Chapter 6
Hazardous or Toxic Agents and Environments

6-1. References.

a. ACGIH, Threshold Limit Values (TLV) and Biological Exposure Indices (BEI) (https://www.acgih.org/publications/) (6-1.a)

b. American Industrial Hygiene Association (AIHA), Indoor Air Quality (https://www.aiha.org/public-resources/air-quality) (6-1.b)

c. ANSI/ ASA S2.70, Measurement and Evaluation of Human Exposure to Vibration Transmitted to the Hand (https://webstore.ansi.org/) (6-1.c)

d. ANSI/ASA S2.73, Mechanical Vibration and Shock – Hand-Arm Vibration – Measurement and Evaluation of the Vibration Transmissibility of Gloves at the Palm of the Hand (https://webstore.ansi.org/) (6-1.d)

e. ANSI/ASSP Z9.4, Abrasive-Blasting Operations - Ventilation and Safe Practices for Fixed Location Enclosures (https://webstore.ansi.org/) (6-1.e)

f. ANSI/ISEA Z358.1, Emergency Eyewash and Shower Equipment (https://webstore.ansi.org/) (6-1.f)

g. AR 50-6, Chemical Surety (https://armypubs.army.mil/epubs/DR_pubs/DR_a/ARN32351-AR_50-6-000-WEB-1.pdf) (6-1.g)

h. AR 385-10, The Army Safety and Occupational Health Program (https://armypubs.army.mil/ProductMaps/PubForm/AR.aspx) (6-1.h)

i. DA Pam 40-501, The Army Hearing Program (https://armypubs.army.mil/ProductMaps/PubForm/PAM.aspx) (6-1.i)

j. DA Pam 40-503, The Army Industrial Hygiene Program (https://armypubs.army.mil/ProductMaps/PubForm/PAM.aspx) (6-1.j)

k. DoDI 6055.11, Protecting Personnel from Electromagnetic Fields (https://www.esd.whs.mil/directives/issuances/dodi/) (6-1.k)

l. DTR 4500.9-R, chapter 204 Hazardous Material (https://www.ustranscom.mil/dtr/part-ii/dtr_part_ii_204.pdf) (6-1.l)

m. EM 385-1-80, Ionizing Radiation Protection Manual (https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_385-1-80.pdf?ver=9Z52MMPJXnB7-Q07cylPQQ%3d%3d) (6-1.m)

n. Environmental Protection Agency (EPA) Lead Renovation, Repair and Painting Program (https://www.epa.gov/lead/lead-renovation-repair-and-painting-program) (6-1.n)

o. EPA IAQ Management Checklist (https://www.epa.gov/sites/default/files/2014-08/documents/mgmtlist.pdf) (6-1.o)

p. ER 385-1-11, Industrial Hygiene Program (https://www.publications.usace.army.mil/LinkClick.aspx?fileticket=WNgg7LkTXZ4%3d&tabid=16441&portalid=76&mid=43546) (6-1.p)

q. ER 385-1-96, USACE Ergonomic Program Policy (https://www.publications.usace.army.mil/LinkClick.aspx?fileticket=13AXVgmz5Vs%3d&tabid=16441&portalid=76&mid=43546) (6-1.q)

r. International Organization for Standardization (ISO) 5349, Mechanical Vibration (https://www.iso.org/standards.html) (6-1.r)

s. ISO 8662, Hand-Held Portable Power Tools – Measurement of Vibrations at the Handle (https://www.iso.org/standards.html) (6-1.s)

t. NFPA 400, Hazardous Materials Code (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=400) (6-1.t)

u. TB MED 507, Heat Stress Control and Heat Casualty Management (https://armypubs.army.mil/ProductMaps/PubForm/TB_Cal.aspx) (6-1.u)

v. TB MED 508, Prevention and Management of Cold Weather Injuries (https://armypubs.army.mil/ProductMaps/PubForm/TB_Cal.aspx) (6-1.v)

w. TB MED 577 NAVMED P-5010-10/AFMAN 48-138_IP, Sanitary Control and Surveillance of Field Water Supplies (https://armypubs.army.mil/ProductMaps/PubForm/TB_Cal.aspx) (6-1.w)

x. TG 277, Industrial Hygiene Public Health Army Mold Remediation Guidance (https://phc.amedd.army.mil/PHC%20Resource%20Library/TG277FINAL28Feb2019.pdf) (6-1.x)

y. TG 278, Industrial Hygiene Public Health Mold Assessment Guide (https://phc.amedd.army.mil/PHC%20Resource%20Library/TG278.pdf) (6-1.y)

z. OSHA Instruction CPL 2.86, Memorandum of Understanding between the OSHA and the U.S. Nuclear Regulatory Commission (1989) (https://www.osha.gov/enforcement/directives/cpl-02-00-086) (6-1.z)

aa. UFGS 02 82 00, Asbestos Remediation (https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-02-82-00) (6-1.aa)

bb. UFGS 02 83 00, Lead Remediation (https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-02-83-00) (6-1.bb)

cc. 29 CFR 1910, General Industry (https://www.osha.gov/laws-regs/regulations/standardnumber/1910) (6-1.cc)

dd. 29 CFR 1910.94, Ventilation (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol5/pdf/CFR-2022-title29-vol5-sec1910-94.pdf) (6-1.dd)

ee. 29 CFR 1910.134, Respiratory Protection https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol5/pdf/CFR-2022-title29-vol5-sec1910-134.pdf) (6-1.ee)

ff. 29 CFR 1910 Subpart H, Hazardous Materials (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol5/pdf/CFR-2022-title29-vol5-part1910-subpartH.pdf) (6-1.ff)

gg. 29 CFR 1910 Subpart Z, Toxic and Hazardous Substances (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol6/pdf/CFR-2022-title29-vol6-part1910-subpartZ.pdf) (6-1.gg)

hh. 29 CFR 1915 Subpart Z, Toxic and Hazardous Substances (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol7/pdf/CFR-2022-title29-vol7-part1915-subpartZ.pdf) (6-1.hh)

ii. 29 CFR 1926.62, Lead (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol8/pdf/CFR-2022-title29-vol8-sec1926-62.pdf) (6-1.ii)

jj. 29 CFR 1926.64, Process Safety Management for Highly Hazardous Chemicals (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol8/pdf/CFR-2022-title29-vol8-sec1926-64.pdf) (6-1.jj)

kk. 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol8/pdf/CFR-2022-title29-vol8-sec1926-65.pdf) (6-1.kk)

ll. 29 CFR 1926 Subpart Z, Toxic and Hazardous Substances (https://www.govinfo.gov/content/pkg/CFR-2022-title29-vol8/pdf/CFR-2022-title29-vol8-part1926-subpartZ.pdf) (6-1.ll)

mm. 40 CFR 61 Subpart M, National Emission Standard for Asbestos (https://www.govinfo.gov/content/pkg/CFR-2011-title40-vol8/pdf/CFR-2011-title40-vol8-part61-subpartM.pdf) (6-1.mm)

nn. 40 CFR 141, National Primary Drinking Water Regulation (https://www.govinfo.gov/content/pkg/CFR-2015-title40-vol23/pdf/CFR-2015-title40-vol23-part141.pdf) (6-1.nn)

oo. 40 CFR 302, Designation, Reportable Quantities, and Notification (https://www.govinfo.gov/content/pkg/CFR-2020-title40-vol30/pdf/CFR-2020-title40-vol30-part302.pdf) (6-1.oo)

6-2. Definitions.

a. Abrasive Blasting. The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force. (6-2.a)

b. Acclimatize. The process or result of becoming accustomed to a new climate or to new conditions. (6-2.b)

c. Action Level. Action level means a concentration designated in 29 CFR 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average (TWA), which initiates certain required activities such as exposure monitoring and medical surveillance. Usually the Action Level represents 1/2 of the OEL. (6-2.c)

d. Asbestos-Containing Material (ACM). Any material containing more than 1% of asbestos. (6-2.d)

e. Chemical. Any substance or mixture of substances. (6-2.e)

f. Cold Stress. An umbrella term that refers to cold-related illnesses that occur when the body can no longer maintain its normal temperature. These illnesses range from mild and treatable to permanent tissue damage and death. (6-2.f)

g. Competent Person (CP). See paragraphs 1-2 or 2-2, as applicable. (6-2.g)

h. Exposure or Exposed. When an employee is subjected in the course of employment to a chemical that is a physical or health hazard. "Subjected" in terms of health hazards includes any route of entry (for example, inhalation, ingestion, skin contact, or absorption). (6-2.h)

i. Hazardous or Toxic Agent. To include but not limited to, any substance defined as a hazardous substance under 29 CFR 1910.120 (29 CFR 1910 Subpart H), 29 CFR 1926.65, or 40 CFR 302, any chemical determined to be a hazard as specified in 29 CFR 1910.1200 to include gases, liquid vapors, mists, dusts, or fumes which have been identified as causing adverse health effects in exposed employees, noise and radiation where duration and quantity of exposure is capable of causing adverse health effects, or any agent pertaining to or that may cause poison, be poisonous, or harmful. (6-2.i)

j. Heat Stress. The net heat load to which a worker is exposed. Physical exertion, environmental factors, and clothing worn all contribute to heat stress. (6-2.j)

k. High-Efficiency Particulate Air (HEPA) Filter. A filter capable of trapping and retaining at least 99.97% of 0.3 micrometer diameter mono-disperse particles. (6-2.k)

l. Industrial Hygienist (IH). A scientist or engineer devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among the citizens of the community. A Certified Industrial Hygienist (CIH) is a professional credential for this vocation, which is governed by the Board for Global EHS (environmental, health and safety) Credentialing. (6-2.l)

m. Occupational Exposure Limit (OEL). A generic term used to apply to all exposure limits, to include DoD standards such as military exposure guidelines, OSHA permissible exposure limits, ACGIH TLVs, NIOSH Recommended Exposure Limits, and other exposure limits reviewed for potential use. (6-2.m)

n. Potable Water. Water that meets the standards for drinking purposes of the state or local AHJ, or water that meets the quality standards prescribed by the U.S. EPAs National Primary Drinking Water Regulations (40 CFR 141). See also TB MED 577/NAVMED P-5010-10 and NAVMED P-5010-6. (6-2.n)

o. Regulated Area. An area established by the employer to demarcate areas where airborne concentrations of contaminants exceed, or there is a reasonable possibility that they may exceed the OEL. (6-2.o)

p. Rest. A period of time during which the person concerned is off duty, is not performing work, including administrative tasks, and is afforded the opportunity for uninterrupted sleep. This does not include time for breaks, meals, to travel time to/from work. (6-2.p)

q. Safety Data Sheet (SDS). A document that includes information such as the properties of each chemical, the physical, health and environmental health hazards, protective measures, and safety precautions for handling, storing, and transporting the chemical. OSHA requires that SDS preparers provide specific minimum information as detailed in Appendix D of 29 CFR 1910.1200 (29 CFR 1910 Subpart Z). (6-2.q)

r. Thermal Stress. Thermal stress includes both heat and cold stress. These conditions arise when temperatures become too extreme for the body, resulting in a physical response. (6-2.r)

s. Threshold Limit Value (TLV). Airborne concentrations of chemical substances and represent concentrations under which it is believed that nearly all workers may be

repeatedly exposed, day after day, over a working lifetime, without adverse health effects. (6-2.s)

t. Wet-Bulb Globe Temperature Index. A measurement of environmental factors that correlate with human deep body temperature and other physiological responses to heat. (6-2.t)

6-3. Personnel Required Training/Qualification

a. General. At a minimum provide training upon initial assignment and whenever a new hazard is introduced, as applicable. The below training requirements must include the following: (6-3.a)

(1) The specific nature of operations which could result in exposure and effects of exposure.

(2) The specific procedures implemented to protect employees from exposure, such as appropriate engineering controls, work practices, and PPE to be used. Workers must be trained in the removal of personal protective clothing and equipment to prevent further spread or contamination. (See chapter 35)

b. Hazard Communication (HazCom). Provide HazCom training to employees who use or may be exposed to hazardous or toxic agents upon initial assignment and whenever a new hazard is introduced. Training must include the following: (6-3.b)

(1) Requirements of the HazCom Program on the project.

(2) The location of all hazardous or toxic agents at the project.

(3) Identification and recognition of hazardous or toxic agents on the project.

(4) Physical and health hazards of the hazardous or toxic agents pertinent to project activities.

(5) Protective measures employees can implement when working with or around project-specific hazardous or toxic agents.

(6) The location and content of the SDSs for the hazardous or toxic agents.

(7) Procedures for preserving employee exposure records. For USACE ONLY, enter employee exposure records into Defense Occupational Environmental Health Readiness System – Industrial Hygiene (DOEHRS-IH).

(8) Requirements for contractors bringing hazardous materials (HAZMAT) onto USACE projects.

c. Thermal Stress. Provide training to employees exposed to thermal stressors commensurate with job responsibilities to include illnesses and injuries, signs and symptoms, prevention procedures and control measures, and first aid measures. (6-3.c)

d. Fatigue Management. Provide training to employees who perform work hours as identified in paragraph 6-7.j. Training must include symptoms, prevention and controls of fatigue. (6-3.d)

e. Testing and Monitoring Training. Those who perform testing and monitoring of hazardous or toxic agents and environments will follow manufacturer's instructions on the use of monitoring equipment. Review of APPs and contractor's qualifications will determine who can perform testing and monitoring. For USACE operations only, all IH testing and monitoring of USACE employees must be overseen by the District or Division IH and entered into DOEHRS-IH. (6-3.e)

f. Hazardous Materials (HAZMAT). Provide training to persons who prepare shipments of HAZMAT as defined by Defense Transportation Regulation (DTR). Such persons must be trained, certified, and issued an appointment letter according to DTR 4500.9-R, chapter 204. (6-3.f)

g. Harmful Plants, Animals, and Insects. Provide training to employees who may be exposed to harmful plants, animals, and insects. Training must include the following as applicable: (6-3.g)

(1) Recognition of the animals and insects and their nesting habits, aggressiveness, potential disease exposure, etc.

(2) Recognition and identification of the plants.

(3) First aid response actions.

h. Exposure Potential Training. The following have different levels of training and certification requirements based on exposure potential and job responsibilities. (6-3.h)

(1) Lead Training. Provide training based on exposure potential according to applicable OSHA/EPA standards.

Note. Individuals performing work in residential houses, apartments, and child-occupied facilities such as schools and day-care centers built before 1978 must comply with EPA training and certification requirements outlined in EPA's Lead-Based Paint Renovation, Repair and Painting Program (RRP).

(2) Asbestos Training. Provide training based on exposure potential according to applicable OSHA/EPA standards.

(3) Beryllium Training. Provide training based on exposure potential according to applicable OSHA standards.

(4) Chromium Training. Provide training based on exposure potential according to applicable OSHA standards.

(5) Abrasive Blasting Training. Provide training based on exposure potential according to applicable OSHA standards.

(6) Respirable Silica. Provide training based on exposure potential according to applicable OSHA standards.

i. Competent Mold Inspector. Assessments/remediations of mold must be overseen by a Competent Mold Inspector with a minimum of five years of experience in evaluation of indoor air concerns and an understanding of the properties of mold behaviors and building design or construction. This person must be an IH, microbiologist, or a qualified indoor air specialist, or mold inspector who has been certified by an independent indoor air quality (IAQ) certifying agency and/or who can demonstrate training and experience in the IAQ investigative field. Some states, local authorities, and host nations also require this person to be licensed. (6-3.i)

6-4. Roles and Responsibilities.
For USACE ONLY, refer to ER 385-1-11, Industrial Hygiene Program.

a. Industrial Hygienist (IH). (6-4.a)

(1) Perform a hazard evaluation of jobsite operations, materials, and equipment that involve potential exposure to hazardous or toxic agents or environments to identify workplace hazards and plans required for implementation (see para 6-8.a).

(2) Review testing and monitoring results to determine the concentration of and any associated hazards of hazardous or toxic agents and environments (see para 6-8.d).

(3) Evaluate activities which could generate airborne contaminants (that is, gases, vapors, fumes, mist, or dusts) to determine potential personnel exposure (see para 6-8.p).

b. Qualified Person (QP). One who because of education, training, or experience, or a combination of these factors can understand the health and environmental risks associated with a chemical substance according to chapters 1 or 2, as applicable. QPs are responsible for overseeing the storage of hazardous chemicals, materials, substances, and wastes prior to transportation. (See para 6-8.e) (6-4.b)

6-5. Inspection Requirements.

a. Testing and Monitoring Equipment. Inspect equipment used for testing and monitoring of hazardous or toxic agents and environments according to the manufacturer's instructions. (6-5.a)

b. Emergency Facilities/Units (Eyewash and Showers). (6-5.b)

(1) Activate plumbed units at least weekly and document to verify proper operation.

(2) Visually inspect and document self-contained units weekly to determine if flushing fluid needs to be changed or supplemented.

(3) Inspect emergency facilities/units annually for compliance with ANSI/ISEA Z358.1 performance requirements.

c. Ventilation Systems. Ventilation systems used to remove hazardous dusts, fumes, gases, or substances must be evaluated at least annually to determine if the system functions as designed. (6-5.c)

d. Blasting Equipment. (6-5.d)

(1) Inspect all blasting PPE and components prior to every use.

(2) The ventilation in all blast enclosures must be measured annually to confirm the flow is adequate and the system does not require cleaning or maintenance.

6-6. Activity Hazard Analysis (AHA) Requirements.
Develop AHAs according to paragraphs 1-6 or 2-6, as applicable. Incorporate applicable information contained in SDSs into AHAs. If a hazardous or toxic agent is used in an operation, attach the SDS to the AHA.

6-7. Minimum Plan Requirements.

a. Hazard Communication (HazCom) Program. A written HazCom Program must be developed when hazardous chemicals are present or used at a project site. The written HazCom program must address the following in project-specific detail: (6-7.a)

(1) Hazardous Chemical Inventory. A list of the hazardous or toxic agents present or used at the project site with the following information. Update the inventory and site map at a minimum, annually, but as frequently as necessary to ensure it is current and accurately reflects those materials onsite.

(a) Explanation of how the agents are used at the project.

(b) For emergency response purposes, identify approximate quantities (for example, liters, kilograms, gallons, pounds) of each agent that is onsite or will be onsite at any given time.

Note. If the agent's name, quantity, and/or location are classified information, maintain in a location so it can be provided to emergency responders during an emergency.

(c) Attach a site map to the inventory showing where substances are stored.

(2) Hazardous or Toxic Agent Labeling. Procedures for assuring containers used to store and transport hazardous or toxic agents around the project site are appropriately labeled to communicate the physical and health hazards associated with the agents in the containers. Labels, at a minimum, must include the information required of the manufacturer label (that is, product identifier (compound name), signal word (danger or warning)), hazard statement(s), pictogram(s), precautionary statements, and name, address and telephone number of the chemical manufacturer, importer, or other responsible party (or for workplace-made labels, the product identifier and any words, pictures, symbols, or combination thereof that provide general information regarding the hazards of the product).

(3) SDS Management. Procedures to ensure SDSs are maintained at the project site for each hazardous or toxic agent so all employees have access to them. The information must be followed in the use, storage, and disposal of material and selection of hazard control and emergency response measures.

(4) Employee Information and Training. Procedures to ensure employees are trained according to paragraph 6-3.b.

b. Process Safety Management (PSM) Program. A written PSM Program must be developed according to 29 CFR 1910.119 (29 CFR 1910 Subpart H) or 29 CFR 1926.64 when any of the following conditions exist: (6-7.b)

(1) A process involves a chemical at or above the specified threshold quantities listed in Appendix A of 29 CFR 1910.119.

(2) A process involves a Category 1 flammable gas or a flammable liquid with a flashpoint below 100 ºF (37.8 ºC) onsite in one location, in a quantity of 10,000 lbs. (4,535.9 kg) or more, except for, hydrocarbon fuels used solely for workplace consumption as a fuel, if such fuels are not part of a process containing another highly hazardous chemical covered under 29 CFR 1910.119, or flammable liquids with a flashpoint below 100 ºF (37.8 ºC) stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

c. Lead Compliance Plan. A written Lead Compliance Plan must be developed when employees may be exposed to lead above the action level, as applicable. The

plan must address the following (see 29 CFR 1910.1025 (29 CFR 1910 Subpart Z) and 29 CFR 1926.62): (6-7.c)

(1) A description of each work activity in which lead is emitted, to include equipment and materials used, crew size, job responsibilities, operating procedures, maintenance practices, and work activity locations and lead-containing components keyed to the project drawings.

(2) Description of control measures to be used to achieve exposure compliance, including any engineering and administrative controls and PPE (see paras 1-6 or 2-6, as applicable).

(3) Employee exposure assessment procedures to monitor and document employee lead exposure. Exposure monitoring must include two types:

(a) Initial determination (may be omitted if there is sufficient objective/historical data showing action level compliance according to the requirements).

(b) Continued exposure monitoring required as a result of initial exposure determinations.

(4) Protective clothing, housekeeping procedures to prevent spread of lead contamination both in and beyond the lead hazard control area, and hygiene facilities and practices to prevent employees from inadvertent ingestion of lead.

(5) Medical surveillance procedures to monitor employee exposures and ensure fitness for wearing respiratory protection (see chapter 5).

(6) Employee training required according to paragraph 6-3.h.

(7) Detailed sketches identifying lead hazard control areas, including decontamination areas and facilities, critical barriers, and physical and air distribution boundaries.

(8) Perimeter or other area air monitoring outside or adjacent to the regulated area.

(9) Security required for each lead hazard control area.

(10) Waste generation, characterization, transportation, and disposal (including recordkeeping).

d. Asbestos Management Plan. A written Asbestos Management Plan must be developed when work is performed that may disturb ACM, as applicable. The plan must address the following (see 29 CFR 1910.1001 (29 CFR 1910 Subpart Z), 29 CFR 1926.1101 (29 CFR 1926 Subpart Z), and 40 CFR 61, Subpart M): (6-7.d)

(1) A description of each activity where asbestos will be disturbed, including OSHA class of work, equipment required, crew size, job responsibilities, operating procedures, maintenance practices, and work activity locations and ACM components keyed to the project drawings.

(2) The method of notification of other employers at the work site.

(3) A description of regulated areas, types of containment, and decontamination unit plan.

(4) Air monitoring plan - personal, environmental, and clearance. Employee exposure assessment procedures must address monitoring and documenting employee exposures.

(a) An initial determination (may be omitted if there is sufficient objective/historical data showing compliance with the requirements).

(b) Continued exposure monitoring may be required as a result of initial exposure determinations.

(c) Environmental monitoring must demonstrate the absence of asbestos fiber migration outside the regulated area.

(d) Clearance monitoring will be conducted by an independent IH or a QP per contract specifications.

(5) Description of control measures to be used to achieve exposure compliance, including any engineering and administrative controls and PPE (see paras 1-6 or 2-6, as applicable).

(6) Housekeeping procedures to prevent spread of asbestos contamination both in and beyond the regulated area.

(7) Hygiene facilities and practices.

(8) Employee training required according to paragraph 6-3.h.

(9) Medical surveillance procedures to monitor employee exposures and ensure fitness for wearing respiratory protection (see chapter 5).

(10) Waste generation, containerization, transportation, and disposal (including recordkeeping).

(11) Security, fire, and medical emergency response procedures.

e. Ionizing Radiation Safety and Radiofrequency (RF) Plans (see EM 385-1-80). (6-7.e)

f. Abrasive Blasting Plan. A written Abrasive Blasting Plan must be developed when abrasive blasting is performed. The plan must address the following: (6-7.f)

(1) Identification of blasting CP and roles and responsibilities.

(2) Identification of blasting equipment make(s) and model(s).

(3) A description of each work activity in which abrasive blasting is required and written SOPs to be implemented for abrasive blasting operations, including pressurized pot procedures (filling, pressurizing, depressurizing, maintenance and inspection).

(4) Selection of abrasive blasting media and description of surface being blasted.

(5) Evaluation to determine composition and toxicity of the abrasive and the dust or fume generated by the blasted material, including surface coatings.

(6) Identify engineering controls, administrative controls to include signage, and PPE to be utilized to minimize exposure during operation to prevent spread of dust, contaminants, and hazardous material in the working area and surrounding area (see paras 1-6 or 2-6, as applicable).

(7) Medical surveillance procedures to monitor employee exposures and ensure fitness for wearing respiratory protection (see chapter 5).

(8) Waste generation, characterization, transportation, and disposal.

(9) Any additional hazards generated because of abrasive blasting work.

(10) Emergency response procedures.

(11) Minimum training and certification requirements (see para 6-3.h).

(12) Methods to inspect blasting equipment according to manufacturer's recommendations.

g. Thermal Stress Management Plan. A written Thermal Stress Management Plan must be developed when employees may be exposed to thermal stressors. The plan must include the following: (6-7.g)

(1) Signs and symptoms of thermal stress illnesses and injuries and first aid procedures for each.

(2) Procedures and control measures for preventing thermal stress illnesses and injuries.

(3) Training on thermal stress according to paragraph 6-3.c.

(4) Methods used to monitor exposures to thermal stressors, including appropriate standards to be utilized and the responsible person to monitor thermal stressors.

h. Mold Remediation Plan. A written Mold Remediation Plan is required when mold remediation activities are performed according to Army TG 277. The plan must include the following: (6-7.h)

(1) Documentation of employee training on proper clean up methods, personal protection, and potential health hazards.

(2) Description of source, location, and extent of mold.

(3) Description of mold growth conditions.

(4) A description of the engineering controls, work practices, and PPE, to include respiratory protection used to limit employee exposure to mold during abatement activities (see paras 1-6 or 2-6, as applicable).

(5) A description of housekeeping measures to limit employee exposure and prevent mold migration.

(6) A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed.

(7) Medical surveillance procedures to ensure fitness for wearing respiratory protection (see chapter 5).

(8) Post–remediation air sampling procedures.

i. Silica Compliance Plan. A written Silica Compliance Plan is required when employees may be exposed to respirable crystalline silica, as applicable. The plan must include the following (see 29 CFR 1910.1053 (29 CFR 1910 Subpart Z) and 29 CFR 1926.1153 (29 CFR 1926 Subpart Z)): (6-7.i)

(1) A description of the task(s) in the workplace that involve exposure to respirable crystalline silica.

(2) A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task.

(a) Identify specific exposure control methods per 29 CFR 1926.1153, tables 1 or 2.

(b) Identify alternative exposure control methods for tasks not listed in table 1, or where the employer does not fully and properly implement engineering controls, work practices and respiratory protection described in table 1.

(3) Employee exposure assessment procedures to document employee silica exposure.

(4) A description of the housekeeping measures used to limit employee exposure to respirable crystalline silica.

(5) A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure, including exposures generated by other employers or sole proprietors.

(6) Medical surveillance procedures to monitor employee exposures and ensure fitness for wearing respiratory protection (see chapter 5).

j. Fatigue Management Plan (FMP). A written FMP is required whenever work hours exceed 10-hours a day for more than four consecutive days, exceed 50-hours in a 7-day work week, exceed 12-hours a day for more than three consecutive days, and/or exceed 58-hours a week for sedentary (to include office) work. The FMP must address the following components and conditions for operator work hour limitations: (6-7.j)

(1) Equipment Operators. Operators of equipment, such as hoisting equipment and draglines, mobile construction equipment, electrical power systems, hydropower plants, industrial manufacturing systems, hydraulically operated equipment, powered vessels, and boats, must not be permitted to exceed 12-hours of duty time in any 24-hour period, including time worked at another occupation. A minimum of eight consecutive hours of rest between shifts in a 24-hour period is required.

(2) Motor Vehicle Operators. Operators of motor vehicles, while on duty, must not operate vehicles for a continuous period of more than 10-hours in any 24-hour period. In addition, no employee, while on duty, may operate a motor vehicle after being in a duty status for more than 12-hours during any 24-hour period. A minimum of eight consecutive hours must be provided for rest in each 24-hour period.

(3) Floating Plant. All floating plant personnel must be scheduled to receive a minimum of 8-hours rest in any 24-hour period, except:

(a) When quarters are provided immediately adjacent to, or aboard the work site, these hours of rest may be divided into no more than two periods, one of which must be at least six continuous hours in length.

(b) Rest periods may be interrupted in case of emergency, drill, or other overriding operational necessity.

(4) Identify affected workers.

(5) Employee training required according to paragraph 6-3.d.

(6) Control measures established at the work site to minimize fatigue including a discussion of driving to and from work and any possible mitigation of driving as a factor of fatigue. Controls for fatigue may include work scheduling (limit number of consecutive night shifts), rotating jobs to prevent repetitive work, breaks at critical times in the work cycle, control of environmental factors (heat, cold, use of PPE), buddy check-in for individuals working alone, and alternate transportation for long commutes. (See paras 1-6 or 2-6, as applicable)

(7) Management responsibility to implement plan requirements.

6-8. General Requirements.

a. Hazard Evaluation and Control. Jobsite operations, materials, and equipment involving potential exposure to hazardous or toxic agents or environments must be evaluated by an IH, or equivalent CP in industrial hygiene operations, to identify workplace hazards and plans required for implementation based on potential exposure (see para 6-7). (6-8.a)

(1) The hazard evaluation must document the workplace and activity evaluated, the nature of the evaluation (air, biological or radiological samples, etc.), any controls and training used, that it serves as certification of hazard evaluation, the name, position, and credentials of the person certifying the evaluation has been performed, and the date of the evaluation. This evaluation must be documented in a written report and available for review by the local SOHO/USACE supervisor/KO or COR.

(2) For USACE operations, frequency of evaluations will be conducted as required by initial survey determination based on DOEHRS-IH shop priorities.

(3) Mitigate hazards according to paragraphs 1-6 or 2-6, as applicable.

(4) In addition, regular housekeeping (work and break area surface cleaning) and personal decontamination procedures must be instituted in areas where operations generate toxic dust and fume hazards. The frequency of surface cleaning and of decontamination procedures is dependent on the nature of the hazard and frequency

and risk from the exposure. Include housekeeping procedures in the applicable plan. (See para 6-7 and chapter 35)

b. Exposure Standards. Occupational exposure, through inhalation, ingestion, skin absorption, or physical contact, to any hazardous or toxic agent more than the OEL is prohibited. (6-8.b)

(1) Comply with all applicable standards and regulations to reduce contaminant concentration levels to as low as reasonably achievable.

(2) For activities where occupational exposure to a chemical or biological warfare agent is possible, comply with current DA SOH requirements for chemical and biological agents such as AR 385-10 chapter 14 Biological Agents, AR 385-10 chapter 21 Chemical Agent Safety Management, and AR 50-6 Chemical Surety.

c. Labs. For laboratory use of chemicals follow 29 CFR 1910.1450 (29 CFR 1910 Subpart Z). (6-8.c)

d. Testing and Monitoring. (6-8.d)

(1) Approved and calibrated testing devices must be provided to measure hazardous or toxic agents and environments. Devices must be labeled with calibration information (that is, name of individual performing the calibration and date of the most current calibration). Calibration results must be maintained in a calibration log. For USACE operations, IH equipment calibration results must be maintained in the DOEHRS-IH.

(2) Individuals performing testing and monitoring must be trained according to paragraph 6-3.

(3) Testing and monitoring devices must be used, inspected, and maintained according to the manufacturer's instructions. Maintain a copy of the manufacturer’s instructions with each device.

(4) Use appropriate NIOSH, OSHA, EPA, or DA sampling and analytical methods, or other independently verified sampling and analytical methods.

(5) Laboratories used for analysis must be accredited by nationally recognized bodies, such as the AIHA, for the type of analysis performed.

(6) Determination of the concentration of and hazards from hazardous or toxic agents and environments must be made by a qualified IH or other CP.

(7) Perform testing and monitoring during initial startup and as frequently as necessary to ensure the safety and health of the workers or other potentially exposed individuals.

(8) Records of testing/monitoring must be maintained onsite and must be available to the local SOHO/USACE supervisor/KO or COR, upon request. For USACE operations, records of testing/monitoring are to be maintained in DOEHRS-IH.

e. Hazardous and Toxic Agents Handling. (6-8.e)

(1) When engineering and work practice controls or substitution are either infeasible or insufficient, appropriate PPE and chemical hygiene facilities must be provided and used for the handling of hazardous or toxic agents.

(a) Refer to the SDS to determine PPE requirements. An IH, Safety, or other CP must determine the scope and type of PPE required.

(a-1) Special attention must be given to selecting proper chemical protection when working with materials designated with a “skin” notation by OEL. Such materials may produce systemic toxic effects through absorption through unbroken skin. (See chapter 5)

(a-2) Before commencing use of epoxy resins, concrete, or other dermatitis-producing substances, employees must be made aware of the manufacturer’s skin protection recommendations. Barrier cream ointment or other skin protection measures recommended by the manufacturer or the SDS for the specific exposure must be available for use.

(b) When the eyes or body of any person may be exposed to hazardous or toxic agents and suitable facilities for drenching or flushing of the eyes and body are required, they must comply with ANSI Z358.1. Such facilities must be provided in the work area for immediate emergency use, no more than 10 seconds from the hazardous or toxic agent.

(b-1) Emergency eyewash equipment must be provided where there is the potential for an employee’s eyes to be exposed to corrosives, strong irritants, or toxic chemicals.

(b-2) The emergency eyewash equipment must irrigate and flush both eyes simultaneously while the operator holds the eyes open.

(b-3) The emergency eyewash equipment must deliver at least 0.4 gal (1.5 L) of water per minute for 15 minutes or more, providing a minimum of 6 gal (22.7 L) of water.

(b-4) Water used in emergency eyewashes and showers must meet potable water standards. When these items are exposed to the elements, steps will be taken to ensure the water does not freeze or become stagnate.

(b-5) Personal eyewash equipment may be used to supplement emergency washing facilities, they cannot be used as a substitute (see para 6-5.b).

(b-6) All plumbed emergency facilities and hand-held drench hoses must be connected to an approved potable water supply and activated weekly.

(b-7) All facilities must be inspected according to paragraph 6-5.b to ensure they function correctly and the quality and quantity of water is satisfactory for emergency washing purposes.

(c) When personal protective clothing is required, an area must be established for the removal of the personal protective clothing which limits the spread of any chemical waste, dust, or fume, and workers must be trained in the removal of personal protective clothing and equipment to prevent further spread or contamination (see chapter 35).

(2) Store hazardous or toxic agents so that they are only accessible to authorized personnel and NFPA 400 according to the manufacturer's recommendations (for example, SDS), 29 CFR 1910 Subpart H and requirements.

(3) Hazardous material must be segregated into appropriate storage designated for ignitability (flammable substances), corrosivity (acids and bases), reactivity (avoid water, temperature, pressure), and toxicity according to 29 CFR 1910 Subpart Z, 29 CFR 1915 Subpart Z, and 29 CFR 1926 Subpart Z.

(4) All hazardous chemicals, materials, substances, and wastes being stored prior to transportation must be under the supervision of a qualified person (see para 6-4.b).

(5) Transportation, use, and storage of hazardous or toxic agents must be planned and controlled to prevent contamination of people, animals, food, water, equipment, materials, and environment.

(6) Dispose of surplus or excess hazardous or toxic agents in a manner that will not contaminate or pollute any water supply, ground water, or streams, and that complies with applicable federal, state, and local requirements and guidelines.

(7) Do not use containers that have held hazardous or toxic agents to hold other materials unless they have been managed or cleaned under hazardous waste and DOT regulatory requirements.

(8) Every hazardous or toxic agent being transported for disposal must be transported with a copy of the substance's SDS.

(9) Persons who prepare shipments of hazardous chemicals, materials, substances and/or wastes that are defined as hazardous material under DOT regulations are required to be trained according to paragraph 6-3.f.

f. Asbestos and Lead Hazard Control. (6-8.f)

(1) Asbestos Hazard Control.

(a) Known friable ACMs must not be used or brought onto any USACE projects.

(b) Evaluate all construction or maintenance projects for the potential to contact ACM.

(c) Label all ACM an asbestos hazard that must not be disturbed without proper protection. If presumed asbestos containing materials or ACM is inaccessible to label, create and post a site map that identifies the location of the asbestos hazards.

(d) If evaluation shows the potential for activities to disturb ACM, an Asbestos Management Plan must be developed and employees trained according to paragraphs 6-3.h and 6-7.d. If regulations in local jurisdictions exceed federal requirements, the most stringent will apply.

(2) Lead Hazard Control.

(a) Lead-based paints will only be used with prior written approval of the local SOHO/USACE supervisor or accepted by the KO or COR and must never be used inside a residence, childcare facility, or medical treatment facility.

(b) Evaluate all construction or maintenance projects for the potential to create an occupational lead hazard exposure.

(c) Label all lead sources that may generate an occupational exposure. If lead hazards are inaccessible or infeasible to label, create and post a site map that identifies the location of the lead hazards.

(d) If evaluation shows the potential for activities to generate an occupational exposure to lead, a written Lead Compliance Plan must be developed and employees trained according to paragraphs 6-3.h and 6-7.c. If regulations in local jurisdictions exceed federal requirements, the most stringent will apply.

g. Hot Substances. (6-8.g)

(1) Protection from Hot Substances. Hazards from hot substances include increased inhalation and skin hazards and burns from the heat. When working with hot substances the following must be considered:

(a) PPE (for example, respirators, gloves) must be evaluated for efficiency in hot atmospheres and protectiveness from heat as well as the chemical hazard.

(b) Heat stress precautions and measurements (see para 5-8.n).

(c) Location where hot substances are heated must be located away from any ventilation intake air vents. If hot substances are being applied to a roof, the ventilation intake air vents must be temporarily relocated to prevent the uptake of the hazardous air

contaminants into the building, or the work must be completed at a time when the building is not occupied. Ventilation requirements are further addressed in paragraph 6-8.j.

(2) Transporting and Handling Hot Substances.

(a) Provide runways or passageways clear of obstructions for all persons carrying hot substances.

(b) Do not carry hot substances up or down ladders.

(c) When hoists are used to raise or lower hot substances, ensure the hoisting mechanism is adequate for the loads imposed and is securely braced and anchored.

(d) Provide protection to all persons handling hot substances against contact with, or exposure to radiant heat, glare, fumes, and vapors of the substances. At a minimum, roofers handling roofing materials must be fully clothed including long sleeved shirts, shoes secured at least 6 inches (15.2 cm) in height and gloves up to the wrist. (See chapter 5)

(e) Containers for handling and transporting hot substances must be of substantial construction (minimum 24-gauge sheet steel), free from any soldered joints or attachments, and must not be filled higher than 4 inches (10.2 cm) from the top.

(f) Piping used to transport hot substances must have an entry and exit shut off valve and must be made of flexible metallic hoses fitted with insulated handles. In cold climates, piping must be insulated to prevent material from solidifying on the inside of the pipe.

h. Harmful Plants, Animals, and Insects. (6-8.h)

(1) Provide protection from disease-carrying or flea-harboring insects or animals according to the following, as applicable:

(a) Ensure PPE such as netted hoods, leather work gloves, and high-top work boots are worn in conjunction with trousers and long-sleeved shirts.

(b) Clothing treated at the factory with DEET or Permethrin is recommended in areas of high insect population.

(c) Drain or spray breeding areas in heavily trafficked and inhabited areas.

(d) Destroy or flag (mark as hazard) nests.

(e) Use smudge pots and aerosols to protect workers and small areas.

(f) Eliminate actions or conditions that propagate insects or vermin.

(g) When necessary, exterminate areas or facilities (see chapter 35).

(h) Ensure employees are trained to perform the necessary first aid response according to chapter 3. Employees allergic to plants, animals, or insects are encouraged to self-identify to their supervisor and carry the necessary response materials (for example, EpiPen).

(i) Provide inoculation against diseases known to be a local hazard.

(j) Provide training to necessary employees according to paragraph 6-3.g.

(2) In areas where there is exposure to poisonous or venomous snakes or lizards, ensure PPE such as snake chaps or knee-high snake boots are worn in conjunction with trousers and long-sleeved shirts.

(3) In areas where employees are exposed to poisonous plants, provide the following protective measures, as applicable:

(a) Remove or destroy plants, where practicable. When burning poisonous plants, implement controls to prevent contact with or inhalation of toxic elements contained in the smoke.

(b) Provide appropriate protective clothing such as gloves.

(c) Provide protective ointments.

(d) Provide soap and water for washing exposed parts.

(e) Provide training to necessary employees according to paragraph 6-3.g.

i. Ionizing Radiation and Non-Ionizing Radiation, Magnetic, and Electric Fields (see EM 385-1-80). (6-8.i)

j. Ventilation and Exhaust Systems. (6-8.j)

(1) Portable and Temporary Ventilation Systems.

(a) All portable or temporary ventilation systems must remove dusts, fumes, mists, vapors, and gases away from the worker and the work environment or provide air to prevent an oxygen deficient atmosphere.

(b) Portable or temporary ventilation systems must be used as designed by the manufacturer. All hoses must be only as long as the maximum allowed by the manufacturer to provide the required air flow at the supply or exhaust point. If adding or

changing hoses, use only hoses and/or connectors that are comparable and compatible with the hoses and connectors provided by the manufacturer.

(c) Make-up air for air supply ventilation systems must draw air free of contaminants and away from any potential contaminant source.

(d) Any portable or temporary ventilation system and the locations where the systems are to be used must be approved by the local SOHO/USACE supervisor or accepted by the KO or COR before use. Provide manufacturer information or design criteria with the request for acceptance.

(e) Use high efficiency, filtered, recirculated ventilation units when:

(e-1) The filtration system lowers the levels of any airborne contaminants from the operation to less than half of the OEL. This must be documented by an IH or CP through sampling for the contaminants.

(e-2) The unit and filtration are regularly maintained and the maintenance procedure and schedule are written and documented when maintenance is completed.

(2) Ventilation systems must be operated and maintained to ensure the maintenance of volume and velocity of exhaust air is sufficient to gather contaminants and safely transport them to suitable points for removal.

(3) Duration of Operation.

(a) Ventilation systems must be operated continuously during operations when persons are exposed to airborne contaminants at or above the OEL or explosive gases at or above acceptable safe limits as defined in paragraph 6-8.b or as otherwise specified by this manual, referenced standards, or regulations.

(b) Ventilation systems must remain in operation for a time after the work process or equipment has ceased to ensure the removal of any contaminants in suspension or vaporizing into the air.

(4) Local exhaust ventilation systems must be periodically evaluated to ensure proper contaminant capture, movement through the system, and filtration or exhaust to the outside.

(5) Dusts and refuse materials removed by exhaust systems or other methods must be disposed of in a manner that will not create a hazard to employees or the public and according to this manual, applicable federal, state, and local requirements.

(6) Evaluate ventilation systems used to remove hazardous dusts, fumes, gases, or substances according to paragraph 6-5.c. The cleaning of the ventilation system must be part of the written Housekeeping Plan. (See chapter 35)

k. Abrasive Blasting. Silica sand must not be used as an abrasive blasting media. Alternative abrasive blasting materials are available and listed in table 6-1. (6-8.k)

(1) When abrasive blasting is performed, an Abrasive Blasting Plan must be developed and employees trained according to paragraphs 6-7.f and 6-3.h.

(2) Blast Cleaning Enclosures and Rooms.

(a) Exhaust systems must be part of a regular cleaning and maintenance program (see para 6-5.d).

(b) All air inlets and access openings must be baffled to prevent the escape of abrasive agents and contaminants.

(c) Provide air inlet flow according to the operation specific minimums of ANSI Z9.4.

(d) Negative pressure must be maintained inside during blasting.

(e) Transport velocities of the system must be at a minimum 3,500 feet per minute (fpm) (17.8 m/s), but 4,000 to 5,000 fpm (20.3 to 25.4 m/s) is recommended by ANSI Z9.4.

(f) The rate of exhaust must be sufficient to provide prompt clearance of the dust-laden air within the enclosure after cessation of the blasting. Appendix A of ANSI Z9.4 outlines minimal airflow velocities for various devices.

(g) If abrasive blasting is automated, the blast must be turned off before the enclosure is opened. The exhaust system must run for a sufficient period to remove the dusty air within the enclosure to minimize the escape of dust into the workroom and prevent any health hazard.

(h) Perform routine cleanup using wet methods or HEPA filtered vacuuming to minimize the accumulation of dusts. Broom sweeping or compressed air is prohibited. If the blasting agent is removed manually, appropriate PPE, including respiratory protection, must be worn and not removed until outside the blasting room.

(i) For blasting cabinets, inward air velocity at the hand openings must be 500 fpm (2.5 m/s) measured at the free openings without the curtains due to proximity of operator. Gloves inserted must be inspected prior to every use according to paragraph 6-5.d. The cabinet must have a minimum of 20 air changes per minute.

(3) Blasting Without Enclosures.

(a) If abrasive blasting must be performed inside a building without enclosures, respiratory protection must be provided for all employees in the area according to

chapter 5. Portable engineering control devices must also be used at the location to collect the entire used abrasive agent as it is applied.

(b) When airborne abrasive blasting dust becomes sufficiently heavy in an area to cause a temporary safety hazard by reduced visibility or discomfort to the unprotected employees not engaged in abrasive blasting, such operations in the affected area must be discontinued until the airborne dust is removed by exhaust ventilation and the settled dust has been removed from the horizontal surfaces in the area.

(c) Abrasive materials must not be allowed to accumulate on aisles and walkways to create a slipping hazard.

(d) If wet abrasive blasting is employed to reduce dust exposures, the aerosols produced and the dried residues that become airborne might be potential hazards and must be considered.

(4) Confined Spaces. Abrasive blasting work conducted in a confined space must be performed according to chapter 34. Use exhaust ventilation systems in containment structures to capture dust.

(5) Blasting Outdoors.

(a) Work completed outside has been shown to create exposures to health hazards for the worker and other trades in the area. Air and noise samples must be taken to document the level of exposure to the worker and the workers in the area, unless similar operations documented no exposure. Blasters must be protected with proper PPE (see chapter 5) and proper ventilation (see 29 CFR 1910.94).

(b) Engineering controls and work practices, such as wet blasting methods, must be used to prevent the dust from spreading to other work areas. Check with local and state requirements which may add restrictions to outdoor abrasive blasting. If the surface to be blasted is painted or contains high levels of silica and/or heavy metals, such as lead, chromium, or cadmium, an enclosure may be required to prevent disbursement of the hazard.

(6) Hearing protection and respiratory protection must be available to all employees in areas where the associated hazards exist (see chapter 5).

l. Personal Protective Equipment (PPE). (6-8.l)

(1) Select and use PPE according to chapter 5. If reusable coveralls are used, they must be vacuumed before all breaks and removed at the end of the shift. Clothes must not be taken home to be cleaned by the worker or family, they must be laundered by the employer. (See chapter 35)

(2) Air-supplied helmets, blast helmets/hoods, respirators, earmuffs, safety boots or toe guards, durable coveralls closeable at wrists, ankles, and other openings, and safety glasses should be an individual issue item, identified with and used by only one employee. Such equipment may be reissued to another employee only after complete cleaning, repair, and decontamination.

(3) Clean and store air-supplied respiratory equipment after each shift of use. Storage must be in a clean enclosure such as locker, footlocker, plastic container, or zip-lock type bag. Employees must be trained to maintain issued equipment in clean and good working condition.

(4) Replace visibly damaged safety glasses (plano or prescription).

(5) Replace faceplates in air-supplied helmets and blast helmets/hoods when a side-on light source produces obscuring visible reflections and glare from the etched spots and pit holes in the faceplate. Mylar coating, or similar transparent plastic material, is recommended to protect the glass or plastic faceplate.

(6) Do not alter the length of air hose(s) from the manufacturer's specifications.

(7) Daily checks must be performed by the wearer of PPE to maintain it in good working condition. Rips, tears, and openings of PPE that expose skin to abrasive agents must be mended or replaced. Functional tests for leaks, proper respiration, and good connections must be performed on the complete air-supply system.

(8) Air supply, portable.

(a) The breathable air supplied to the blast helmet or hood must be Grade D quality air per 29 CFR 1910.134(i) for breathing air quality and use. The compressed air used for blasting must be isolated and separated from the compressed air line used for breathing air. The compressed air line for breathing air must be used per manufacturer's recommendations and be adequately labeled to clearly state quality air if being provided by the same compressor as the blasting air. Breathable air-supply system should be equipped, if possible, with audible alarm at the helmet or hood to warn the user of low air pressure.

(b) Hearing protection. Suitable hearing protection, capable of attenuating employee noise exposure according to chapter 5, must be worn.

(c) Heat stress. Cooling of breathable air, supplied to the blast helmets/hoods, should be considered depending on season and employee exposure to heat sources.

m. Thermal Stressors Management. When employees may be exposed to thermal stressors, a Thermal Stress Management Plan must be developed and employees trained according to paragraphs 6-7.g and 6-3.c. Take into consideration the influence of environmental conditions, workload, and personal factors. (6-8.m)

(1) Implement a buddy system. Workers should not only monitor themselves, but also be alert to changes and the symptoms of their co-workers.

(2) Provide readily available potable drinking water to all employees (see chapter 35).

(3) Allow workers to adequately acclimatize to work conditions.

(4) Monitor weather conditions. When possible, schedule work activities to minimize thermal stress exposure.

(5) Comply with thermal stressor management recommendations as promulgated by Centers for Disease Control (CDC)/NIOSH Heat Stress and Cold Stress (see https://www.cdc.gov/niosh/topics/heatstress/default.html or https://www.osha.gov/winter-weather/cold-stress), OSHA Heat Stress and Cold Stress (see https://www.osha.gov/heat-exposure or https://www.osha.gov/winter-weather/cold-stress), and the Defense Centers for Public Health - Aberdeen Heat Illness Prevention and Cold Injury Prevention (see https://phc.amedd.army.mil/topics/discond/hipss/Pages/default.aspx or https://phc.amedd.army.mil/TOPICS/DISCOND/CIP/Pages/default.aspx).

n. Industrial Ergonomics. (6-8.n)

(1) Work activities that require employees to conduct lifting, handling, or carrying; rapid and frequent application of high grasping forces; repetitive hand/arm manipulations; tasks that include continuous, intermittent, impulsive, or impact hand-arm vibration or whole-body vibration; and other physical activities that stress the body's capabilities must be evaluated by a CP to ensure the activities are designed to match the capabilities of the employees.

(2) When work activities include items listed in paragraph 6-8.n(1), the employer must identify and document hazards and controls via the associated AHA. The AHA must incorporate processes that recognize cumulative trauma hazards, isolate causative factors, provide controls and train as appropriate.

(3) Specific control measures to minimize vibration may include use of anti-vibration tools and/or gloves; implementation of work practices that keep the employee's hands and body warm/minimize vibration coupling between employee and the vibration tool; application of specialized medical surveillance to identify personnel susceptible to vibration; and adherence to TLV guidelines as specified by ACGIH in "Threshold Limit Values and Biological Exposure Indices". For USACE only, the evaluation must be according to ER 385-1-96, ANSI S2.70, ANSI S2.73, ISO 5349, and ISO 8662.

o. Indoor Air Quality (IAQ) Management. (6-8.o)

(1) Investigations. IAQ must be brought to the attention of the facility manager/owner or other designated representative who is responsible for resolving the

IAQ complaint in a timely manner. For leased facilities, procedures for resolving IAQ issues should ultimately be investigated and resolved by the lessor. An IH or CP should initiate an IAQ investigation using appropriate guidelines published by ACGIH; AIHA; ANSI; American Society of Heating, Refrigeration, and Air Conditioning Engineers; EPA; OSHA; NIOSH; or other federal, DoD, state, local, and host nation requirements.

(2) Environmental tobacco smoke (ETS) and vaping products. Employees must be protected from involuntary exposure to ETS and vaping in working and public living environments. Smoking, to include the use of smokeless cigarettes or cigars, is prohibited inside all DoD vehicles, aircraft, vessels, and work buildings. Provide designated smoking areas (that is, outdoors) that are at least 50 feet (15.2 m) from building entrances and in areas that are not commonly used or accessed by nonsmokers.

(3) Mold Assessment. Because mold can contribute to health concerns ranging from minor irritation to serious debilitation if found in high quantities or improper locations, a mold assessment must be performed when need is indicated.

(a) Assessments/remediation must be overseen by a competent mold inspector according to paragraph 6-3.i.

(a-1) Mold remediation should not be performed by the same entity that performed the mold assessment.

(a-2) Employees in the immediate area of the mold contamination must be informed of the remediation, results of any testing, and symptoms of the hazard. The employees must not be in the area during the remediation.

(a-3) Post-remediation air sampling must be done in the immediate area and in any areas in the mold spore or vegetative air-pathway and compared to outside air samples. Mold in areas above drop ceilings with combined air plenums must have air samples taken within the plenum as well as in air-serviced areas. Air samples should be taken in the immediate area of remediation and analyzed by a laboratory in the AIHA Environmental Microbiology Laboratory Accreditation Program.

(b) A visual assessment of potential mold hazards must be performed, based on criteria in the TG 278, the EPA IAQ Management Checklists, and guidance from AIHA. Bulk and/or air samples are generally not necessary to evaluate mold hazardous environments.

(c) A mold assessment must be written and must contain the following:

(c-1) Description of the area assessed including size (footprint), ventilation, and occupancy.

(c-2) Name and qualifications of the individual completing the assessment.

(c-3) Results of samples taken, including location of the sample result, date and time of the sample, temperature, and humidity at the time of the sample, and laboratory procedure used to analyze the sample.

(c-4) Drawing of the area showing location of samples, location of visible mold or mildew and the type of substrate it is growing on, ventilation sources in the room, and other information thought to be important.

(c-5) Potential sources of the moisture which has caused the mold growth.

(c-6) Recommendations for controlling the problem and remediating the mold.

(d) Causes of mold (for example, water leakages, seepages, drainage, HVAC/insulation damage) must be addressed before completing mold remediation.

(e) If the assessment indicates remediation is required, a Mold Remediation Plan must be developed according to paragraph 6-7.h.

p. Control of Chromium (VI) Exposure. (6-8.p)

(1) General. All activities which could generate chromium (VI) fumes, mists, or dusts must be evaluated by an IH to determine potential personnel exposure over the OEL. Typical operations where chromium exposures are high include cutting or breaking up of cement surfaces made from Portland cement with a high chromium content, painting or paint removal operations, welding using rods or wire with a chromium coating, heating or welding on stainless steel, and handling or applying anti-corrosive substances or coatings.

(a) The evaluation must include a risk assessment of the type and frequency of exposure and breathing zone air sampling in the work and surrounding area according to applicable OSHA/EPA standards.

(b) The evaluation must be added as an appendix to the APP or the Project SOH Plan. Individual sample results must be provided to the employee and add to their official occupational health record and a summary of the sample results should be posted in the work area.

(2) To prevent exposure to chromium (VI), the use of paints with chromium pigments, Portland cement with greater than 0.002% chromium, or chromium/arsenic treated lumber must be avoided when possible. Should chromium (VI) containing products be required, a justification and similar non-chromium (VI) product evaluation must be conducted and submitted for review by the local SOHO/USACE supervisor/KO or COR.

(3) If chromium containing compounds are used and the objective determination is inconclusive, before air sampling confirms the level of exposure, the employer must

comply with the requirements of 29 CFR 1910.1026 (29 CFR 1910 Subpart Z), 29 CFR 1915.1026 (29 CFR 1915 Subpart Z), or 29 CFR 1926.1126 (29 CFR 1926 Subpart Z), whichever is applicable. At a minimum, employers must provide appropriate PPE, respirators, decontamination facilities, and a lunchroom/area clean from chromium (IV) dust and/or fume.

(4) If air sampling confirms chromium (VI) exposure over the OEL, and there is no adequate substitute or work practice change (for example, use of argon instead of carbon dioxide (CO_2) when arc welding), then the employer must provide appropriate engineering controls (for example, local HEPA filtered ventilation systems, medical surveillance, housekeeping, and air sampling as required by the applicable chromium (VI) standard). If adequate engineering controls are not feasible or appropriate due to the length of the task, then PPE must be provided.

(5) In areas where chromium (VI) is generated or used, there must be a housekeeping plan according to applicable OSHA/EPA standards and decontamination program instituted.

(a) Maintain surfaces as free as practicable of accumulations of chromium (VI), as required by the applicable OSHA standard.

(a-1) The employer will ensure that surfaces contaminated with chromium (VI) are cleaned by HEPA-filter vacuuming or other methods that minimize the likelihood of exposure to chromium (VI).

(a-2) The employer will ensure cleaning equipment is handled in a manner which minimizes the reentry of Chromium (VI) into the workplace.

(b) At a minimum all exhaust and ventilation systems must be cleaned and filters changed according to manufacturer's recommendations.

(c) Workers will not enter eating and drinking areas with protective work clothing or equipment unless surface chromium (VI) has been removed from the clothing and equipment by methods that do not disperse chromium (VI) into the air.

q. Crystalline Silica. (6-8.q)

(1) The employer must ensure no employee is exposed to an airborne concentration of respirable crystalline silica more than 25 micrograms (ACGIH) per cubic meter of air, as calculated as an 8-hour TWA.

(2) All exposures to respirable crystalline silica, except where employee exposure will remain below 25 micrograms per cubic meter of air as an 8-hour TWA, will be regulated by applicable OSHA/EPA standards.

(3) The employer must assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level (12.5 micrograms per cubic meter of air as an 8-hour TWA).

(a) If initial monitoring indicates employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(b) Where the most recent exposure monitoring indicates employee exposures are at or above the action level, but at or below the OEL, the employer must repeat such monitoring within six months of the most recent monitoring.

(c) Where the most recent exposure monitoring indicates employee exposures are above the OEL, the employer must repeat such monitoring within three months of the most recent monitoring.

(d) Where the most recent (non-initial) exposure monitoring indicates employee exposures are below the action level, the employer must repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the action level, at which time the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(e) The employer must reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level, or when the employer has any reason to believe new or additional exposures at or above the action level have occurred.

(4) Control mechanisms must be implemented to reduce employee exposures if exposure data indicates action levels are exceeded.

(5) If the evaluation shows the potential for activities to generate an occupational exposure to silica exceeding the action level, a written Silica Compliance Plan must be developed according to paragraph 6-7.i and employees trained according to paragraph 6-3.h. If regulations in local jurisdictions exceed federal requirements, the most stringent will apply.

6-9. Figures and Tables.

Table 6-1
Abrasive Blasting Media, Silica Substitutes

Applications	Media	Advantages
Cleaning Hard Metals (Titanium); Removing Metal Etch Glass; Carve Granite	Aluminum Oxide	Recyclable
General Paint Removal Stripping Aircraft Skins Cleaning Surfaces in Food Processing Plants Removing Paint from Glass	Baking Soda (Sodium Bicarbonate)	Less Material Used/Less Cleanup Low Nozzle Pressures (35-90 pounds per square inch (PS)I) Non-Sparking Water Soluble
General Paint, Rust, & Scale Removal from Steel Paint Removal from Wood Exposure of Aggregates	Coal Slag	Less than 1% Free Silica Inert, Fast Cutting Creates Anchor Profile
General Paint, Rust & Scale Removal from Steel Paint Removal from Wood	Copper Slag	Rapid Cutting
Deburring Paint & Rust Removal from Wood & Metal	Corn Cob Granules	Low Consumption Low Dust Levels Biodegradable
Cleaning Aircraft Parts Cleaning Exotic Metals	Dry Ice (CO_2)	No Residue Remains Minimal Cleanup
General Paint, Rust & Scale Removal from Steel	Garnet	Lower Nozzle Pressure (60-70 PSI) Low Dust Levels Fast Cleaning Rates Can be Recycled 6-7 Times Low Free Silica
Cleaning & Polishing Deburring	Glass Beads	Uniform Size and Shape Recyclable Provide High Luster Polished Surface
General Paint, Rust & Scale Removal from Steel	Nickel Slag	Rapid Cutting
Cleaning Soft Materials (for example, Aluminum, Plastic, Wood)Cleaning Surfaces in the Petroleum Industry	Nut Shells	High Removal Speed Non-Sparking Low Consumption
Clean Light Mill Scale/Rust from Steel 2.5 MIL Profile & Finer	Olivine	Low Chloride Ion Level Low Conductivity

6-10. Checklists and Forms.

Not Applicable.