazine. Similar to the pre-

placement evaluation, the scope and content of the periodic evaluation will be determined by the Occupational Health Working Group and the evaluating physician at the time this evaluation is needed.

A8.3.5.4.3. Termination of Exposure Evaluations : The medical record of an employee removed from exposure to hydrazine will be reviewed by a physician. The scope and content of any additional evaluation will be made by the physician reviewing the medical record.

A8.3.5.5. An abnormal finding indicates further evaluation and is not in itself disqualifying. Verification of abnormal laboratory results should disqualify a worker from duties that risk exposure to hydrazine until a physician can determine the significance of the finding.

A8.3.5.6. Medical Fitness For Duty Procedures :

A8.3.5.6.1. Civilian Employees : Civilian employees with medically disqualifying conditions will be evaluated IAW 5CFR Part 339, "Medical Qualification Determinations," 1 January 1991. This guidance specifically addresses that care be used to consider each case on an individual basis, obtaining consultation on each case with the employee's private physician (as appropriate) and with the relevant military medical specialists as appropriate (at no cost to the employee). A determination should be made by the examining physician whether a disqualifying medical condition is temporary or permanent in nature and whether the employee's medical condition has reached maximum medical benefit. This information should be discussed with the employee's supervisor and employee relations representative (with care given not to divulge medical information which might be considered confidential). Guidance should be given to the supervisor on what accommodations might be possible in order for the employee to perform the minimum essential functions of his/her job. The final decision on whether an employee with a disqualifying medical condition is to be retained at work or accommodated is a managerial decision, not a medical one.

A8.3.5.6.2. Active Duty and Reserves: Medical fitness for duty procedures for military members shall follow Air Force Instructions 44-113, "Medical Boards And Continued Military Service," AFI 48-123, "Medical Examination and Standards," 15 November 1994 and AFI 36-3212, "Physical Evaluation For Retention, Retirement and Separation," 14 June 1994.. Final determination of duty status for military members is a personnel action (similar to the case with civilian employees) defined by the Physical Evaluation Board process described in the above instructions.

A8.3.5.6.3. Air Force National Guard: Medical surveillance requirements and fitness for duty evaluations for reservists exposed to hydrazine shall address only those exposures or functional capabilities expected during active duty, including anticipated duties during deployment. Fitness for duty procedures shall follow the medical evaluation and physical examination board procedures described above (identical to the active duty force). Medical monitoring requirements for exposure to hydrazine while employed by the States (outside the jurisdiction of the Department of the Air Force) as well as fitness for duty evaluations arising from these activities is beyond the scope of this instruction.

A8.3.5.7. The physician will enter the following information into the medical record, if an entry is appropriate:

- Any medical condition that would place the worker at significantly increased risk of health impairment due to hydrazine exposure.

- Any recommended limitation on the worker's exposure, use of respirators, or protective clothing.
- Any medical condition arising from, or aggravated by, work requiring further examination or treatment.

A8.3.6. Emergency Response.

A8.3.6.1. Emergency response plans for controlled areas will include emergency treatment directed toward removing the worker from the area of exposure, removing contaminated clothing, and flushing contaminated skin and eyes with large amounts of water for at least 15 minutes. All eligible DoD employees or beneficiaries who have skin or eye contact with liquid hydrazine or who are suspected of being exposed to airborne levels greater than the OEL without proper respiratory protection will be examined at the nearest medical facility.

A8.3.6.2. Emergency response plans will also address containing, diluting, and neutralizing hydrazine spills. The minimum protection for a worker who responds to control a spill will include a self contained breathing apparatus in pressure demand mode, rocket fuel handlers gloves, boots, and an apron.

A8.3.6.3. The first action will be to contain the spill to prevent it from entering storm drains, sanitary sewers, or other bodies of water. The method used to contain the spill must account for the fact that the hydrazine will be diluted to a 1 percent concentration before it can be neutralized. If the dilution is not done first, an adverse exothermic reaction with the neutralizing agent will occur.

A8.3.6.4. If the volume of the containment area is not large enough to accommodate the dilution, a volume of water equal to the amount of hydrazine may be added to control the fire hazard and limit evaporation. The partially diluted hydrazine can then be mopped up with polypropylene sponges or clean cotton cloths and transferred to containers where it can be further diluted and neutralized.

A8.3.6.5. After the hydrazine is diluted to a 1 percent solution, it can be neutralized with household bleach (5 percent sodium hypochlorite) or with commercial HTH (a granular mixture of 65% calcium hypochlorite) to achieve a 10 percent excess hypochlorite residual. The bleach or HTH should be added in small increments in a manner that the vigorous bubbling stops before more is added. Note: The calculated volumes of pure neutralizing agent must never be added directly to undiluted hydrazine. Determine how much hydrazine is in the diluted hydrazine spill and then calculate the volume of neutralizing agent to be added to the diluted hydrazine.

A8.3.6.5.1. Use 142 volumes of bleach to neutralize each volume of neat (100 percent) hydrazine. For example, 17.75 gallons are required to neutralize 1 pint of neat hydrazine spilled.

A8.3.6.5.2. Use 60 pounds of HTH to neutralize each gallon of neat hydrazine. This ratio corresponds to 7.5 pounds for each pint of 100 percent hydrazine.

A8.3.6.5.3. Use 100 volumes of bleach to neutralize each volume of H-70. (H-70 is the 70 percent hydrazine fuel used in the F-16 aircraft emergency power limit.) Each pint of H-70 will require 12.5 gallons of bleach to neutralize it.

A8.3.6.5.4. Use 42 pounds of HTH to neutralize each gallon of H-70 spilled. If 1 pint of H-70 is spilled, 7.5 pounds of HTH will neutralize it.

A8.3.7. Employee Information and Training. Supervisors of operations that involve potential exposure to hydrazine will make sure training is given at least annually. In addition to the training

required by AFI 91-301 and AFOSH Standard 161-21, training will include a description of each operation that risks exposure to hydrazine, the quantity of hydrazine involved, work methods and protective equipment required for each task, actions to be taken in the event of an accidental spill or over-exposure, and a description of the medical surveillance program.

A8.3.8. Signs. The supervisor will ensure that caution signs are displayed at each entrance to a controlled area, properly illuminated as needed, and are free of obstructions.

A8.3.8.1. The sign should be a standard yellow caution sign sized between 7 X 10 inches and 20 x 28 inches.

A8.3.8.2. The word "CAUTION" should be displayed in yellow letters on a black rectangular pattern at the top of the sign. The width of the black rectangle should be 5/8-inch less than the width of the sign. The heights of the letters and the rectangle should correspond to the height of the sign according the guidelines below:

Table A8.1. Heights, In Inches.

Sign	Letter	Rectangle
7	1-5/8	2-1/4
10	2-1/4	3-1/4
14	2-3/4	3-3/4
20	3-1/4	4-1/4

A8.3.8.3. Beneath the caution label, the following words should be displayed in the styles listed in parentheses:

- HYDRAZINE (1-inch Sans Serif, Gothic, or Block)
- FLAMMABLE CANCER SUSPECT AGENT (3/4-inch Gothic)
- AVOID VAPORS AND SKIN CONTACT (1/4-inch Gothic)
- WEAR PROTECTIVE EQUIPMENT (1/4-inch Gothic)
- NO SMOKING, EATING OR DRINKING (1/4-inch Gothic)

A8.3.9. Recordkeeping. The supervisor of the controlled area will keep a log of each person who enters the area for at least one year until BE can review it during the annual survey.

Attachment 9

OCCUPATIONAL EXPOSURE TO ASBESTOS

This attachment implements 29 CFR 1910.1001, 29 CFR 1926.1101, 40 CFR part 61, and 40 CFR part 763. The provisions apply to occupational exposure to asbestos and establish environmental compliance requirements. The requirements of 29 CFR 1910.1001 apply to all occupational exposure to asbestos, except as provided in 29 CFR 1910.1001, paragraph (a)(2). All construction work excluded from coverage in the general industry standard for asbestos by 29 CFR 1910.1001, paragraph (a)(2), is covered by 29 CFR 1926.1101. **Special attention should be paid to the scope and application paragraph of the construction standard (the preface of the standard) as most asbestos abatement activities performed at base level are covered within the construction standard.**

A9.1. Definitions: See 29 CFR 1910.1001, paragraph (b), 29 CFR 1926.1101, paragraph (b), 40 CFR 61.141, 40 CFR 763.83, and attachment 1 of this standard for definitions. The OEL governs exposure control. The following definitions are added for asbestos:

A9.1.1. Workplace Supervisor. A person that supervises personnel working in areas where Asbestos Containing Materials (ACM) are present, functions as the “competent person” according to 29 CFR 1926.1101 and 29 CFR 1926.32 and is knowledgeable of the locations where ACM exists.

A9.1.2. Emergency. An unpredicted and unexpected occurrence likely to release airborne concentrations of asbestos fibers greater than the OEL.

A9.1.3. Accredited Laboratory. A laboratory that is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) to analyze bulk and air samples of either presumed asbestos containing material (PACM) or asbestos containing material (ACM).

A9.1.4. Construction Work. Construction, alteration, repair, or renovation activities that disturb in-place asbestos-containing materials (ACM). For the purposes of asbestos exposure, this definition includes, but is not limited to, demolition, renovation, and maintenance of structures, as well as the removal of asbestos containing materials (ACM). It does not include automotive repair work or aircraft maintenance tasks.

A9.1.5. Action Level. There is no action level established for asbestos. The analysis method is too unreliable at concentrations less than 0.1 fiber/cc to distinguish the difference between 0.01 and 0.09 fiber/cc with a predictable degree of confidence. Analyzing data based on a statistical distribution of air sample results less than 0.1 fibers/cc should be avoided.

A9.2. Responsibilities. In addition to the responsibilities discussed in paragraph 2 of this standard, the following are added for asbestos exposure:

A9.2.1. The Aerospace Medicine Council (AMC). The AMC will:

- Establish medical surveillance protocols that meet the requirements of 29 CFR 1910.1001, paragraph (l), or 29 CFR 1926.1101, paragraph (m) and applicable appendices.
- Periodically (at least annually) review the status of the asbestos program (ambient and bulk monitoring, education, medical monitoring, etc.) for compliance with Air Force, OSHA, and Environmental Protection Agency (EPA) standards.

A9.2.2. Bioenvironmental Engineering (BE). BE will:

- Verify asbestos analyses are performed by accredited laboratories.
- Verify personnel performing asbestos work, including sampling, receive proper training as outlined in 29 CFR 1910.1001, paragraph (j)(5), or 29 CFR 1926.1101, paragraph (k)(8).
- Verify compliance with 40 CFR part 763, Asbestos-Containing Materials in Schools, when required.
- Assist in the prioritization of asbestos abatement projects by utilizing the Air Force Asbestos Guidance for Rating and Assessing Damage and Exposure (GRADE) System, Armstrong Laboratory Report 86-072EH0021HGA or an alternative prioritization method.
- Review construction/renovation plans for ACM, to include self-help projects. Self-help projects with the potential to expose personnel to airborne levels of asbestos will not be permitted.
- Evaluate asbestos abatement projects to ensure Federal, State, and Local regulations are followed.
- Performs a compliance review of procedures initially and periodically of the Asbestos abatement team program.

A9.2.3. The Asbestos Abatement Team will:

- Have a qualified competent person on site as defined in 29 CFR 1926.1101, paragraph (b).
- Coordinate with or notify Base, State, and Federal agencies concerning asbestos removal and disposal as outlined in 29 CFR 1926.1101, paragraph (l)(2) and 40 CFR part 61.
- Be comprised of members who are properly trained by completing an EPA accredited course at the time of the initial assignment and at least annually thereafter as specified in 29 CFR 1926.1101, paragraph (k)(8)(ii) and 40 CFR Part 763, Asbestos Model Accreditation Program (MAP).
- Coordinate with BE on the proper selection and wear of personal protective equipment.
- Follow proper work practices/procedures as required in 29 CFR 1926.1101, paragraph (e)(6)(ii).
- Notify personnel working in the immediate area (but not involved in the asbestos work) in accordance with 29 CFR 1926.1101, paragraph (k)(1)(ii).

A9.2.4. Workplace Supervisor will:

- Ensure work practices/procedures are followed as required in 29 CFR 1910.1001, paragraph (f) and 29 CFR 1926.1101 paragraph (g), if applicable.
- Be aware of the locations, uses, and condition of ACM in the workplace.
- Inform affected employees of the location of ACM in the workplace.
- Notify Base Civil Engineering/Environmental Management and BE of asbestos emergency situations.
- Notify BE prior to the initiation of work that involves removal or disturbance of asbestos containing material.

A9.2.5. Public Health (PH). Public Health will provide occupational health education/training on asbestos awareness for federally employed maintenance and custodial personnel who may work in buildings that contain ACM but are not required to work with ACM to the extent requiring EPA accredited training.

A9.3. Specific Requirements:

A9.3.1. Airborne Exposure Monitoring. BE will:

A9.3.1.1. Conduct airborne exposure monitoring as outlined in 29 CFR 1910.1001, paragraph (d), or 29 CFR 1926.1101, paragraph (f). **Note:** There is no action-level due to the unreliability of analysis methods to accurately measure airborne exposure concentrations below 0.1 fibers/cc.

A9.3.1.2. Ensure exposure monitoring is consistent with the OSHA Reference Method outlined in 29 CFR 1910.1001 or 29 CFR 1926.1101, Appendix A.

A9.3.1.3. Ensure clearance level is achieved before reoccupancy following asbestos abatement projects as outlined in paragraph A9.3.6

A9.3.2. Employee Notification. BE will notify employees involved in asbestos removal of personnel monitoring results as soon as possible following receipt of results as specified in 29 CFR 1926.1101, paragraph (f)(6)(i). Personnel involved in operations covered by the General Industry asbestos standard will be notified of sampling results within 15 days as specified by 29 CFR 1910.1001, paragraph(d)(7).

A9.3.3. Methods of Compliance. BE will determine if engineering control and/or practices are feasible to reduce exposure levels as discussed in 29 CFR 1910.1001, paragraph (f)(1) or 29 CFR 1926.1101, paragraph (g). Where exposures exist that can be feasibly controlled, BE will report the recommended actions to the supervisor for implementation. The actions taken to incorporate these compliance measures will be tracked as outlined in AFI 91-301. The supervisor shall document the status of compliance efforts as required by AFI 91-301.

A9.3.4. Respiratory Protection.

A9.3.4.1. BE will select the appropriate respirator for affected employees as specified in 29 CFR 1910.1001, paragraph (g)(2), or 29 CFR 1926.1101, paragraph (h)(2).

A9.3.4.2. Whenever respirators are issued or used, the workplace supervisor /competent person will establish a respiratory protection program according to AFOSH Standard 48-1 and ensure workers are trained and fitted with a respirator by BE before working in an operation where asbestos exposure exceeds the OEL or use of a respirator is required.

A9.3.5. Protective Clothing and Equipment. BE will recommend appropriate protective clothing and equipment and the supervisor will provide it and enforce its use, handling, and laundering according to the requirements outlined in 29 CFR 1910.1001, paragraph (h), or 29 CFR 1926.1101, paragraph (i), and AFOSH Standard 127-31.

A9.3.6. Clearance Level. BE should verify that a clearance level is achieved before reoccupancy following abatement projects. Verification can be by either reviewing contractor air monitoring data or by collecting clearance air samples. This level must not exceed the background concentration established with pre-abatement air samples, provided this level does not exceed the OEL.

A9.3.6.1. Clearance air sampling by contractor or BE should be collected using aggressive air sampling (i.e., using a blower to resuspend settled fibers) after visual inspection of the abatement area as outlined in EPA Publication 560/5-85-024, Guidance for Controlling Asbestos-Containing Materials in Buildings, paragraph 6.4.2.1.

A9.3.7. Hygiene Facilities and Practices. The supervisor of areas where workers are exposed to asbestos at levels more than the OEL will establish hygiene practices and facilities that comply with 29 CFR 1910.1001, paragraph (i) or 29 CFR 1926.1101, paragraph (j).

A9.3.8. Warning Signs and Labels. BE will assist the workplace supervisor/competent person in identifying the appropriate location to post warning signs and labels as required by 29 CFR 1910.1001, paragraph (j)(3) and (j)(4), or 29 CFR 1926.1101, paragraph (k)(6) and (k)(7).

A9.3.9. Employee Information and Training. (See 29 CFR 1910.1001(j) and 29 CFR 1926.1101(k) for additional guidance.)

A9.3.9.1. PH will provide occupational health education/training on asbestos awareness for maintenance and custodial personnel prior to or at the time of initial assignment. This training should include the potential hazards of working with nonfriable asbestos.

A9.3.9.2. Personnel who conduct activities that will result in removing more than three square or linear feet of friable ACM will receive training by completing an EPA accredited asbestos worker course (or equivalent) as specified in 40 CFR part 763, Asbestos MAP.

A9.3.9.3. Each initial and refresher training course offered for accreditation will be specific to a single discipline, and not combined with training for any other discipline. This training must be equivalent in curriculum, training method and length to the Asbestos MAP as outlined in 40 CFR Part 763.

A9.3.10. Medical Surveillance.

A9.3.10.1. The Physical Examinations and Standards Section (PES) will use DD Form 2493-1, Asbestos Exposure, Part I - Initial Medical Questionnaire and DD Form 2493-2, Asbestos Exposure, Part II - Periodic Medical Questionnaire, as appropriate, when accomplishing asbestos medical examinations. **Note:** Medical surveillance of personnel conducting class I, II, or III work more than 30 days per year, regardless of whether their exposure exceeds the OEL, is required.

A9.3.10.2. Employees Enrolled Under The Construction Standard:

A9.3.10.2.1. Preplacement, Periodic and Termination of Exposure Exams: Employees enrolled under this standard will receive at a minimum a preplacement physical exam with emphasis on the respiratory, cardiovascular and digestive systems, in addition to medical review of the questionnaire referenced above. Employees will also receive a pulmonary function test which determines the FEV1 and Forced Vital Capacity. The performance of a Chest X-ray is discretionary (the only discretionary item in this section) and left to the opinion of the examining physician.

A9.3.10.2.2. Employees Enrolled Under The General Industry Standard:

A9.3.10.2.3. Preplacement, Periodic and Termination Exams: Employees covered under this standard will receive the same exams mentioned in the construction standard. The only difference between the two surveillance programs is that Chest X-rays are mandatory, and will be administered according to the following schedule:

Table A9.1. Frequency of Chest Roentgenogram

Years Since First Exposure	Age of Employee		
	15-35	35-45	45+
0-10	Every 5 years	Every 5 years	Every 5 years
10+	Every 5 years	Every 2 years	Every 1 year

A9.3.10.3. Physician's written opinion required by 29 CFR 1910.1001, paragraph (l)(7), or 29 CFR 1926.1101, paragraph (m)(4), will be documented on AF Form 2770, Assessment and Disposition, and provided by the PES to all affected employees.

A9.3.10.4: Chest X-rays may be interpreted by a certified B-reader, a board eligible/certified radiologist, or an experienced physician with known expertise in pneumoconiosis. All interpreters must have a complete set of ILO-U/C International Classification of Radiographs For Pneumoconiosis 1980 immediately available for reference.

A9.3.10.5: Medical facilities should consult with their MAJCOM (or equivalent) Chief of Aerospace Medicine to establish local policy regarding whether ILO films should be purchased (and asbestos films read locally), or whether the asbestos films should be shipped to their supporting medical center for interpretation.

A9.3.11. Recordkeeping. Records of employee exposure measurements, objective data for exempted operations, medical surveillance, and training, outlined in 29 CFR 1910.1001, paragraph (m), or 29 CFR 1926.1101, paragraph (n), will be maintained according to AFR 168-4 and AFOSH Standard 48-17.

A9.4. References: In addition to the references listed in attachment 1 of this standard, the following OSHA and EPA standards and publications apply to this attachment:

- A9.4.1. 40 CFR part 61, Asbestos National Emissions Standards for Hazardous Air Pollutants (NES-HAP).
- A9.4.2. 40 CFR part 763, Asbestos Hazard Emergency Response Act (AHERA).
- A9.4.3. 29 CFR 1910.1001, Asbestos; General Industry.
- A9.4.4. 29 CFR 1926.1101, Asbestos; Construction Work.
- A9.4.5. USEPA, Guidance for Controlling Asbestos-Containing Materials in Buildings, EPA 560/5-85-024.
- A9.4.6. USEPA, Managing Asbestos in Place, EPA 20T-2003.
- A9.4.7. USEPA, Measuring Airborne Asbestos Following an Abatement Action, EPA 600/4-85-049.
- A9.4.8. USEPA, Asbestos in Buildings: Simplified Sampling Scheme for Surfacing Materials, EPA 560/5-85-030A.
- A9.4.9. AFR 91-42, Facility Asbestos Management
- A9.4.10. Asbestos School Hazard Abatement Reauthorization Act (ASHARA)
- A9.4.11. USAFOEHL Report 86-072EH0021HGA, Air Force Asbestos Guidance for Rating and Assessing Damage and Exposure (GRADE) System, Aug 86.