Section 7

Occupational Health

This section sets forth the requirements and standards for Reclamation's occupational health programs. It covers the following specific areas:

- Employee Exposure Standards
- Health Hazard Assessments
- Exposure Control
- Hazard Control Plans
- Recordkeeping
- Medical Surveillance
- Hazard Communication Program
- Respiratory Protection
- Noise Exposure and Hearing Conservation
- Sanitation
- Exposure to Hazardous Chemicals in Laboratories
- Bloodborne Pathogens
- Heat Stress and Cold Stress
- Ionizing and Non-ionizing Radiation
- Asbestos
- Lead
- Illumination

7.1 Employee Exposure Standards

An employee exposure measures dose, toxicity, and route of entry to an employee for a specified period of time. Maintain employee exposures to airborne contaminants at or below the more protective requirements of the OSHA permissible exposure limits (PELs) or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents.

7.2 Requirements for Health Hazard Assessments

A health hazard assessment is a study of the worksite, including identification of potential to hazardous materials or atmospheres, equipment, and work procedures.

7.2.1 Exposure Assessment. The exposure assessment is a process that determines the magnitude (including dose and toxicity), duration, and route of entry of a potential health threat. Conduct health hazard assessments for all facilities and operations to determine the extent of existing, as well as introduced, health hazards (physical, chemical, and biological).

7.2.2 Exposure Monitoring. Conduct exposure monitoring when hazardous materials or physical agents are present in the workplace. Also use exposure monitoring to:

- Evaluate new processes and establish baselines
- Evaluate engineering controls
- Investigate employee complaints
- Comply with Federal, State, and local regulations
- Conduct investigations or research

Periodically monitor exposure when employees wear respiratory protection, use hearing protection devices, are exposed to radiation sources, or when monitoring is required by specific standards. A qualified person must direct and supervise employee exposure monitoring.

7.3 Requirements for Exposure Control

7.31 Engineering Controls. Use engineering controls as the primary means to minimize workplace health hazards. Engineering controls may include, but are not limited to, the use of enclosures, isolation, substitution of materials, or ventilation.

7.3.2 Administrative Control Measures. Use administrative controls such as scheduling reduced work times in high exposure areas, erecting signs, training employees, and specific job procedures to reduce personnel exposures.

7.3.3 Personal Protective Equipment. Use personal protective equipment to protect employees from their environment when engineering and administrative controls are not adequately protective.

7.3.4 Assessment. Complete a written assessment on the feasibility of engineering controls when either of the following occurs:

a. The air contaminant concentrations meet or exceed an action level (which is 50 percent of the more stringent of OSHA PEL's, ACGIH TLVs, or other specific occupational-based exposure standard in effect).

b. The source noise level meets or exceeds 85 dBA.

7.4 Requirements for the Hazard Control Plans

7.4.1 Air Contaminant Control Plan. Establish an air contaminant control plan when an air contaminant is produced by stationary or portable sources at concentrations that reach an Action Level. An Action Level is defined as one-half of an established PEL or TLV, unless otherwise stated in a specific standard. The plan will reflect the means and processes used to:

a. Identify all contaminant sources.

b. Track corrective actions associated with contaminant sources.

c. Conduct area monitoring to determine the effectiveness of the controls applied.

d. Complete job hazard analyses for operations with air contaminant exposure.

e. Provide exposure control through the use of administrative controls or use of the personal protective devices when engineering control is infeasible.

f. Implement a medical surveillance program, when necessary.

7.4.2 Noise Control Plan. Establish a noise control plan when noise is produced by stationary or portable sources expose personnel to 85 or more decibels (dBA). The plan will reflect the means and processes used to:

a. Conduct noise surveys to identify, inventory, and label all sources that expose personnel to 85 dBA or more.

b. Track corrective actions associated with noise sources.

c. Conduct area monitoring to determine the effectiveness of the controls applied.

d. Complete job hazard analyses for operations with noise source exposure.

e. Provide exposure control through the use of administrative controls or the use of personal protective devices when engineering control is infeasible.

f. Implement a hearing conservation program, when necessary.

7.5 Recordkeeping Requirements

Maintain employee medical, exposure monitoring, and training records in accordance with OSHA 29 CFR 1910.1020, the Privacy Act of 1974 (P.L.93-579), and FPM 293. Follow the employee medial records maintenance guidance found in the Department of the Interior's *Occupational Medicine Program Handbook*. Medical and exposure monitoring records must be maintained for the duration of employment plus 30 years.

7.6 Requirements for Medical Surveillance

7.6.1 Requirements for Medical Surveillance are Determined by Exposure or Risk. Include an employee in a medical surveillance program after an initial hazard assessment for certain high demand jobs; where required by specific Federal regulations; after exposure monitoring verifies

the necessity; or when employees are exposed to or exhibit symptoms of exposure to chemicals, dust, noise, and other workplace hazards as determined by credible exposure monitoring.

7.6.2 Medical Administration. When medical surveillance is required, it must be conducted under the direction of a physician who specializes in occupational medicine. The medical surveillance program must be based on a comprehensive evaluation of the workforce, worksites, and job duties. Provide the examining physician with a description of duties that relate to the hazardous workplace, results of employee exposure monitoring, a description of personal protective equipment used, and information from previous medical examinations.

7.6.3 Notification. Notify employees of their inclusion in the program and educate them as to the program's goals, benefits, and procedures. Provide employees with a written summary of any examination, as well as laboratory tests results. Recommendations for any additional tests relating to the medical surveillance program and information on non work-related problems requiring further medical evaluation must be conveyed to the employee in a timely manner. The medical provider will provide the employer with the physician's opinion concerning: (1) any detected medical conditions that place the employee at increased risk of harm from continued performance on the job, (2) any recommended work modifications, and (3) a statement that the employee has been informed of the results and any other matters requiring further medical followup.

7.7 Hazard Communication Program Requirements

7.7.1 General Requirements. Obtain Material Safety Data Sheet (MSDS) for any substance possessing combustible, flammable, corrosive, explosive, or toxic properties. Make MSDS readily available and accessible by employees. All persons who use hazardous materials must receive training.

7.7.2 Written Program. Establish a written hazard communication program wherever employees use, store, or produce substances with hazardous properties. Exceptions to this requirement include laboratories where the chemical hygiene plan is required. The OSHA 29 CFR 1910.1200 mandatory Appendices A, B, and D shall be included in all written programs.

7.7.3 Program Requirements. The written program must identify the means used and the individuals responsible for performing the following:

a. Maintaining an inventory of all hazardous substances that are available to employees and regulatory officials at the point of use or storage.

b. Maintaining an MSDS for each inventoried substance that is available to employees and regulatory officials at the point of use or storage.

c. Legibly and prominently label all containers of hazardous substances. The label must identify the material link it to other required information

resources (inventory and MSDS), identify the primary hazard(s), and state appropriate precautions such as "Do not use near open flame."

d. Providing and documenting hazard communication training for each employee who uses or stores inventoried substances. The training must cover the following issues:

1. Terminology used in, and elements of, an MSDS.

2. Location(s) of written program, hazardous substance inventory, and MSDS files.

3. Individuals responsible for hazard communication program.

4. The physical and health hazards of substances used and stored in the workplace and specific protective measures.

5. How to use the labeling system.

6. How to recognize tasks that may lead to hazard exposure.

7. How to use work practice, engineering controls, and PPE to limit exposure.

8. How to obtain information on the types, selection, proper use, location, removal, handling, decontamination, and disposal of PPEs.

9. Who to contact (and what to do) in an emergency.

e. Responding to hazardous substance spills/emergencies.

f. Annually assessing and reporting the status of implementation of the program elements.

7.8 Requirements for Respiratory Protection

Reclamation requires using respiratory protective equipment when inhalation hazards are anticipated to meet or exceed 50 percent of the PEL, TLV, or other accepted exposure limit. Reclamation requires written programs for respirator use.

7.8.1 General Requirements for Respiratory Protection. If the worksite has respiratory hazards, measure the atmospheric contaminants and require employees to use protective equipment properly.

a. Job Hazard Analysis. Provide a written job hazard analysis (JHA) for every operation during which a respirator of any type is used. The JHA must assess the perceived respiratory hazard. Measuring or estimating airborne contaminant concentrations with confidence allows for the determination of whether respirators are required and what respirator type will provide adequate protection. These determinations are generally

based on the relationship of the airborne contaminant concentration to an established exposure limit such as a permissible exposure limit (PEL) established by OSHA.

b. Failure to Measure Airborne Contaminants. If you do not measure air contaminant concentrations or estimate based on supporting studies, you must consider the atmosphere to be "immediately dangerous to life or health" (IDLH). This assumption forces the use of the most stringent respiratory protection program requirements. The absence of a JHA that appropriately characterizes the workplace atmosphere requires the use of more restrictive, burdensome, and costly equipment, as well as additional personnel, to enter the contaminated atmosphere. (See the subsection on IDLH entry.)

c. Written Program Requirement. Respiratory protective equipment will not be used by any person until a written program meeting the minimum requirements of these standards is established and all of the requirements of the program have been met. Base program requirements on the type of respirator used and whether respirator use is exclusively voluntary at a site.

d. Delegation of Responsibility and Authority. Identify a program coordinator responsible for implementing the respiratory protection program for all sites where respiratory protection is used. Delegate this coordinator sufficient authority to implement the program. Select a coordinator who is qualified by appropriate training or by experience commensurate with the complexity of the program and the respirator use requirements.

e. Mandatory Records. Maintain the following documents in a manner that allows for efficient program administration and evaluation:

- Pertinent job hazard analysis
- Written voluntary use requests
- Respirator selection criteria
- Medical evaluations
- Fit testing documentation
- Training records
- Program evaluation records

Keep the following available onsite:

- Respirator selection criteria
- Record of completion for medical qualification of all respirator users
- Record of completion for fit testing of all respirator users

- Record of completion for required respiratory protection training of all respirator users
- Workplace airborne contaminant monitoring records

Maintain the following records in the employee medical folder:

- Results of personal physicals
- Personal exposure monitoring results
- Personal medical surveillance records

7.8.2 Requirements for the Written Program. If you require personnel to use respiratory protection of any kind, provide a written program (except for the voluntary use of a filtering facepiece type).

a. Program Elements for Sites Where Respirator Use is Required. Write your own site-specific program if respirators are required at your site. The written program will contain or reference all the applicable JHA(s) that indicate respirator use. The JHA will include exposure monitoring data and clarify the scope of the hazard and the need for respiratory protection. Include these elements in your site program:

- Respirator selection
- Respirator-user medical qualification
- Fit testing
- Program evaluation
- User training
- Respirator maintenance
- Recordkeeping

1. Selecting respirators. Use only respirators certified by the National Institute for Occupational Safety and Health (NIOSH).

(a) Selection criteria. Base your selection of respirators for required use on known or anticipated atmospheric conditions, contaminant warning properties, worksite physical limitations, established respirator protection factors and user factors affecting respirator performance.

(b) Protection against gases and vapors. Select an air-supplying respirator unless the respirator (air-purifying) is equipped with an end-of-service-life indicator (ESLI) or a change schedule for the cartridges or canisters is included in the program, which is based upon objective information, data, or experience.

(c) Protection against particulates. Select an air supplying respirator unless the respirator (air-purifying) has a filter with one of the following qualifications:

- Certified by NIOSH as a high efficiency particulate air (HEPA) filter according to 30 CFR part 11

- Certified as a particulate filter according to 42 CFR part 84
- The primary particulate contaminants have a mass median aerodynamic diameter (MMAD) greater than 2 micrometers(□), in which case, a respirator (air-purifying) may be equipped with any particulate filter certified by NIOSH.

2. Providing medical determinations. Allow respirator use only when there is no negative impact on the health of the employee using the respirator. Provide medical evaluations for employees before they are allowed to use respirators to determine their ability to wear a respirator without suffering adverse effects.

(a) Medical evaluator. The evaluator must be a physician or licensed health care provider with the appropriate knowledge to make a judgement. Before the medical evaluation, employees must complete the OSHA Respirator Medical Evaluation Questionnaire, 29 CFR 1910.134, Appendix C for the medical evaluator.

(b) Employee information. Before any evaluation, provide the medical evaluator the following information about the conditions of respirator use:

- Type and weight of respirators to be used
- Duration and frequency of use
- Expected physical effort during use
- Expected use of additional personal protective equipment
- Expected temperature and humidity to be encountered
- Anticipated workplace hazards and potential exposures

(c) Medical evaluator information. The medical evaluator must furnish to the employer information that:

- States the employee's ability to wear the identified respirator types under the specified conditions without adverse effect
- Specifies limitations on respirator use or provides another type respirator which would mitigate existing medical condition
- Identifies any need and time limit for a followup examination
- States that the employee has been given a copy of the recommendations

(d) Additional medical evaluations. Provide subsequent medical evaluations or consultations not specified by the medical examiner when:

- An employee using a respirator requires an explanation or consultation regarding the evaluation results
- An employee using a respirator reports medical signs or symptoms related to his ability to use a respirator
- A supervisor or program coordinator determines a need for reevaluation
- Workplace conditions or expectations change and substantially increase the employee's physiological burden

3. Fit testing. Before using a respirator, provide a complete test for each individual that verifies a satisfactory fit of the selected tight-fitting facepiece. This test will include each of the following:

(a) Facepiece selection. Provide a suitable number of facepiece choices that allow a proper fit and acceptable comfort for the user.

(b) Test protocol. Use the OSHA protocol, which may be found in 29 CFR 1910.134.

(c) Test type. Require quantitative tests except where the negative pressure air-purifying respirator must achieve a fit factor of 100 or less, or where the tight fitting facepiece is used with an atmosphere-supplying or powered air-purifying system and is tested in the negative mode.

(d) Retesting. Provide subsequent testing annually or when:

- The use of a different facepiece configuration (size, style, model, or make) is required
- The employee requests testing
- A change in the user's physical condition could affect facepiece fit
- Specific OSHA standards require more frequent testing

4. Providing respirator training. Before respirator use, provide training that enables the user to demonstrate the following respirator knowledge:

- Understanding of the nature and degree of the respiratory hazard
- How to select a respirator based on the hazard and the respirator's capabilities and limitations
- How to don the respirator and use the seal check procedures

- How to use the respirator
- Limitations of the respirator
- How to care for, maintain, clean, and store the respirator

5. Providing retraining. Retrain respirator users in respiratory protection practices annually or in response to:

- Changes in the workplace or type of respirator used
- A supervisor's or program coordinator's determination of an individual's need of retraining

6. Providing respirator maintenance, cleaning, and inspection. You will:

- Maintain respirators with all labeling and markings intact and in a sanitary condition.
- Clean respirators frequently and in a manner that prevents the spread of any harmful agent to users.
- Use either procedures recommended by the respirator manufacturer or specified in 29 CFR 1910.134.
- Provide storage that protects against respirator damage or contamination.
- Inspect all respirators for damage during cleaning and before each use.
- Inspect emergency respirators in accordance with manufacturer's recommendations at least monthly and before providing an escape-only respirator to an employee for his or her specific use. Document all emergency respirator inspections. Include identification of the respirator, the date of inspection, the name of the inspector, deficiencies found, and corrective actions taken in the documentation. Take cylinders of emergency respirators out of service when the pressure falls below 90 percent of manufacturer's recommended pressure level.
- Remove defective respirators from service until repairs are completed in a manner that maintains the integrity of the NIOSH certification.

7. Entry into IDLH atmospheres. In addition to complying with the other parts of this section, implement the following requirements for any entry into an area classified as immediately dangerous to life or health (IDLH).

(a) The atmosphere will be considered IDLH when any of the following apply:

- A JHA has not been completed
- The contaminant concentration has not been measured or estimated with confidence
- The atmospheric contaminant exceeds an established IDLH concentration
- The atmosphere contains less than 16 percent O_2
- The atmosphere contains more than 16 percent but less than 19.5 percent O_2 (oxygen-deficient atmosphere), and it can not be demonstrated that the atmosphere can be maintained within the parameters set forth in CFR 1910.134, table II, under all foreseeable conditions.

(b) All entries into IDLH atmospheres require that:

- One employee or, when needed, more than one employee be located outside the IDLH atmosphere
- Visual, voice, or signal line communication be maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere
- The employee(s) located outside the IDLH atmosphere be trained and equipped to provide or activate effective emergency rescue
- The employer or designee be notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to activate or provide emergency rescue
- The employer or designee authorized to do so by the employer, once notified, provide necessary assistance appropriate to the situation
- The employee(s) located outside the IDLH atmospheres be equipped with:
    - Pressure demand or other positive pressure SCBAs or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA, and either
    - Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry, or
    - Equivalent means for rescue where retrieval equipment is not required under the previous paragraph.

8. Supplied air respirators

(a) Compressed breathing air odor and oxygen content. Compressed breathing air must have no noticeable odor and an oxygen content in the range of 19.5 to 23.5 percent. The supplied air must have no more than 5 milligrams per cubic meter condensed hydrocarbon, 10 parts per million (ppm) carbon monoxide (CO), or 1,000 ppm carbon dioxide (CO_2).

(b) Purchasing cylinders of breathing air. Purchased cylinders containing breathing air must have an analytical certificate verifying the quality of the breathing air (must meet Type 1, Grade D breathing air specifications) and verifying that the moisture content in the cylinder does not exceed a dew point of -50 degrees F at 1 atmosphere pressure. Ensure that all cylinders used to supply breathing air are hydrostatically tested and maintained according to 49 CFR Part 173 and Part 178 and marked in accordance with 42 CFR Part 84.

(c) Compressor use and maintenance. Use and maintain compressors (see figures 7-1 and 7-2) that are used to supply breathing air in a manner to:

(1) Control moisture content so that a dew point at 1 atmosphere pressure is 10 degrees F below the ambient temperature

(2) Replace or maintain sorbent beds and filters according to manufacturer's recommendation, and tag the compressor with the most recent change date, printed name, and signature of the employee performing the test.

(3) Equip oil-lubricated compressors with a carbon monoxide and/or a high temperature alarm that is audible or otherwise detectable to the employee wearing the respirator.

- Set carbon monoxide alarms to activate at or below 10 ppm
- Set high temperature alarms to activate according to the manufacturer's specification, and, if used exclusively as the compressor monitor, conduct periodic monitoring to prevent carbon monoxide in the breathing air from exceeding 10 ppm

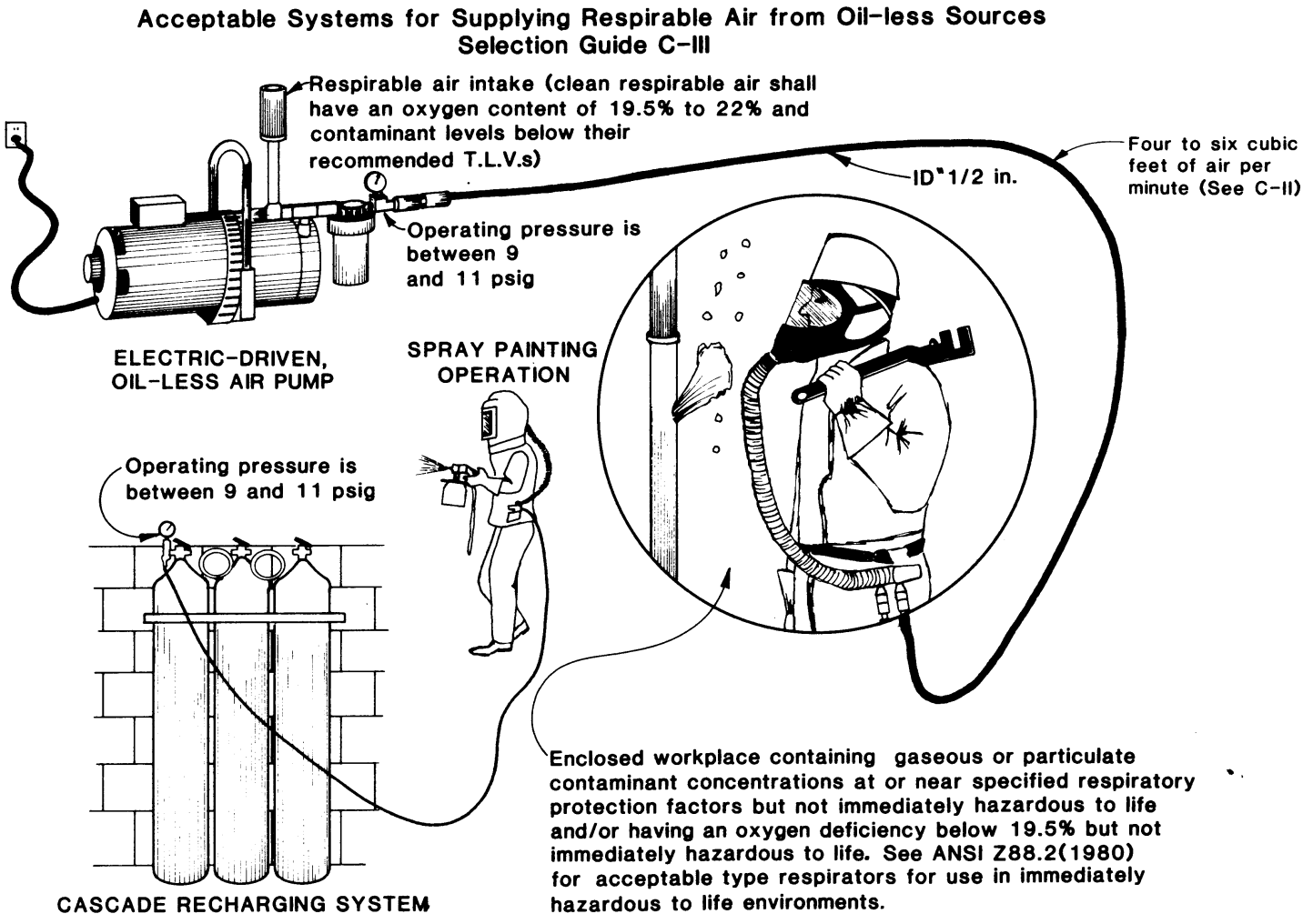

Figure 7-1.—Respirator and respirable air system selection guide C-II.

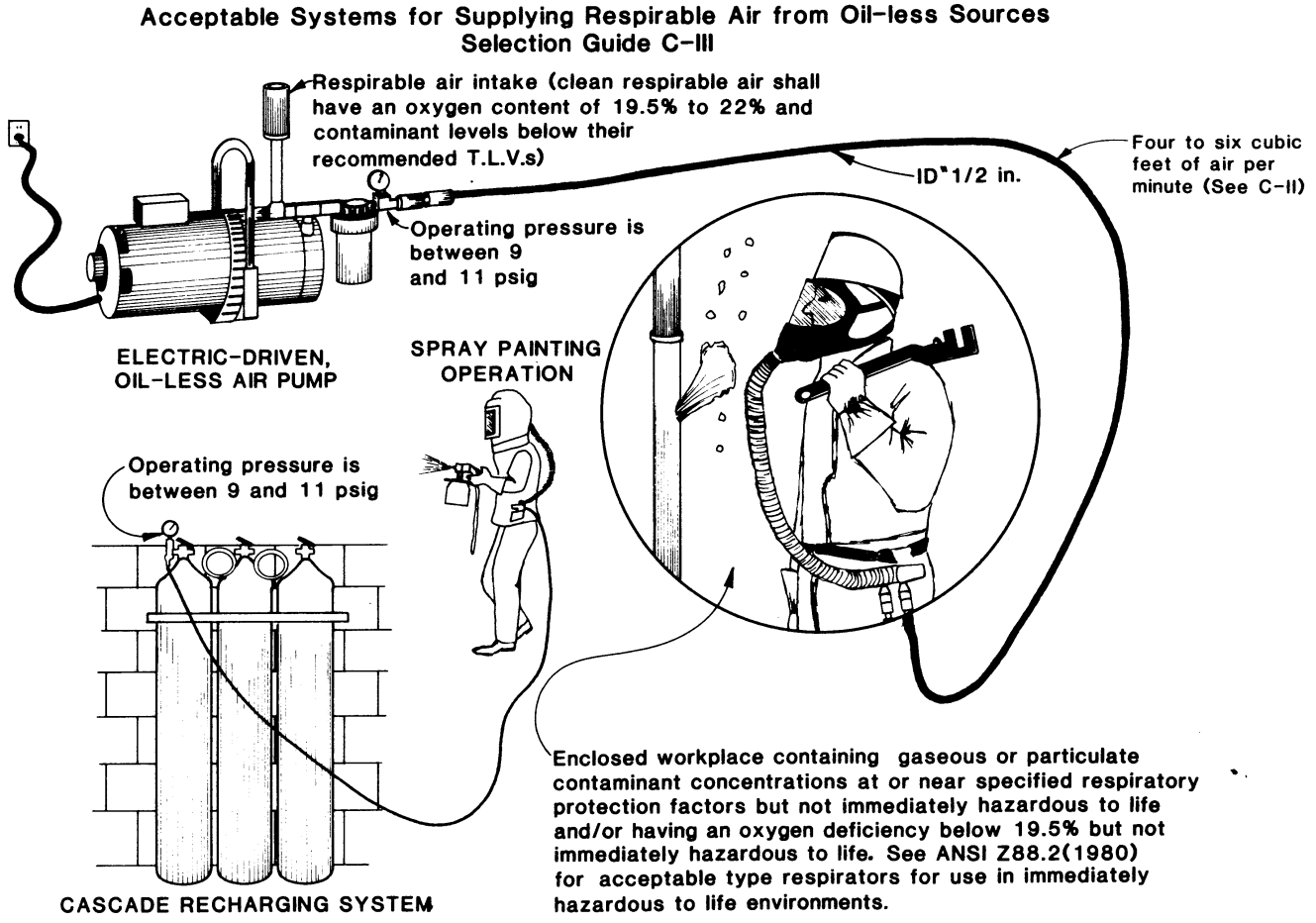

Figure 7-2.—Respirator and respirable air system selection guide C-III.

(4) Prevent the use of couplings that allow attachment to non-respirable worksite air or other gas systems.

(5) Locate the air intake of the compressor in respirable quality air.

(6) Ensure that compressors, hoses, vortex heater/coolers, connectors, filters, and valves are stored so as to prevent contamination with dust, mist, vapor, fume, toxic gases, heat, and intense light such as from welding operations.

(d) Testing breathing air quality. Test the quality of breathing air at least every 6 months to ensure that the air meets Grade D quality as specified in ANSI-CGA G.7-1-1997 when non-vendor breathing air is produced or when breathing air is transferred from compressors, cascade system cylinders, storage receivers, and other breathing air manufacturing or storage equipment.

9. Program Evaluation. Conduct evaluations of the implementation of the elements of the program. Workplace observation, document review, and consultation with employees will be used for this purpose. Conduct evaluations annually or more frequently when management determines it is necessary. Complete an abatement schedule when deficiencies are identified.

10. Record Retention. Retain all records for time periods that meet specific records management requirements. The program will identify the locale of the following records:

- Pertinent job hazard analyses
- Medical evaluation
- Training
- Respiratory selection criteria
- Fit testing
- Program evaluations

b. Program Elements for Sites With Exclusive Voluntary Use of Respirators. Write a site-specific program if there is exclusive voluntary use of any respirator other than a filtering facepiece at your site. The written program will contain or reference all the applicable JHAs that indicate respirator use. Your written program will contain or reference all the applicable JHAs, processes, and procedures that address the following minimum requirements:

1. Have the employee submit a written request establishing a record for voluntary use of the respirator.

2. Complete a written JHA that assesses the perceived hazard and indicates that respirator use is of a "voluntary" nature. The JHA will also assess the possibility of introduced hazards associated with respirator use.

3. Provide basic training on respirators (appendix D of 29 CFR 1910.134 may be used) and record the date and the content outline used to satisfy this element.

4. The use of respirators will be allowed only if there is no negative impact on the health and well being of the user. Therefore, prior to use and periodically thereafter, provide a medical evaluation of the respirator user to determine the user's ability to wear a respirator without being adversely affected. The evaluation must include the following items:

(a) The evaluator will be a physician or licensed health care provider with the appropriate knowledge to render judgment. The evaluator will use the questionnaire in appendix C to 29 CFR 1910.134, or an equivalent, as an element of each employee's evaluation.

(b) Before any evaluation or recommendation, provide the following workplace information relative to the respirator user to the physician or licensed health care provider:

- Type and weight of respirator to be used
- Duration and frequency of use
- Expected physical effort during respirator use
- Expected use of additional personal protective equipment
- Expected temperature and humidity encountered

(c) The medical evaluator will provide the following:

- An evaluation of the individual's ability to wear the identified respirator under the specified conditions without adverse effect.
- Any limitations on respirator use or any other type of respirator that would mitigate any existing medical condition, when necessary
- The need and time for follow-up examinations
- A statement that the employee has been furnished a copy of the medical evaluator's recommendations.

5. Clean the respirator according to manufacturer's recommendations or by disassembling, thoroughly washing in warm (a maximum of

110 degrees Fahrenheit) water with a combination detergent or disinfectant, thoroughly rinsing, air drying, and reassembling.

6. Inspect the respirator to ensure that all parts are working properly and are in good condition.

7. Conduct evaluations of the implementation of the elements of the program. Use workplace observation, document review, and consultation with employees for this purpose. Conduct evaluations annually or more frequently when it is necessary. Complete an abatement plan when deficiencies are identified.

8. Retain all records for time periods that meet specific records management requirements. The plan will identify the locale of the following records:

- Pertinent job hazard analyses
- Medical evaluation and physician name
- Training
- Respiratory selection criteria
- Fit testing
- Program evaluations

c. Program Elements for Sites With Exclusive Voluntary Use of Filtering Facepiece Respirators. Exclusive voluntary use of filtering facepiece respirators (a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering media) necessitates the following minimum requirements:

1. Require the employee to submit a written request establishing a record for voluntary use of the respirator.

2. Complete a written Job Hazard Analysis (JHA) that assesses the perceived hazard and indicates the determination that the respirator use is of a "voluntary" nature. The JHA will also assess the possibility of introduced hazards associated with respirator use.

3. Provide the user with basic training on respirators (Appendix D of 29 CFR 1910.134 may be used) and record the date and outline of the content used to satisfy this element.

4. The program coordinator will retain the request, associated JHA's, and training records.

7.9 Requirements for Noise Exposure And Hearing Conservation

7.10.1 General Requirements. Do not expose personnel to noise in excess of the limits indicated in table 7-1.

Table 7-1.—Permissible noise exposures[1]

Duration per day (hours)	Sound level, dBA, slow response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

[1] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) + ... + C(n)/T(n) exceeds unity, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level and Tn indicates the total time of exposure permitted at that level. Do not allow exposure to continuous, intermittent, or impact noise in excess of a peak of 140 dB.

a. Noise Monitoring Program. Establish a noise monitoring program, primarily based on dosimetry whenever information indicates that personal exposure is likely to exceed an 8-hour time weighted average of 85 dBA. Integrate all continuous, intermittent, and impulsive sound levels from 80 decibels to 130 decibels into the noise measurement. Use representative personal monitoring for highly mobile workers if sound levels vary significantly or impulse noise is present. Calibrate instrumentation used in measuring the sound pressure levels in accordance with the manufacturer's recommendations, allow employees to observe the monitoring procedures, and notify employees of the results of any exposure monitoring. Conduct the program in a manner that allows identification of individuals for inclusion in the hearing conservation program and enables the proper selection of hearing protective devices. Repeat monitoring when changes in the process, equipment, or controls increase noise levels.

b. Hearing Protective Devices. When engineering and/or administrative controls do not reduce noise levels below 85 dBA, provide and ensure personal protective equipment (PPE) that it is used. The hearing protective device(s) provided must reduce the noise exposure to less than 90 dBA TWA or to less than 85 dBA TWA for those enrolled in the hearing conservation program or who have experienced a standard threshold shift. In addition, hearing protective devices must be worn by employees until a baseline audiogram is obtained.

Employees must decide, with the help of a person who is trained in fitting hearing protectors, which size and type protector is most suitable for their working environment. The protector selected must be comfortable to wear and offer sufficient attenuation. The manufacturer's NRR (noise reduction rating) for hearing protectors is used to calculate the attenuated level based on the equation:

Attenuated Level = measured sound level - [(NRR-7) / 2]

When single protection does not provide the desired level of attenuation, use double hearing protection. For double hearing protection, add 5 dBA to the attenuated value.

7.9.2 Hearing Conservation Program Requirements. When it is determined that noise levels exceed the 85 dBA 8-hour TWA, implement a written hearing conservation program.

a. Enrollment. Enroll any employee whose noise exposure exceeds the action level of 85 dBA 8-hour TWA in a hearing conservation program. Dosimetry will be the means for substantiating exposure. Base continuing enrollment on dosimetry results from subsequent periodic monitoring.

b. Audiometric Program.

(1) Audiometric Testing. A qualified technician may give the audiogram, but the results must be reviewed by a qualified professional. A licensed or certified audiologist (specialist dealing with an individual having impaired hearing), an otolaryngologist (physician specializing in the diagnosis and treatment of disorders of the ear, nose, and throat), or a physician must be responsible for the program. The professional's responsibilities include overseeing the program and the work of the technicians, reviewing problem audiograms, and determining whether referral is necessary.

(2) Baseline Audiogram. The baseline audiogram is the reference audiogram against which future audiograms are compared. Provide baseline audiograms within 6 months of an employee's first exposure at or above an 8-hour TWA of 85 dB. Do not expose employees to workplace noise for 14 hours preceding the baseline test unless appropriate hearing protectors are worn during this period. Instruct employees to avoid high, non-occupational noise levels in the 14 hours preceding the baseline audiometric examination.

(3) Annual audiogram. Audiograms must be conducted yearly for employees enrolled in the hearing conservation program. Routinely compare annual audiograms to baseline audiograms to determine whether the audiogram is valid and to determine whether the employee has lost hearing ability, i.e., if a standard threshold shift (STS) has

occurred. STS is an average shift in either ear of 10 dB or more at 2,000, 3,000, and 4,000 hertz. If an STS is detected, the employee may be retested within 30 days and the better of the two tests used. If an STS is identified, fit the employee or refit employees with adequate hearing protectors, show how to use them, and require the employees to wear them. Notify employees within 21 days from the time the determination is made that their audiometric test results showed an STS. A confirmed threshold shift is a reportable occupational illness in the OSHA 200 Log and electronic Safety Management Information System (SMIS).

c. Training. Enrolled employees must receive training at least annually about the effects of noise; the purpose, advantages, and disadvantages of various types of hearing protectors; the selection, fit, and care of protectors; and the purpose and procedures of audiometric testing.

d. Recordkeeping. Maintain records of audiometric test results for enrolled employees for the duration of employment of the affected employee. Audiometric test records must include the name and job classification of the employee, the date, the examiner's name, the date of the last acoustic or exhaustive calibration, and measurements of the background sound pressure levels in audiometric test rooms. All area noise measurements must be retained for at least 2 years.

7.9.3 Warnings and Labels. Post or label all areas and equipment which emit noise levels of 85 dBA or greater. Post areas where noise levels are of 85 to 99 dBA and equipment that produces noise levels of 85 to 99 dBA in black lettering on a yellow background with wording such as:

CAUTION
High Intensity Noise
Hearing Protection Required

Post areas where noise levels are 100 dBA or greater and equipment that produces noise levels of 100dBA or greater in black lettering on a red and white background with wording such as:

DANGER
High Intensity Noise
Hearing Protection Required

7.10 Requirements for Sanitation

7.10.1 General Requirements. Employers shall establish and maintain basic sanitation provisions for all employees in all places of employment. These provisions include, but are not limited to, a potable water, toilet, and waste collection and removal system. Provide washroom, showers, and separate eating facilities, as appropriate.

7.10.2 Potable Water. An adequate supply of potable water must be provided in all places of employment. Cool water must be provided during hot weather. Supply drinking water from sources that meets the quality standards prescribed in the U.S. Public Health Service Drinking Water Standards that are published in 42 CFR Part 72 that is approved for drinking purposes by the State or local authority having jurisdiction. Keep portable containers used to dispense drinking water tightly closed, equipped with a dispensing tap, labeled as "DRINKING WATER," and in a sanitary condition. Water must not be dipped from any portable water container. Drinking directly from the container is prohibited unless a properly installed drinking fountain with guarded orifice is provided. Do not use containers used to dispense or distribute drinking water for any other purpose. Use of breakable cups or glasses is prohibited. Also provide fountain-type dispensers or one-use cups at each dispenser and a waste receptacle. Conspicuously post outlets dispensing nonpotable water:

CAUTION
WATER UNSAFE FOR DRINKING,
WASHING OR COOKING

7.10.3 Toilet Facilities.

a. Portable Toilet Facilities. When sewage disposal systems are not available, provide one or more of the following type toilet facilities unless they are prohibited by local codes:

1. Chemical toilets
2. Recirculating toilets
3. Combustion toilets
4. Other toilet systems as approved by State/local governments

b. Design of Portable Toilets. Equip each toilet facility with a toilet seat and toilet seat cover. Design toilets to provide privacy and protection from weather and falling objects. Cracks must be sealed and the door tight-fitting, self-closing, and must be capable of being latched from the inside. Toilets must have adequate ventilation and light, and all windows and vents must be screened.

c. Chemical Toilets. Provide for routine servicing and disposing of the sewage in accordance with Federal, State, and local health regulations.

d. Toilets at Temporary Jobsites. Toilets will be provided at each temporary jobsite in accordance with table 7-2.

Toilets must be within easy access to the worksite unless they are for a mobile crew and transportation is readily available.

Table 7-2.—Toilets at temporary jobsites

Number of employees	Minimum number of units (per gender)[1]
1 to 20	1 toilet
21 to 199	1 additional toilet and urinal for each additional 40 employees
200 or more	1 additional toilet and urinal for each additional 50 employees

[1] Where toilet rooms may be occupied by no more than one person at a time, provide the doors with locks so that they can be locked from the inside, and provide the toiletrooms with at least one toilet seat. Separate toilet rooms for each gender are not needed.

e. Permanent facilities. Toilets at permanent facilities will be provided in accordance with table 7-3. The number of units to be provided for each gender must be based on the number of employees of that gender for whom the facilities are furnished.

Table 7-3.—Toilets at permanent facilities

Number of employees	Minimum water closets (per gender)[1]
1 to 15	1
16 to 35	2
36 to 55	3
56 to 80	4
81 to 110	5
111 to 150	6
over 150	one for each additional 40 persons

[1] Where toilet rooms may be occupied by no more than one person at a time, provide the doors with locks so that they can be locked from the inside, and provide the toiletrooms with at least one toilet seat. Separate toilet rooms for each gender are not needed.

f. Sanitation. Provide frequent inspections and maintenance at all toilet facilities to keep them clean and sanitary. Maintain an adequate supply of toilet paper with holder for each seat.

7.10.4 Washing Facilities. Provide adequate washing facilities for all employees to maintain healthful and sanitary conditions. Such facilities must be near the worksite and furnished with cleaning materials that will remove the specific type of contaminant. Maintain each washing facility with water (either hot and cold running water or tepid running water), soap, and individual means of drying.

7.10.5 Food Consumption. Designate a clean area for consuming food and drink at each work location. Also, establish the following minimum conditions:

- Do not consume or store food or beverage in a toilet room or in any area exposed to biological or chemical hazard
- Provide an adequate number of waste receptacles in the food consumption area. Construct receptacles of corrosion resistant or disposable material provided with solid, tight-fitting covers. Empty receptacles at least daily and maintain them in a sanitary condition.

7.10.6 Sleeping Facilities. Sleeping quarters will comply with all applicable Federal, State, and local sanitation and fire protection codes. Sleeping quarters constructed on the jobsite must comply with the NFPA 101, Life Safety Code.

7.10.7 Waste Disposal. Keep decomposing or foul-smelling waste in substantial, closed insect- and rodent-tight containers that are constructed to prevent leakage and to allow thorough cleaning and sanitary maintenance. Remove solid and liquid in a way that does not create a menace to health. Remove waste as often as necessary to maintain a sanitary environment. Dispose of garbage and similar refuse in designated areas.

7.10.8 Vermin Control. Construct and maintain enclosed workplaces to prevent, to the extent practicable, the entrance and harborage of rodents, insects, and other vermin. If the presence of such vermin is detected, implement a control program.

7.11 Exposure to Hazardous Chemicals in Laboratories

7.11.1 Hazardous Chemicals. Laboratories where employees may be exposed to hazardous chemicals must develop and implement a written chemical hygiene plan and designate a chemical hygiene officer to ensure compliance with OSHA standard 1910.1450. This standard generally applies to all chemical laboratory activities and specifies that employee exposures to hazardous chemicals be at or below the PELs and TLVs.

7.11.2 Employee Exposure Determination. Measure the employee's exposure to any regulated substance if there is reason to believe that exposure levels for that substance routinely exceed the action level. Events or circumstances that might reasonably constitute overexposure include (1) an uncontrolled hazardous chemical leak or spill, (2) direct skin or eye contact with a hazardous chemical, (3) physical symptoms that disappear when the person is removed from the area but reappear soon after the person returns to work with the same hazardous chemical, and (4) two or more people in the same laboratory have similar complaints. Employees must be notified within 15 working days after receipt of the monitoring results.

7.11.3 Chemical Hygiene Plan. Where hazardous chemicals are used in a laboratory, develop and implement a written Chemical Hygiene Plan. The Chemical Hygiene Plan must include a chemical inventory, the necessary

work practices, procedures, and policies to ensure that employees are protected from all potentially hazardous chemicals in use in their work area. Keep the plan readily available.

7.11.4 Employee Training and Information. Provide employees with information and training to ensure that they are aware of the hazards of chemicals in their work areas before their initial assignments and as any new substances are introduced.

a. Inform employees of (1) the contents of the OSHA Laboratory Standard (29 CFR 1910.1450), (2) location of the Chemical Hygiene Plan, (3) PELs and TLVs for the chemicals used, (4) the signs and symptoms associated with exposures to these chemicals, (5) the location of known reference material on the hazards, safe handling, storage, and instructions for disposing of hazardous chemicals, including the MSDS, and (6) spill cleanup procedures.

b. Educate employees about: (1) methods and observations that may be used to detect the presence or release of a hazardous chemical, (2) physical and health hazards of chemicals in the work area, and (3) the measures the employees can take to protect themselves from these hazards. Include appropriate work practices, emergency procedures, personal protective equipment to be used in these specific procedures, and the applicable details of the Chemical Hygiene Plan.

7.11.5 Hazard Identification. Do not remove or deface labels on incoming containers of hazardous chemicals. Retain MSDSs on incoming hazardous chemicals and make them available to laboratory employees. Label all solutions prepared in-house with the name of the chemical, the date of preparation, hazardous properties, emergency procedures, and the preparer's name.

7.11.6 Medical Consultation and Examinations. Give laboratory employees who have experienced events or circumstances that might reasonably constitute overexposure the opportunity for medical consultation. For these employees and those included in a medical surveillance program, provide the physician with (1) the identity of the hazardous chemical(s) to which the employee may have been exposed, (2) a description of the conditions of exposure and any quantitative exposure data available, and (3) a description of any signs and symptoms of exposure that the employee is experiencing.

The examining physician will provide, in writing, (1) recommendations for follow-up, if warranted; (2) a record of the results of the consultation and, if applicable, the examination and any tests that were conducted; (3) conclusions concerning any other medical condition noted that could put the employee at risk; and (4) a statement that the employee has been informed both of the results of the consultation or examination and of any medical condition that

may require further examination or treatment. These written statements and records must only address the occupational exposure.

7.11.7 Records and Recordkeeping. All memos, notes, and reports related to a complaint of actual or possible exposure to hazardous chemicals must be maintained as part of the record. Retain monitoring data and medical records.

7.11.8 Laboratory Equipment. Provide an emergency eyewash fountain or safety shower and ensure that it is immediately available where corrosive materials are used. Conduct work that involves hazardous and noxious materials that are toxic, odoriferous, volatile, or harmful within a laboratory hood. If there is a need to refrigerate a substance that is flammable, refrigerate it in an explosion-proof refrigerator that is either U.L. listed or approved by an accredited laboratory.

7.12 Bloodborne Pathogens

Blood pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immuno-deficiency virus (HIV) and are regulated by 29 CFR 1910.1030 for workplace exposures.

7.12.1 Exposure Determination. Identify employees whose job duties place them at risk of exposure to bloodborne pathogens and develop and implement an exposure control program. Make this exposure determination without regard to personal protective clothing or equipment.

7.12.2 Exposure Control Plan. Develop and implement a written exposure control plan where employees are determined to have an occupational exposure. The exposure control plan must include (1) the exposure determination based on the tasks, procedures, and job classifications; (2) the schedule and methods of compliance; and (3) procedures for evaluating circumstances surrounding exposure incidents. Review and update the plan at least annually.

7.12.3 Universal Precautions. Universal precautions must be observed when any contact with blood or potentially infectious materials is possible. These precautions are applicable to all employees. Treat all body fluids and materials as if they are infectious. Use the following methods to eliminate or reduce risk for transmission of bloodborne pathogens:

- Wash hands frequently and use disposable garments
- Select gloves for the hazards of a specific job
- Avoid spray or splash of bloodily fluids
- Label and package contaminated wastes properly

After administering emergency care, wash hands and other skin surfaces immediately and thoroughly with warm water and soap. Wash hands immediately after removing protective gloves, even if the gloves appear to be intact.

7.12.4 Personal Protective Equipment (PPE). Provide PPE to employees and ensure that they are used properly to eliminate or minimize the risk of infectious material entering the employees' bodies. It is appropriate only if it prohibits potentially infectious materials from reaching the employees' outer clothing, skin, eyes, mouth, or other mucous membranes under normal conditions of use.

a. Gloves. Provide hand protection whenever contact with blood or other potentially infectious materials is possible. Disposable (single-use) gloves, if possible.

b. Masks, Eye Protection and Face Shields. Use masks, eye protection, and face shields in combination whenever splashes, spray, or droplets of infectious materials are generated.

c. Gowns, Aprons, and Other Protective Clothing. Wear gowns, aprons, and other protective clothing when splashing of body fluid on skin or clothing is possible.

d. Resuscitation Equipment. Provide CPR mouthpieces, pocket masks, resuscitation bags, or other ventilation equipment to eliminate the need for direct mouth to mouth contact.

7.12.5 Cleanup of Contaminated Areas. Use personal protective equipment when disinfecting areas. Presoak any spills of body fluid with an antibacterial/viral solution (one part chlorine bleach to 8 parts water). Clean up methods must prevent physical injury from direct handling of broken glass, needles, or other sharps.

7.12.6 Handling Contaminated Materials. Waste handlers must not press down, smash, step on, or otherwise compress any biohazard waste containers.

7.12.7 Hepatitis B Vaccination. Within 10 working days of assignment, the Hepatitis B vaccine and vaccination series will be made available to all employees who have occupational exposure. Make available post-exposure evaluation and follow-up to all employees who have an exposure incident. Prompt reporting of incidents is necessary for exposed employees to be offered the vaccination series in a timely manner.

Figure 7-3.— Biohazard symbol.

7.12.8 Container Labeling. Use an approved biohazard container for blood, other potentially infectious material, or regulated waste a fluorescent

orange or orange-red background label with lettering and biohazard symbol in a contrasting color (see figure 7-3). Infectious waste must be disposed of by an approved contractor in accordance with Federal, State, and local regulations.

7.12.9 Training

a. General Training. All employees must receive basic information about bloodborne pathogens and ways to reduce risks of exposure. The training must include those tasks identified with increased risk, the universal precautions about self-protection in the event of an incident, and determining where to find more information in the local exposure control plan.

b. Employees With Increased Risk of Exposure. Employees with occupational exposure must have initial and annual training on the 29 CFR 1910.1030 bloodborne pathogen standard, bloodborne diseases and their transmissions (a general discussion), exposure control plan, engineering and work practice controls, personal protective equipment, hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, proper handling and disposal methods of infectious waste, the post-exposure evaluation and follow-up program, and the signing and labeling program. There must be an opportunity for questions and answers about the bloodborne pathogen program.

7.12.10 Recordkeeping

a. Medical Records. Medical records for each employee with occupational exposure must be kept for the duration of employment plus 30 years. Keep medical records confidential and include the name and social security number, hepatitis B vaccination status (including dates), results of any examinations, a copy of the health care professional's written opinion, and a copy of information provided to the health care professional. Make medical records available to the subject employee or anyone with written consent of the employee, but not to the employer.

b. Training Records. Training records must include dates, contents of the training program or a summary, trainer's name and qualifications, and the names and job titles of all people attending.

c. Sharps Record Log. A sharps injury log must be maintained at healthcare facilities for recording injuries resulting from contaminated sharps penetrating the skin. The information in the sharps injury log must be recorded and maintained in such manner as to protect the confidentiality of the injured employee. The log must contain the type and brand of device involved in the incident, the department or work area where the exposure incident occurred, and an explanation of how the incident occurred.

d. SMIS (Safety Management Information System) Incident Report. Report bloodborne pathogen exposures as personal injuries in the automated SMIS. Information must include the method of injury, the work area and activity when incident occurred, and what post-exposure action followed.

7.13 Heat Stress

The combination of three risk factors (climatic conditions of the environment, work demands, and clothing) causes heat stress is evidenced by an increase in heat stress body temperature, heart rate, and sweating.

7.13.1 Assessment. Conduct an assessment of the working conditions, if the environment is subjectively judged as being hot or the physiological markers of increased body temperature, increased heart rate, or excessive water loss are noted. Use a qualified individual who follows the guidelines stated in the latest ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices to conduct the assessment.

7.13.2 Training. Conduct training for employees and supervisors working on heat-related jobs. Training will include a description of heat stress; a recognition of the physiological symptoms of dehydration, heat exhaustion, fainting, heat cramps, and heat stroke; first-aid measures; personal hygiene practices such as the need to replace fluids and the importance of diet, life-style, general health and acclimation; and the specific engineering and administrative control measures used to manage the hot work environment.

7.13.3 Controls. If the assessment concludes that employees may be at risk of heat stress, implement one or more of the various control measures listed in table 7-4 lists.

Table 7-4.—Heat stress control measures

Fluid replacement	Medical surveillance	Reduce radiant heat
Self-determination	Reduce physical work demands	Pacing work
Diet	Reduce air temperature	Sharing work
Life style	Reduce air humidity	Scheduling of work
Acclimation	Change clothing	Circulating air systems
Circulating water systems	Reflective clothing	Ice garments

7.14 Cold Stress

Exposure to cold temperatures increases the likelihood and potential for worker disorders or conditions that could result in injury or illness. Cold stress is evidenced by the body trying to conserve body heat by reducing blood circulation through the skin and by shivering to increase the rate of metabolism. Extreme low temperatures or strong wind accompanied by cold temperatures can lead to hypothermia or localized tissue damage.

7.14.1 Recognition of Cold Stress. Subjective responses of workers provide a good tool for the recognition of cold stress. Behaviors such as seeking warm locations, adding layers of clothing, or increasing work rate are common indicators. Other behaviors are loss of manual dexterity, shivering, accidents, and unsafe behaviors.

7.14.2 Evaluation of Cold Stress. When temperatures fall below 39 °F, begin workplace monitoring. Below 30 °F, the dry bulb temperature and air speed must be measured and recorded at least every 4 hours. When air speed is greater than 5 miles per hour (mph), determine the equivalent chill temperature from table 7-5. Do not expose employees to equivalent wind chill temperatures (ECT) below -25 °F dry bulb.

Table 7-5.—Equivalent Chill Temperature (ECT) in degrees Fahrenheit for different combinations of temperature and air speed (also called Windchill Index)

	Actual temperature reading (°F)									
Estimated wind speed (in mph)	**50**	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**
	Equivalent Chill Temperature (°F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	-18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Winds greater than 40 mph have little additional effect.	Little Danger in < hr with dry skin. Maximum danger of false sense of security.				Increasing Danger. Danger from freezing exposed flesh within one minute.			Great Danger. Flesh may freeze within 30 seconds.		

7.14.3 Control of Cold Stress. General controls of cold stress include training, hygiene practices, and medical surveillance. When the temperature falls below 39 °F in the work environment, workers must be informed that cold stress is a hazard and what clothing is proper, what they should do to practice cold stress hygiene (such as replacing fluid with warm drinks, and proper diet), and how to self- monitor for discomfort or symptoms of hypothermia. When work is performed at or below 10 °F ECT, include safe work practices, recognition and treatment of hypothermia, and other cold-related disorders in the training. Initiate medical surveillance on those who are routinely exposed below -11 °F ECT, and those workers who cannot properly thermoregulate. Other methods of controlling cold exposures include:

a. Engineering controls to reduce loss of body heat such as general or spot heating, hand warming, minimizing air movement, reducing heat transfer, providing warming shelters where ECT is 20 °F or less, or using thermal insulating material on equipment handles when temperature drops below 30 °F.

b. Administrative controls to reduce exposure time, such as establishing work-rest cycles; moving work to warmer areas; allowing individual control over work, such as self-pacing and extra breaks if requested; providing for mutual observation (buddy system); and adjusting for productivity reductions when wearing extra clothing.

c. Protective clothing with proper insulating values, wind barriers, water barriers, and eye protection for snow or ice covered terrain.

7.15 Ionizing Radiation

- Anyone who procures, uses, possesses, transports, transfers, or disposes of regulated radioactive materials or radiation generating devices must:
- Notify, in writing, the Designated Authority of the nature of the material or device and provide a description of the intended use, the location of use and storage, and all transportation and disposal requirements.
- Secure appropriate authorization or a permit if a licensed or regulated radiological device or radioactive material is to be used on Reclamation property.

7.15.1 Qualified Personnel

a. Operations involving ionizing radiation hazards or use of radioactive material or radiation generating devices must be performed under the direct supervision of a person, designated in writing by the Radiation Safety Officer (RSO), who is qualified and responsible for radiological safety. This person will conduct surveys and evaluate and secure any specialized assistance needed to ensure compliance with radiation protection standards.

b. The RSO must be technically qualified and meet the experience, training, and education requirements listed below:

(1) Formally trained in radiation protection including the following topics: physics of radiation; radiation's interaction with matter; mathematics necessary for the subject matter; biological effects of radiation; type and use of instruments for detection, monitoring, and surveying radiation; radiation safety techniques and procedures; and use of time, distance, shielding, engineering controls, and PPE to reduce radiation exposure.

(2) Hands-on training regarding all the equipment, instrumentation, procedures, and theory used.

(3) Knowledge of regulations (NRC, EPA, Department of Energy (DOE), DOT, and DOI) pertaining to radioactive materials, radiation generating devices, and radioactive and mixed waste.

(4) Knowledge of the standards and recordkeeping requirements for work with radioactive materials and radiation generating devices.

7.15.2 Radiation Safety Program

a. Operations involving regulated radiation hazards and users of radioactive material or radiation generating devices must develop and implement a Radiation Safety Program. The RSO must manage the program and base it on sound radiation safety principles that keep occupational doses and doses to the public ALARA (as low as reasonably acceptable). Review the program at least annually.

b. Instruct all personnel entering an area where radioactive material or radiation generating devices are used and where there is a potential for an individual to receive a Total Effective Dose Equivalent (TEDE) of 100 mrem or more in one year in:

- The presence of the material or device
- Health and safety problems associated with exposure to radiation, including the potential effects of radiation on a pregnant female, the fetus or embryo
- Precautions and controls used to control exposure
- Proper use of instrumentation and dosimetry in the area
- The Radiation Safety Program
- Their rights and responsibilities

7.15.3 Dose Limits

Occupational dose limits are based on the TEDE. See table 7-6.

No employee under 18 years of age will perform work with or around ionizing radiation.

The dose to an embryo/fetus must not exceed the monthly equivalent dose of 0.05 rem during the entire gestation period.

Table 7-6.—Exposure to ionizing radiation

Body part	Annual limits (NRC)[1]	Suggested ALARA limits[2]
Whole body	5 rem (50 mSv {millisievert})[3]	0.1 rem (1 mSv)
Lens of eye	15 rem (150 mSv)	0.15 rem (1.5 mSv)
Skin	50 rem (500 mSv)	0.5 rem (5 mSv)
Hands/feet	50 rem (500 mSv)	0.5 rem (5 mSv)

[1] An annual limit which is the more limiting of: 5 rems TEDE, 15 rems to the lens of the eye, or 50 rems shallow dose equivalent to the skin or any extremity.

[2] To keep doses ALARA, the user will set administrative action levels below the annual dose limits. These action levels must be realistic and attainable. Suggested action levels are the more limiting of: 0.1 rems TEDE, 0.15 rems to the lens of the eye, or 0.5 rems shallow dose equivalent to the skin or any extremity.

[3] 10 mSv = 1 rem.

7.15.4 Radiation Monitoring, Surveys and Dosimetry

a. Users of radioactive material or radiation generating devices must conduct surveys and monitoring to ensure occupational dose limits are not exceeded.

b. Swipte-test each sealed source, other than those exempt by size or specific regulation, for leakage at not greater than 6-month intervals and maintain records for each test. If the sample indicated a contamination activity greater than 0.005 microcuries (μCi), withdraw the source from use and notify the RSO immediately.

c. Use instruments for radiation monitoring and surveying that are appropriate for the type and intensity of radiation surveyed, calibrated to a traceable source, and operationally checked before each use.

d. Users of radioactive material or radiation generating devices and visitors or personnel performing work tasks in the area must coordinate with the RSO for appropriate dosimetry use whenever either of the following situations exist:

(1) an individual enters a Radiation Area (>5 mrem in any 1 hour)

(2) an individual has the potential to receive greater than 0.5 rem in 1 year.

All individuals must wear personnel monitoring equipment within the radiation areas as defined above. Supervisors are responsible for ensuring compliance.

e. Process all external dosimetry at a National Voluntary Laboratory Accreditation Program (NVLAP) certified laboratory.

f. Users of unsealed radioactive material sources or personnel working on a radioactive hazardous waste site must institute an internal dosimetry

program approved by the RSO when there is a potential for a worker to receive an internal dose of greater than 0.5 rem per year.

7.15.5 Access, Storage, and Control

a. Design, construct, install, use, store, transport, and dispose of all radiological devices and radioactive materials in such a manner as to ensure personnel exposures are kept ALARA.

b. Users of radioactive materials or radiation generating devices must post signs and control access to radiation areas.

c. Users must use engineering controls, shielding, access time limitation, and/or physical separation to keep doses to the public ALARA where radiation levels exceed 2 mrem (20 Sv) in any one hour.

d. Users must secure radioactive material and radiation generating devices against theft or unauthorized use.

e. Storage must be in accordance with any license or permit requirements.

f. Conduct surveys to ensure that the public dose limit of 0.01 rem (0.0001 Sv) is not exceeded for operations involving regulated radiation hazards or users of regulated radioactive material or radiation generating devices.

7.15.6 Respiratory Protection and Other Controls

a. Users of radioactive material must, to the extent practicable, institute process or engineering controls to limit concentrations of radioactive materials in air.

b. Users must increase monitoring and limit intakes of radioactive materials through control of access, limitation of exposure times, use of respiratory protection equipment, or other controls where process or engineering controls are unable to control airborne radioactive material concentrations.

c. Users of respiratory protection equipment must comply with this section of the standard. Limit the use of respiratory protection equipment according to the protection factors listed in appendix A of 10 CFR 20.

7.15.7 Signs, Labels, and Posting Requirements

a. The RSO must post, in a conspicuous location, (1) a sign or signs bearing the standard radiation symbol shown in figure 7-4, and (2) the following words:

(1) “Caution, Radiation Area” - areas where the radiation field is equal to or greater than 5 mrem (0.05 mSv) in any one hour and less than 100 mrem (1 mSv) in any 1 hour

(2) "Caution, High Radiation Area" - areas where radiation field is equal to or greater than 100 mrem in any one hour (0.1 mSv) and less than 500 rads in any 1 hour

(3) "Caution, Airborne Radioactivity Area" – areas where airborne radioactive material concentrations are greater than the derived air concentration (DAC) limits listed in 10 CFR 20 appendix B.

(4) "Caution, Radioactive Material" - rooms where quantities of radioactive materials in excess of 10 times the 10 CFR 20 appendix C quantities are used or stored.

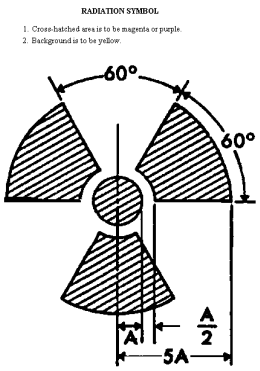

Figure 7-4.—Radiation symbol.

b. Users who receive or expect to receive a package containing radioactive material must follow the package receipt procedures listed in 10 CFR 20.1906 "Procedures for Receiving and Opening Packages."

c. The RSO must post an NRC Form 3 "Notice to Employees" in a location visible to all employees who work with or around radioactive materials.

7.15.8 Spills and Contamination Control

a. Promptly clean up all spills of radioactive material, using appropriate PPE. Cleaning responsibility rests with the individual(s) working in the area involved and responsible for the spill. Survey the area after cleaning to verify that the cleaning has removed the radioactive material. Notify the RSO of all spills or incidents involving radioactive contamination.

b. Where hand or shoe contamination is possible, all employees working with radioactive materials are to:

(1) Accomplish decontamination before eating, smoking, applying makeup, or leaving work.

(2) Wash protective gloves before removing from hands unless radiation level requires immediate removal.

(3) Refrain from wearing protective clothing outside the radiation area if there is any possibility it has been contaminated.

7.15.9 Radioactive Waste Disposal

a. Radioactive sealed sources (and gauges), when no longer needed, may be returned (transferred) to the manufacturer. Notify the local RSO and amend or terminate any applicable licenses or permits.

b. Dispose of radioactive waste appropriately, in accordance with Federal, State, and local regulations, only after coordinating with the designated RSO.

7.15.10 Records

a. All users of radioactive material or radiation generating devices must prepare and maintain records of the Radiation Safety Program for 3 years after termination of the license or permit.

b. For any individual who frequents a restricted or controlled area and may potentially be exposed to 100 mrem (1 mSv) or more per year, the licensee must prepare and maintain records to determine that person's:

(1) occupational dose during the current year
(2) dose received, both internal and external

The licensee must also attempt to obtain records of cumulative occupational radiation exposure.

c. All users of radioactive material or radiation generating devices must prepare and maintain records of all calculated or monitored radiation doses to individual members of the public to document compliance with the section on "Radiation Monitoring, Surveys and Dosimetry."

7.15.11 Reports

a. Report immediately upon discovery, to the RSO, any spills, loss, theft, damage, or overexposure. The RSO will then file a report with NRC in accordance with the requirements of 10 CFR 20.

b. The RSO must issue annual reports and notify each individual radiation worker of the recorded or calculated dose assigned to that worker for the year or specific work project. These reports and notices must be maintained in such a manner that accumulated exposure can be determined at a future date.

7.15.12 Transportation. Transportation, interstate or intrastate, must comply with the requirements of the DOT for transportation of radioactive materials contained in 49 CFR.

7.15.13 Medical Examinations

a. Medical examinations are not routinely required before work with ionizing radiation.

b. Defer all cases of overexposure and suspected ingestion or inhalation of radioactive materials to a physician for examination.

7.16 Non-ionizing Radiation and Fields

Employers will use qualified, competent persons and appropriately calibrated monitoring equipment to assess, survey, and evaluate non-ionizing radiation and field strengths, employee exposures, and control measures.

7.16.1 Lasers. Comply with the manufacturer's requirements and restrictions in accordance with current ANSI Z136.1, American National Standard for the Safe Use of Lasers when installing and using lasers and laser systems. Table 7-7 explains the laser hazard classification system and some of the controls necessary.

Table 7-7.—Laser hazard classes

Class 1	Cannot emit laser radiation at known hazard levels (typically Continuous Wave: CW 0.4 watts at visible wavelengths). Users of a Class 1 laser product are generally exempt from radiation hazard controls during operation and maintenance (but not necessarily during service).
Class 2	Low power visible lasers which emit above Class 1 levels, but emit a radiant power not above 1 mW. The concept is that the human aversion reaction to bright light will protect a person. Only limited controls are specified. Class 2A is a special designation that is based on a 1,000 second exposure and applies only to lasers that are "not intended for viewing," such as a supermarket laser scanner. The upper power limit of Class 2A is 4.0 W. These are products whose emission does not exceed the Class I limit for an emission duration of 1,000 seconds.
Class 3	CLASS 3A: intermediate power lasers (CW: 1-5 mW). Only hazardous for intrabeam viewing. Some limited controls are usually recommended. CLASS 3B: moderate power lasers (CW: 5-500 mW, pulsed: 10 J/cm(2) - or the diffuse reflection limit, which ever is lower). In general, Class 3B lasers will not be a fire hazard and are not generally capable of producing a hazardous, diffuse reflection, unless the diffuser is stored at from a short distance. Specific controls are recommended.
Class 4	High power lasers (cw: 500 mW) are hazardous to view under any condition (directly or diffusely scattered) and are a potential fire hazard and a skin hazard. Significant controls are required of Class 4 laser facilities.

a. Assign only qualified and trained employees to install, adjust, and operate laser equipment. The operator shall have proof of qualification of the laser equipment in his or her possession during operation.

b. Laser equipment (except Class 1) must bear a label to indicate make, maximum output, and beam spread.

c. Post areas in which Class 3 and Class 4 lasers are used with standard laser warning signs.

d. Provide employees whose work requires exposure to Class 3b and Class 4 laser beams with appropriate laser safety goggles that will protect for the specific wavelength of the laser and be of optical density adequate for the energy involved. Label protective goggles with the following

data: the laser wavelengths for which use is intended, the optical density of those wavelengths, and the visible light transmission.

e. Use beam shutters or caps on Class 3b or Class 4, and ensure the laser is turned off when laser transmission is not required. When the laser is left unattended for a period of time (e.g., during lunch hour, overnight, or at change of shifts), turn the laser off.

f. Use only mechanical or electronic means as a detector for guiding the internal alignment of the laser (except for Class 1 and 2a).

g. Do not direct any laser beam at employees. Whenever possible, set laser units that are in operation above the heads of employees.

h. When it is raining or snowing or when there is dust or fog in the air, the operation of outdoor laser systems will be prohibited. During such weather conditions, keep employees out of range of the areas of source and target if system operations continue.

i. Keep employee exposure to laser power densities within the threshold limit values (TLVs) as specified by the ACGIH in "Threshold Limit Values and Biological Exposure Indices."

j. Do not direct lasers used as pointing devices toward employees. Handle and store these lasers in accordance with the manufacturer's recommendations.

7.16.2 Static Magnetic Fields. Routine occupational exposure must not exceed 60 millitesla (mT), equivalent to 600 gauss (G)**,** whole body or 600 mT (6000 G) to the limbs on a daily, time-weighted average basis [1 tesla (T) = 10^4 G]. Ceiling values are 2 T for the whole body and 5 T for the limbs. Safety hazards may exist from the mechanical forces exerted by the magnetic field upon ferromagnetic tools and medical implants. Cardiac pacemaker and similar medical electronic device wearers must not be exposed to field levels exceeding 0.5 mT (5G). Areas exceeding 0.5 mT that are assumed to affect medical devices must be labeled and access limited.

Table 7-8.—TLVs for static magnetic fields

Body part	8-hour TWA	Ceiling
Whole body	60 mT	2 T
Limbs	600 mT	5 T
Medical electronic device wearers	------	0.5 mT

7.16.3 Sub-Radio Frequency (30 kHz and below) Magnetic Fields

a. Occupational exposures in the extremely-low frequency (ELF) range from 1 Hz to 300 Hz must not exceed the ceiling value given by the equation:

$$B_{TLV} = 60 / f$$

where f is the frequency in Hz and B_{TLV} is the magnetic flux density in millitesla (mT).

b. For frequencies in the range of 300 Hz to 30 kHz (which includes the voice frequency band from 300 Hz to 3 kHz and the very-low-frequency band from 3 kHz to 30 kHz, occupational exposures must not exceed the ceiling value of 0.2 mT. These ceiling values for frequencies of 300 Hz to 30 kHz are intended for both partial-body and whole-body exposures. For frequencies below 300 Hz, the TLV for exposure of the extremities can be increased by a factor of 10 for the hands and feet and by a factor of 5 for the arms and legs. The magnetic flux density of 60 mT/f at 60 Hz corresponds to a TLV of 1 mT. At 30 kHz, the TLV is 0.2 mT. Limit the exposure of people wearing cardiac pacemakers or similar medical electronic devices to no more than 0.1 mT at power frequencies.

7.16.4 Sub-Radio Frequency (30 kHz and below) and Static Electric Fields. Occupational exposures must not exceed a field strength of 25 kV/m from 0 Hz to 100 Hz. For frequencies in the range of 100 Hz to 4 kHz, the ceiling value is given by:

$$E_{TLV} = 2.5 \times 10^6 / f$$

where f is the frequency in Hz and E_{TLV} is electric field strength in volts per meter (V/m).

A value of 625 V/m is the ceiling value for frequencies from 4 Hz to 30 Hz. These ceiling values for frequencies of 0 to 30 kHz are intended for both partial-body and whole-body exposures. Limit the exposure of people wearing cardiac pacemakers or similar medical electronic devices to no more than 0.1 kV/m.

7.16.5 Radio Frequency and Microwave Radiation. The maximum microwave power density is 10 milliwatts per square centimeter for frequencies between 3 and 300 Ghz. For exposure limits at other frequencies, refer to the latest edition of the ACGIH *TLVs and BEIs*.

7.16.6 Light and Near-Infrared and Ultraviolet Radiation. Do not operate near-infrared, visible, or ultraviolet radiation in excess of the values and indices specified in the ACGIH *TLVs and BEIs.* Although it is believed that employees may be exposed repeatedly up to these TLVs without adverse health effects, employers take all necessary measures to maintain exposures as low as reasonably achievable and prevent needless exposure to higher levels of radiation when simple measures will prevent exposure.

7.17 Asbestos

Airborne concentrations of asbestos must not exceed 0.1 fibers per cubic centimeter of air averaged over 8 hours or 1.0 fiber per cubic centimeter of air averaged over a sampling period of 30 minutes. When there is risk of exposure to asbestos in the workplace, the regulatory provisions of 29 CFR 1910.1001, 29 CFR 1926.1101, or more stringent State standards apply.

7.17.1 Exposure Assessments and Monitoring. Assess all operations conducted with or on asbestos containing materials for the potential to generate airborne fibers. Employers must use exposure monitoring data to assess employee exposures. Records of all measurements taken to monitor employee exposure to asbestos must contain the date of measurement, operation involving exposure, sampling and analytical methods used, and evidence of their accuracy; number, duration, and results of samples taken; type of respiratory protective devices worn; and name, social security number, and results of all employee exposure measurements. Retain these records for 30 years.

7.17.2 Methods of Compliance. To the extent feasible, use engineering controls to control exposures. If engineering controls are not feasible to meet the exposure limit, use them to reduce employee exposures to the lowest levels attainable and supplement them with the use of respiratory protection.

a. Control Measures. Use the following methods to reduce exposures:

- Equip local exhaust ventilation with a HEPA (high-efficiency particulate air) filter dust collection system.
- Enclose or isolate processes producing asbestos dust.
- Ventilate regulated areas to move contaminated air to a collection device with a HEPA filter.
- Control engineering and work practices to reduce exposures to the lowest possible level and supplement with respiratory protection.
- Equip vacuum cleaners with HEPA filters to collect debris and dust.
- Use wet methods or wetting agents, unless such methods would cause electrical hazards, equipment malfunction, slipping hazards or other hazards.
- Promptly clean up and dispose of asbestos-contaminated wastes and debris in leak-tight containers.

b. Prohibited Practices. Regardless of the measured exposure levels, the following practices are prohibited:

- Use of high-speed abrasive disk saws unless they are equipped with point-of-cut ventilation or they are enclosed with HEPA-filtered exhaust air.
- Use of compressed air to remove asbestos or asbestos-containing materials unless the compressed air is used with an enclosed ventilation system.
- Dry sweeping, shoveling, or other dry cleanup of dust and debris.
- Rotating employees to reduce exposure.

7.17.3 Hazard Identification. In the absence of analytical data to the contrary, inventory and treat as all thermal insulation, sprayed, or troweled-on surfacing materials, and resilient flooring material installed before 1981 asbestos containing materials. In addition, inventory all materials containing more than 1 percent asbestos. Indicate at least the material identity, location, and quantity present in the record of inventory. Maintain the records for the duration of ownership.

7**.17.4 Hazard Communication.** Communicate the exposure hazards and exposure control measures that were implemented to:

- All workers working with, on or adjacent to asbestos containing materials
- All prospective employers applying or bidding for work in or adjacent to areas containing asbestos
- All tenants who may occupy the areas containing asbestos

7.17.5 Signs. Post warning signs at all regulated areas. Regulated areas are established where there are or a reasonable expectation of airborne concentrations in excess of permissible exposure limits or where there is a reasonable expectation of airborne concentrations in excess of permissible exposure limits. At entrances to rooms or areas containing asbestos thermal insulation and surfacing materials, the building owner must post signs identifying the material, its location, and the work practices that ensure it is not disturbed. The warning sign must contain at least the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORY EQUIPMENT AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

7.17.6 Warning Labels. Warning labels with the following wording must be placed on all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers:

DANGER
Contains Asbestos Fibers
Avoid Creating Dust
Cancer And Lung Disease Hazard

7.17.7 Work Classification. Four classes of asbestos related work activities are defined in table 7-9.

Table 7-9.—Asbestos work classification

Class	Definition and examples of asbestos work
I	Work involves the removal of asbestos-containing or presumed-asbestos-containing thermal insulation and sprayed-on or troweled-on surfacing. Thermal insulation includes asbestos-containing materials applied to pipes, boilers, tanks, ducts, or other structural components to prevent heat loss or gain. Surfacing materials may include decorative plaster on ceilings, acoustical materials on decking, or fireproofing on structural members.
II	Work includes the removal of other types of asbestos-containing materials that are not thermal insulation, such as flooring and roofing materials. Removing intact incidental roofing materials such as cements, mastics, coatings, and flashings is not regulated as Class II. Examples of Class II work include removal of floor and ceiling tiles, siding, roofing, or transite panels.
III	Work that includes repair and maintenance operations where asbestos-containing or presumed-asbestos-containing materials are disturbed.
IV	Work includes maintenance and custodial activities in which employees contact but do not disturb asbestos-containing materials. These activities must be related to the construction project and usually result from Class I, II, or III activities.

7.17.8 Training. Train employees performing Class I through IV asbestos operations before they begin these jobs and annually thereafter. The training course must inform employees of:

- Ways to recognize asbestos
- Adverse health effects of asbestos exposure
- The relationship between smoking and asbestos in causing lung cancer
- Operations that could result in asbestos exposure and the importance of protective controls
- The purpose, proper use, fitting instructions, and limitations of respirators
- Appropriate work practices for performing asbestos jobs
- Medical surveillance program requirements
- The contents of the asbestos standard
- The names, addresses, and phone numbers of public health organizations that provide information and materials or conduct smoking-cessation programs
- The required signs and labels and their meanings

Additional training based on the work classification that is required:

a. Class I. Equivalent in curriculum, method, and length to the EPA Model Accreditation Plan asbestos worker training, (40 CFR 763, Subpart E, appendix C). Eight hours of annual refresher training is required.

b. Class II. Training must cover the elements listed above plus hands-on training and last at least 8 hours. Annual refresher is required.

c. Class III. Training must be the equivalent in curriculum and method to the 16-hour "Operations and Maintenance" course developed by EPA for maintenance and custodial workers whose work disturbs asbestos-containing materials (40 CFR 763.92). The course must include hand-on training in proper respirator use and work practices. Annual refresher training is required.

d. Class IV. Training must be equivalent in curriculum and method to EPA awareness training. Focus on training locations of asbestos-containing or presumed-asbestos-containing materials and ways to recognize damage and avoid exposure. The course must be at least 2 hours long. Annual refresher training is required.

7.17.9 Work Plans. All Class I-III operations will have a written program and plan in place before initiating activities that reflects the means implemented to meet the applicable requirements of 29 CFR 1910.1001 or 29 CFR 1926.1101. For all Class IV operations, provide a written Job Hazard Analysis and Standard Operating Procedure reflecting the safety and health protective expectations associated with the applicable operations before initiating activities.

7.18 Lead

The permissible exposure limit (PEL) for lead is 50 µg/m3, averaged over an 8-hour period. Conduct monitoring and medical surveillance at an action level of 30 µg/m3 or more. OSHA standards regulating lead are at 29 CFR 1910.1025 and 29 CFR 1926.62. The employer must ensure that no employee is exposed to lead at concentrations in excess of the PEL.

7.18.1 Written Lead Program. When work is conducted on surfaces containing lead coatings, a lead compliance program containing the following elements must be developed:

- Detailed description of work activities
- Engineering controls used to reduce or control exposures
- Work practice controls
- Decontamination procedures
- Personal hygiene practices

- Training
- A medical surveillance program and biological monitoring
- Exposure monitoring
- Respiratory protection
- Personal protective equipment
- Workplace inspections
- Signing of work area
- Recordkeeping

7.18.2 Action Level. Several provisions of the lead standard, such as periodic exposure monitoring, biologic monitoring, and initial and annual employee training, are triggered whenever exposure measurements reach or exceed the action level (30 □g/m^3). For employees exposed to lead at or above the action level for more than 30 days per year, employers are also required to provide an ongoing medical surveillance program.

7.18.3 Minimum Program Requirement if Lead Is Present. Until exposure monitoring is conducted that documents that employees are not exposed above the PEL, the employer must assume that the following tasks result in lead exposure and implement a full lead compliance program:

a. Manual demolition of structures, manual scraping, manual sanding, or use of a heat gun when lead containing coatings are present or when the composition of the coatings has not been tested

b. Abrasive blasting in an enclosure

c. Power tool cleaning

d. Lead burning

e. Using lead containing mortar or spray painting with lead-containing paint

f. Abrasive blasting, welding, cutting, or burning on any structure where lead-containing coatings or paint are present

g. Cleanup activities where dry expendable abrasives are used

h. Gouging with copper jacketed resistance rods known to contain high amounts of lead

i. Performing any other task the employer believes may cause exposures in excess of the PEL

7.18.4 Interim Measures. When an employee performs a specified task where lead is present, interim protection must at least include:

a. Appropriate respiratory protection
b. Appropriate personal protective clothing and equipment
c. Change areas
d. Hand washing facilities
e. Biological monitoring
f. Training, including hazard communication and respiratory training

7.18.5 Housekeeping

a. Maintain all surfaces as free as practicable of accumulated lead dust. Accomplish this primarily by vacuuming floors, rafters, and other surfaces or by employing methods equally effective in preventing the dispersal of lead into the workplace. Vacuuming is considered to be the most reliable method of cleaning surfaces on which dust accumulates, but equally effective methods may be used, for example, a wet floor scrubber. Where vacuuming methods are selected, the vacuums must be equipped with HEPA filters. Dry or wet sweeping, shoveling, or brushing may not be used except where vacuuming or other methods have been tried and do not work.

b. Do not allow employees to smoke, eat, apply cosmetics, or have tobacco products, food stuffs, or cosmetics in any work areas.

c. Provide separate storage facilities in change areas for street and work clothing to prevent cross-contamination between the two. Employees exposed to lead during their work shift must shower before leaving the workplace, if showers are provided, and must not leave wearing protective work clothing.

7.18.6 Medical Surveillance. If an employee's airborne lead exposure is at or above the action level for more than 30 days a year, the employer must provide a medical surveillance program to the employee consisting of routine monitoring of an employee's blood lead and ZPP (zinc protoporphyrin) levels, made available at least every 2 months for the first 6 months in the exposed job and every 6 months thereafter. If an employee's blood lead exceeds 40 μg/dl, the monitoring frequency must be increased to at least every 2 months and not reduced until two consecutive blood leads are below 40 μg/dl.

7.18.7 Medical Removal Protection. When an employee's blood lead level is at or above 50 μg/dl on a periodic and follow-up blood sampling test (within 2 weeks of the first report), remove the employee from any exposure to lead. Also remove the employee from work having an exposure to lead at or above the action level on each occasion when a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition that places the employee at increased risk of material impairment to health from exposure to lead.

7.18.8 Training. Employees who are exposed at or above the action level must be trained in the following:

- The content of the OSHA lead standard and its appendices
- The specific nature of the operations that could result in exposure to lead above the action level
- The purpose, proper selection, fitting, use, and limitations of respirators
- The purpose and a description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant)
- The engineering controls and work practices associated with the employee's job assignment, including training of employees to follow relevant good work practices
- The contents of any compliance plan in effect
- Why chelating agents should not routinely be used to remove lead from employees' bodies and why they should not be used at all except under the direction of a licensed physician
- The employee's right of access to records under 29 CFR 1910.20.

7.18.9 Recordkeeping. Establish and maintain records of all exposure monitoring and other data used in conducting the exposure assessment. The records must include the name and job classification of employees monitored, the details of the sampling and the analytic techniques, the results, and the type of respiratory protection worn. Keep these records for 30 years in accordance with OSHA's standard 29 CFR 1910.20, Access to Exposure and Medical records. Employers must establish and maintain records of medical surveillance (biological monitoring and medical examination results). These records must include the names of employees, the physician's written opinion, exposure data provided to the physician, and any employee medical complaints associated with lead exposure. The employer is required to keep or must ensure that the examining physician keeps a record of the results of medical examinations, a description of laboratory procedures, and a copy of the results of biological monitoring. These records must be kept for at least the duration of employment plus 30 years.

7.18.10 Observation of Monitoring. Employers must provide employees or their representatives with the opportunity to observe monitoring of employee exposures to toxic materials or harmful physical agents. To ensure that this right is meaningful, observers are entitled to an explanation of the measurement procedure, to observe all steps related to the measurement

procedure, and to record the results obtained. When results of the monitoring are returned by the laboratory, make them available to the employee.

7.18.11 Signing. The following warning sign must be displayed in each work area where lead hazards exist:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

7.19 Illumination

While work is in progress, provide lighting in accordance with the current ANSI/IES RP-7, Recommended Practice for Industrial Lighting; ANSI/IES RP-1, Recommended Practice for Office Lighting; and UL 924, Emergency Lighting and Power Equipment. Table 7-10 is a summary of the minimum light intensities.

7.19.1 Means of Egress. Provide a minimum of 11 lux (1 footcandle) of illumination, measured at the floor to the means of egress.

Table 7-10.—Minimum lighting requirements

Facility or function	Illuminance – lux (footcandles)
Accessways - general indoor - general outdoor - exitways, walkways, ladders, stairs	 55 (5) 33 (3) 110 (10)
Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)
Chemical laboratories	540 (50)
Construction areas - general indoor - general outdoor - tunnels and general underground - tunnel and shaft heading during drilling, mucking, and scaling	 55 (5) 33 (3) 55 (5) 110 (10)
Conveyor routes	110 (10)
Docks and loading platforms	33 (3)
Elevators, freight, and passenger	215 (20)
First aid stations and infirmaries	325 (30)
Mechanical/electrical equipment rooms	110 (10)
Parking areas	33 (3)
Toilets, wash rooms, dressing rooms	110 (10)
Visitor areas	215 (20)

Table 7-10.—Minimum lighting requirements

Facility or function	Illuminance – lux (footcandles)
Warehouses and storage rooms/areas - indoor stockroom, active/bulk storage - indoor stockroom, inactive - indoor rack storage - outdoor storage	110 (10) 55 (5) 270 (25) 33 (3)
Work areas - general (not listed above)	325 (30)