HAZARDOUS SUBSTANCES, AGENTS AND ENVIRONMENTS

06.A GENERAL

06.A.01 Exposure standards.

a. Exposure, through inhalation, ingestion, skin absorption, or physical contact, to any chemical, biological, or physical agent in excess of the acceptable limits specified in the ACGIH "*Threshold Limit Values and Biological Exposure Indices*" shall be prohibited.

b. In case of conflicts between ACGIH and other standards or regulations referenced in this manual, the more stringent shall prevail.

c. The employer shall comply with all applicable standards and regulations to reduce contaminant concentration levels as low as is reasonably achievable (ALARA).

06.A.02 Hazard evaluation.

a. All operations, materials, and equipment shall be evaluated to determine the presence of hazardous environments or if hazardous or toxic agents could be released into the work environment.

b. Activity and/or position hazard analyses shall be used for the evaluation. The analyses shall identify all substances, agents, and environments that present a hazard and recommend hazard control measures. Engineering and administrative controls shall be used to control hazards; in cases where engineering or administrative controls are not feasible, PPE may be used.

c. The analyses shall identify: that it serves as certification of hazard assessment; the workplace and activity evaluated; the name of the person certifying that the evaluation has been performed; and the date of the evaluation.

d. Operations, materials, and equipment involving potential exposure to hazardous substances, agents, or environments shall be evaluated by a qualified industrial hygienist, or other competent person, to formulate a hazard control program. This program must be approved by the designated authority before the start of operations.

06.A.03 Testing and monitoring.

a. Approved and calibrated testing devices shall be provided to measure hazardous substances, agents, and environments. (Devices shall be labeled indicating the name of the individual performing the calibration and date of the current calibration.)

b. Individuals performing testing and monitoring shall be trained in testing and monitoring procedures and hazards: testing devices shall be used, inspected, and maintained in accordance with the manufacturer's instructions, a copy of which shall

be maintained with the devices.

c. NIOSH sampling and analytical methods, OSHA required, or other approved sampling and analytical methods shall be used; laboratories used for analysis shall be accredited by nationally recognized bodies, such as the American Industrial Hygiene Association, for the type of analysis performed.

d. Determinations of the concentrations of, and hazards from, hazardous substances, agents, and environments shall be made by a qualified industrial hygienist or other competent person during initial startup and as frequently as necessary to ensure the safety and health of the work environment.

e. Records of testing/monitoring shall be maintained on site and shall be available to the designated authority upon request.

06.A.04 The following precedence shall be in the control of exposure to hazardous substances, agents, and environments:

a. engineering controls (such as local/general ventilation) shall be instituted to limit exposure to hazardous substances, agents, and environments within acceptable limits;

b. when engineering controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments within acceptable limits, work practice controls (such as the wetting of hazardous dusts) shall be instituted;

c. when engineering or work practice controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments within acceptable limits, PPE programs (such as the use of respirators or gloves) shall be instituted.

06.B HAZARDOUS SUBSTANCES

06.B.01 When any hazardous substance is procured, used, stored, or disposed, MSDS for the substances shall be available at the worksite. ***> See 01.B.04***

a. Information contained in the MSDS shall be incorporated in the hazard analyses for the activities in which the material will be used and will be followed in the use, storage, and disposal of the material and the selection of hazard control and emergency response measures.

b. All employees using, storing, or disposing of hazardous substances shall receive training in the information contained in the MSDS for the substance and any general safety and health instruction required to understand this information.

06.B.02 When engineering and work practice controls are either infeasible or insufficient, appropriate PPE and sanitary facilities shall be provided and used for the transportion, use, and storage of hazardous substances.

a. When irritants of hazardous substances may contact skin or clothing, sanitary facilities and protective equipment shall be provided. ***> See also paragraphs 02.C.01 and Section 5***

b. When the eyes or body of any person may be exposed to harmful substances, suitable facilities for quick drenching or 9 flushing of the eyes and body shall be provided within the work area for immediate emergency use. ***> Reference ANSI Z358.1***

06.B.03 Transportation, use, storage, and disposal of hazardous substances shall be under the supervision of a qualified person.

a. Transportation, use, and storage of hazardous substances shall be planned and controlled to prevent contamination of people, animals, food, water, equipment, materials, and environment.

b. All storage of hazardous substances shall be in accordance with the recommendations of the manufacturer and accessible only to authorized persons.

c. Disposal of surplus or excess materials and containers shall occur in a manner that will not contaminate or pollute any water supply, ground water, or streams, and will comply with federal, state, and local regulations and guidelines.

d. Containers that have been used for hazardous substances shall not be used for any other material until they have been cleaned in accordance with the hazardous substance manufacturer's recommendations.

e. Every hazardous substance being transported for disposal shall be transported with a copy of the substance's MSDS.

06.B.04 Process safety management of highly hazardous chemicals shall be employed IAW 29 CFR 1910.119 or 29 CFR 1926.64 whenever a work activity involves:

a. A process that involves a chemical at or above the threshold quantities listed in Appendix A of the above-cited CFRs, or

b. A process that involves a flammable liquid or gas as defined in 29 CFR 1926.59(c) on site in one location in a quantity of 10,000 pounds or more except (1) 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 by the standards cited above, or (2) flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

06.B.05 Asbestos and lead abatement activities.

a. Before initiation of activities where there is an identified asbestos or lead hazard,

a written plan detailing compliance with Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) asbestos or lead abatement requirements shall be developed and implemented. This plan shall be submitted to and accepted by the Government's designated authority before initiation of work activities. (For contract activities, the compliance plan may be incorporated into the project's accident prevention plan.)

b. The contractor shall dispose asbestos- and lead-containing materiel in accordance with all Federal, State, and local regulations.

06.C HOT SUBSTANCES

06.C.01 Heating devices and melting kettles.

a. Heating devices and melting kettles shall be placed on firm, level foundations and protected against traffic, accidental tipping, or similar hazards.

b. A fire extinguisher, rated not less than 2-A:20-B:C, shall be available at all locations where heating devices and melting kettles are in use. ***> Hot work permits shall be required on government installations unless otherwise indicated by the Government's Designated Representative***

c. Heating devices and melting kettles shall not be left unattended when in use. ***> See paragraph 09.J.03***

d. Bituminous-material melting kettles shall be provided with an effective lid or hood and a thermometer in operating condition.

e. Bituminous-material melting kettles shall not be used or operated inside, atop, or within 8 m (25 ft) of buildings or combustible material.

06.C.02 Enclosed areas in which hot substances are heated or applied shall be ventilated.

06.C.03 Ladles, equipment, and material shall be moisture-free before being used or placed in heated material.

06.C.04 Transporting and handling hot substances.

a. Runways or passageways, clear of obstructions, shall be provided for all persons carrying hot substances.

b. Hot substances shall not be carried up or down ladders.

c. When hoists are used to raise or lower hot substances, attention shall be given to assuring that the hoisting mechanism is adequate for the loads imposed and is securely braced and anchored.

d. All persons handling hot substances shall be provided protection against contact with, or exposure to radiant heat, glare, fumes, and vapors of the substances. ***> See***

Section 5

e. Containers for handling and transporting hot substances shall be of substantial construction, free from any soldered joints or attachments, and shall not be filled higher than 10 cm (4 in) from the top.

06.D HARMFUL PLANTS, ANIMALS, AND INSECTS

06.D.01 Protection against hazards from animals and insects shall include, as applicable, the following:

a. personal protection such as boots, hoods, netting, gloves, and masks;
b. repellents;
c. drainage or spraying of breeding areas;
d. burning or destruction of nests;
e. smudge pots and aerosols for protecting small areas;
f. elimination of conditions that propagate insects or vermin;
g. extermination measures;
h. inoculation;
i. approved first aid remedies for employees; and
j. instruction in recognition of the animals and insects.

06.D.02 In areas where employees are exposed to poisonous plants (e.g., poison ivy, oak, or sumac), the following protective measures, as applicable, shall be provided:

a. removal or destruction of plants, where practical;
b. appropriate protective clothing such as gloves;
c. protective ointments;
d. soap and water for washing exposed parts;
e. approved first aid remedies; and
f. instruction in recognition and identification of the plants.

06.D.03 When burning poisonous plants, controls shall be instituted to prevent contact with or inhalation of toxic elements contained in the smoke.

06.E IONIZING RADIATION

06.E.01 Anyone who procures, uses, possesses, transports, transfers or disposes of regulated radioactive materials or radiation generating devices shall:

a. Notify, in writing, the Designated Authority of the nature of the material or device, a description of the intended use, the location of use and storage, and all transportation and disposal requirements.

b. Secure appropriate authorization or permit if a licensed or DOD regulated radiological device or radioactive material is to be used on a DOD installation (a lead time of at least 45 days should be allowed for obtaining a DOD authorization or permit).

c. Provide to the Designated Authority a copy of all Nuclear Regulatory Commission

(NRC) or Agreement State licenses, Department of the Army Radiation Authorization (DARA), and reciprocity forms (to include NRC Form 241), as applicable.

06.E.02 Qualified Personnel.

a. Operations involving radiation hazards or use of radioactive material or radiation generating devices shall 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 shall conduct surveys, evaluate and secure any specialized assistance to assure compliance with radiation protection standards.

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

(1) formally trained in radiation protection that includes 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 in the uses all of the equipment, instrumentation, procedures and theory used in their unit.
(3) knowledge of regulations (NRC, EPA, Department of Energy (DOE), DOT and DOD to include all applicable Components) pertaining to radioactive materials, radiation generating devices, radioactive and mixed waste; and
(4) knowledge of the USACE Radiation Safety Program, and recordkeeping requirements for work with radioactive materials and radiation generating devices.

06.E.03 Radiation Safety Program.

a. Operations involving regulated radiation hazards, and users of radioactive material or radiation generating devices shall develop and implement a Radiation Safety Program. The program shall be managed by the RSO and based on sound radiation safety principles that shall keep occupational doses and doses to the public ALARA. A RSO and Ionizing Radiation Safety Committee (IRSC) shall be established in accordance with 10 CFR 20 and DOD regulation as part of the Radiation Program. The program shall be reviewed annually.

b. 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, shall receive instruction in:

(1) the presence of the material or device;
(2) health and safety problems associated with exposure to radiation, including the potential effects of radiation on a pregnant female, the fetus or embryo;
(3) precautions and controls used to control exposure;
(4) proper use of instrumentation and dosimetry in the area;

(5) the Radiation Safety Program required in paragraph 06.E.03; and
(6) their rights and responsibilities.

06.E.04 Dose Limits.

a. Occupational dose limits shall be based on the TEDE. ***> See Table 6-1***

(1) An annual limit which is the more limiting of: 5 rems (0.05 Sieverts (Sv)) TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 50 rems (0.5 Sv), or 15 rems (0.15 Sv) to the lens of the eye, or 50 rems (0.5 Sv) shallow dose equivalent to the skin or any extremity.

(2) Without the written approval of the Radiation Safety Officer (RSO) the annual occupational dose shall not exceed the more limiting of: 0.5 rems (0.005 Sv) TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 5 rems (0.05 Sv), or 1.5 rems (0.015 Sv) to the lens of the eye, or 5 rems (0.05 Sv) shallow dose equivalent to the skin, or any extremity.

Table 6-1

(3) To keep doses ALARA, the user shall set administrative action levels below the annual dose limits. These action levels shall be realistic and attainable. Suggested action levels are the more limiting of: 0.1 rems (0.001 Sv) TEDE, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue of 0.5 rems (0.005 Sv), or 0.15 rems (0.0015 Sv) to the lens of the eye, or 0.5 rems (0.005 Sv) shallow dose equivalent to the skin or any extremity.

b. Planned special exposures shall not be used without the written consent of the RSO and the IRSC.

c. No employee under 18 years of age shall receive occupational exposure to ionizing radiation.

d. The dose to an embryo/fetus shall not exceed 0.5 rem (0.005 Sv) during the entire gestation period.

06.E.05 Radiation Monitoring, Surveys and Dosimetry.

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

b. Instruments used for radiation monitoring and surveying shall be:

(1) available and used whenever radioactive material or radiation generating devices are used;
(2) properly calibrated to a National Institute of Standards and Technology (NIST) traceable source;
(3) appropriate for the type and intensity of the radiation surveyed; and
(4) operationally checked against a dedicated check source before each use.

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

(1) an individual enters a Radiation Area (>5 mrem (50 μSv) in any one hour), or a High Radiation Area (>100 mrem (1 mSv) in any one hour), or a Very High Radiation Area (>500 rad (5 Gy) in one hour),
(2) an individual has the potential to receive greater than 0.5 rem (0.005 Sv) in one year.

d. All external dosimetry shall be processed by a National Voluntary Laboratory Accreditation Program (NVLAP) certified laboratory. USACE personnel shall use the designated Department of Army dosimetry center.

e. Users of unsealed radioactive material sources shall institute an internal dosimetry program:

(1) when there is a potential for a worker to receive an internal dose of greater than 0.5 rem (5 mSv) per year;
(2) which is reviewed and approved by a qualified health physicist, and
(3) which contains provisions for a pre-exposure bioassay, a bioassay method capable of detecting internal radioactive materials, at a level below 10% of the Annual Limit of Intake listed in Appendix B of 10 CFR 20 for each radionuclide used, appropriate action levels for requiring additional bioassay, actions for individuals found to have internally deposited radioactive materials, and provisions for post-exposure bioassay.

06.E.06 Access, Storage and Control.

a. All radiological devices and radioactive materials shall be designed, constructed, installed, utilized, stored, transported and disposed of in such a manner to assure personnel exposures are kept ALARA.

b. Users of radioactive materials or radiation generating devices shall post signs and control access to radiation areas in accordance with 06.E.08.

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

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

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

f. Radioactive material and radiation generating devices, not in storage, shall be under constant control and surveillance.

g. Operations involving regulated radiation hazards or users of regulated radioactive material or radiation generating devices shall conduct surveys to ensure that the

public dose limit of 0.01 rem (0.0001 Sv) is not exceeded.

06.E.07 Respiratory Protection and other Controls.

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

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

c. The use of respiratory protection equipment shall be in compliance with paragraph 05.E. of this manual, and shall be limited by the protection factors listed in Appendix A of 10 CFR 20.

06.E.08 Signs, Labels, and Posting Requirements.

a. The RSO shall post in a conspicuous location a sign or signs bearing the standard radiation symbol shown in Figure 8.5 and the following words:

(1) "Caution, Radiation Area" - areas where 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 one 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 (5 Gy) in any one hour;
(3) "Grave Danger, Very High Radiation Area" - areas where the radiation field is equal to or greater than 500 rads (5 Gy) in any one hour;
(4) "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. or
(5) “Caution, Radioactive Material” - rooms where quantities of radioactive materials in excess of ten times the 10 CFR 20 Appendix C quantities are used or stored.

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

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

06.E.09 Radioactive Waste Disposal.

a. Radioactive sealed sources (and gauges) when no longer needed may be returned (transferred) to the manufacturer. The local USACE Command RSO must be notified and any applicable licenses or permits amended or terminated.

b. Radioactive waste shall not be disposed of except through coordination with the designated authority (the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise).

c. Tritium (H-3) and Carbon-14 used in liquid scintillation counting, at concentrations below 0.05 μCi/g may be disposed without regard to its radioactivity. (Note many liquid scintillation fluids are hazardous wastes and must be disposed of as such.)

06.E.10 Records.

a. All users of radioactive material or radiation generating devices shall prepare and maintain records of the Radiation Safety Program for three 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) per year or more, the licensee shall prepare and maintain records to determine that person's:

(1) occupational dose during the current year,
(2) attempt to obtain records of cumulative occupational radiation exposure, and
(3) dose received, both internal and external.

c. All users of radioactive material or radiation generating devices shall prepare and maintain records of all calculated or monitored radiation dose to individual members of the public so as to document compliance with paragraph 06.E.05.

06.E.11 Reports.

a. Any loss, theft, damage or overexposure shall immediately upon discovery be reported to the RSO who will then file a report with NRC in accordance with the requirements of 10 CFR 20.

b. Annual reports shall be issued by the RSO for each individual USACE radiation worker with the recorded or calculated dose assigned to the USACE individual for the year or specific work project. These shall be maintained in such a manner that accumulated exposure can be determined at a future date.

06.E.12 Transportation, interstate or intrastate, shall comply with the requirements of the DOT for transportation of radioactive materials contained in 49 CFR.

06.E.13 Medical surveillance.

a. Medical examinations are not routinely required before occupational exposure to ionizing radiation. For USACE personnel a medical examination shall be conducted in accordance with AR 40-5, when deemed necessary by a physician or referred by the RSO.

b. All cases of overexposure and suspected ingestion or inhalation of radioactive materials shall be referred to a physician for examination.

06.F NONIONIZING RADIATION AND MAGNETIC AND ELECTRIC FIELDS

06.F.01 Lasers:

a. Only qualified and trained employees may be assigned to install, adjust, and operate laser equipment; proof of qualification of the laser equipment operator shall be in the operator's possession during operation.

b. Laser equipment shall bear a label to indicate make, maximum output, and beam spread.

c. Areas in which lasers are used shall be posted with standard laser warning signs. ***> See paragraph 08.A.04e***

d. Employees whose work requires exposure to laser beams shall be provided 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.

Table: Laser Safety Goggles

Protective goggles shall bear a label identifying the following data: the laser wavelengths for which use is intended; the optical density of those wavelengths; and the visible light transmission.

e. Beam shutters or caps shall be used, or the laser 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) the laser shall be turned off.

f. Only mechanical or electronic means shall be used as adetector for guiding the internal alignment of the laser.

g. The laser beam shall not be directed at employees: whenever possible, laser units in operation shall be set 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 laser systems shall be prohibited (as practical; during such weather conditions employees shall be kept out of range of the areas of source and target.

I. Employee exposure to laser power densities shall be within the threshold limit values (TLVs) as specified by the ACGIH in "Threshold Limit Values and Biological Exposure Indices."

j. Lasers used as pointing devices (e.g., during briefings) shall not be directed toward employees and shall be handled and stored in accordance with the manufacturer's recommendations.

06.F.02 Airborne upper sonic and ultrasonic acoustic, light, and near-infrared, radio frequency, sub-radio frequency (30kHz and below) magnetic and/or electric field, microwave, and ultraviolet radiation.

a. Employees shall not be exposed to airborne upper sonic or ultrasonic sound,

sub-radio frequency (30 kHz and below), radio frequency (30 kHz to 300 Ghz), infrared, ultraviolet or microwave electromagnetic radiation and/or electric or magnetic fields in excess of the values and indices as specified in the ACGIH "Threshold Limit Values and Biological Exposure Indices." (Although it is believed that employees may be exposed repeatedly up to these TLVs without adverse health effects, USACE and USACE contractors shall take all necessary measures to maintain exposures as low as reasonably achievable and prevent needless exposure to higher levels of radio frequency radiation when simple measures will prevent exposure.)

b. Employers shall use qualified competent persons and appropriate calibrated monitoring equipment to assess, survey, andevaluate non-ionizing radiations, employee exposures, and control measures.

c. For workers wearing cardiac pacemakers, the TLVs may not protect against electromagnetic interference with pacemaker function. It is recommended that, lacking specific information on electromagnetic interference from manufacturers, the posure of persons wearing cardiac pacemakers or similar medical electronic devices be maintained as specified in the ACGIH's "Threshold Limit Values and Biological Exposure Indices."

06.G VENTILATION AND EXHAUST SYSTEMS

06.G.01 Design.

a. Ventilation systems shall be designed to prevent dispersion into the air, or drawing through the work area, of dusts, fumes, mists, vapors, and gases in concentrations causing harmful exposure
b. The design of proposed engineering controls shall be approved by the designated authority before acquisition or installation of the equipment; design data and drawings shall accompany the request for approval.
c. Airborne contaminants created by portable equipment (such as drills, saws, and grinding machines) in concentrations exceeding acceptable safe limits shall be effectively controlled at the source. ***> See 06.A.04***

06.G.02 Ventilation systems shall be designed, installed, operated, and maintained in such a manner to ensure the maintenance of a volume and velocity of exhaust air sufficient to gather contaminants and safely transport them to suitable points for removal.

06.G.03 Duration of operation.

a. Ventilation systems shall be operated continuously during operations when persons are exposed to airborne contaminants or explosive gases at or above acceptable safe limits as defined in 06.A.01 or as otherwise specified by this manual, referenced standards, or regulations.

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

06.G.04 The efficiency of engineering control systems and methods shall be periodically verified as specified by the designated authority.

06.G.05 Dusts and refuse materials removed by exhaust systems or other methods shall be disposed of in a manner that will not create a hazard to employees or the public and in accordance with federal, state, and local requirements.

06.H ABRASIVE BLASTING

06.H.01 Written operating procedures shall be developed and implemented for abrasive blasting operations, including pressurized pot procedures (filling, pressurizing, depressurizing, and maintenance and inspection).

a. The written operating procedures will be developed, maintained, and provided as stated in paragraph 3.g of Appendix C.

b. No employee will be allowed to work in abrasive blasting operations unless he/she has met the medical surveillance and training and experience, and has been provided the personal protective equipment, specified in Appendix C.

c. Pressurized systems and components shall be inspected, tested, certified, and maintained in accordance with the requirements of Section 20.

06.H.02 Abrasive blasting operations shall be evaluated to determine composition and toxicity of the abrasive and the dust or fume generated by the blasted material, including surface coatings. This determination shall be documented on the activity hazard analysis(ses) developed for the abrasive blasting activity.

06.H.03 The concentration of respirable dust and fume in the breathing zone or persons exposed to the blasting operation shall be maintained in accordance with paragraph 06.A.01.

06.H.04 When silica sand or other substances containing more than 1% crystalline silica are used for abrasive blasting, the silica control program stated in Appendix C shall be implemented.

06.H.05 Blast cleaning enclosures shall be exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure during the blasting operation.

a. All air inlets and access openings shall be baffled or so arranged that by the combination of inward air flow and baffling the escape of abrasive or dust particles into an adjacent work area will be minimized and visible spurts of dust will not be observed.

b. The rate of exhaust shall be sufficient to provide prompt clearance of the dust-laden air within the enclosure after cessation of the blasting.

06.I CONFINED SPACE

06.I.01 At each facility or activity, the Designated Authority shall evaluate, or designate a competent person to evaluate, the potential for permit-required confined spaces (PRCSs).

a. The evaluation shall use the procedures and decision logic presented in Figure 6-1.

b. A list of confined spaces (permit-required and non-permit required) shall be maintained on site and shall be updated as new confined spaces are discovered.

c. For workers wearing cardiac pacemakers, the TLVs may not protect against electromagnetic interference with pacemaker function. It is recommended that, lacking specific information on electromagnetic interference from manufacturers, the posure of persons wearing cardiac pacemakers or similar medical electronic devices be maintained as specified in the ACGIH's "Threshold Limit Values and Biological Exposure Indices."

d. Facilities shall be reevaluated at least once annually for the presence of confined spaces. In addition, confined spaces shall be reevaluated whenever they or their characteristics change in a way that could lead to reclassification as a PRCS.

06.I.02 Responsibilities.

a. Authorized entrants shall:

(1) communicate with the attendant as necessary so the attendant can monitor entrant status and alert entrants of any need to evacuate the PRCS, and
(2) evacuate the PRCS and alert the attendant whenever they recognize any warning sign or symptom of exposure to a dangerous situation or they detect a prohibited condition or whenever the attendant or entry supervisor orders evacuation or an evacuation alarm is activated.

b. Attendants shall:

(1) remain outside the PRCS during entry operations until relieved by another attendant,
(2) take action (warn that they must stay away from the PRCS or that they must immediately exit if they have entered the PRCS; inform authorized persons and the entry supervisor if unauthorized persons have entered the PRCS) when unauthorized persons approach or enter a PRCS while entry is underway,
(3) continuously maintain an accurate count of authorized entrants in the PRCS and ensure that the means used to identify authorized entrants accurately identify the entrants,
(4) communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the PRCS,
(5) monitor activities inside and outside the PRCS to determine if it is safe for entrants to remain in the PRCS
(6) immediately order evacuation of the PRCS if they detect a prohibited condition, the behavioral effects of hazard exposure in an authorized entrant, or a situation outside the PRCS that could endanger the authorized entrants, or if the attendant

cannot effectively and safely perform any of his or her duties and responsibilities,
(7) perform non-entry rescues as specified by the confined space entry permit; summon rescue and other emergency services as soon as it is determined that authorized entrants may need assistance to escape from PRCS hazards, and
(8) not, under any circumstance, monitor more than one occupied PRCS at any given time; not perform any duty that might interfere with their primary duty to monitor and protect the authorized entrants.

c. Entry supervisors shall:

(1) verify that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin,
(2) terminate the entry and cancel the permit when the entry operations covered by the entry permit have been completed or whenever a condition that is not allowed under the entry permit arises in or near the PRCS,
(3) verify that rescue services are available and that the means for summoning them are operable,
(4) remove unauthorized individuals who enter or who attempt to enter the PRCS during entry operations,
(5) determine (at intervals dictated by the hazards and operations performed within the PRCS and whenever responsibility for a PRCS entry operation is transferred) that entry operations are consistent with terms of the entry permit and that acceptable entry conditions are maintained.

Figure 6-1: Permit Required Confined Space Evaluation Procedures and Decision Logic

Figure 6-1, continued

d. Contractors who perform work in, or who may be required to enter, a PRCS on a USACE-controlled facility shall:

(1) request and obtain (from USACE) information on the location and hazards of PRCS that his or her employees will be entering or working near, before start of work;
(2) request and obtain any pertinent information on USACE or previous contractor experience with PRCS that his/her employees will be entering or working near, before start of work;
(3) be apprised of any precautions or procedures that the USACE installation has implemented for the protection of employees in or near PRCSs;
(4) submit a copy of their written permit required confined space program, which meets the requirements of this section and 29 CFR 1910.146 without respect to 1910.146(a), which will be followed;
(5) coordinate permit-required confined space entry operations with USACE; and
(6) debrief USACE personnel at the conclusion of entry operations on any matters concerning the entry program or any hazards created or confronted in the PRCS during entry operations.

06.I.03 All employees with potential entry into a PRCS shall be notified of the existence, location, and hazards of the space. All authorized entrants, attendants, and

entry supervisors shall know the hazards that may be faced during entry, including information on the mode, signs or symptoms, behavioral effects, and consequences of the exposure.

06.I.04 Written permit-required confined space (PRCS) program.

a. Each activity, USACE and contractor, and each USACE acility shall maintain a PRCS program and, if it has been determined that the activity or facility has confined spaces, PRCS entry procedures.

b. PRCS programs shall cover the elements in Table 6-1.

c. The activity or facility, as part of its PRCS program, will provide, maintain, and assure the proper use of:

(1) testing and monitoring equipment,
(2) ventilating equipment needed to obtain acceptable entry conditions,
(3) communications equipment,
(4) PPE used where engineering controls and work practices do not adequately protect USACE personnel,
(5) lighting equipment,
(6) equipment, such as ladders, needed for safe ingress and egress by authorized entrants,
(7) rescue and emergency equipment, and
(8) any other equipment necessary for safe entry into and rescue from permit spaces.

06.I.05 Permit-required confined space entry procedures.

a. The designated authority shall develop and implement a system for the preparation, issuance, use, and cancellation of PRCS entry permits (ENG Form 5044-R).

(1) Before entry begins, the entry supervisor identified on the permit shall sign the permit to authorize entry.

Table 6-1: PRCS Program Elements

(2) The completed permit shall be made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm the pre-entry preparations have been completed.

(3) The duration of the permit may not exceed the time required to complete the task or job identified on the permit.

b. Plans and procedures shall be developed and implemented or summoning rescue and emergency services, for rescuing entrants from PRCSs, and for preventing unauthorized personnel from attempting a rescue.

c. The entry supervisor shall designate at least one attendant who will remain, for the duration of entry operations, outside the PRCS into which entry is authorized.

d. The designated official shall develop and implement procedures to coordinate entry operations when more than one work crew are authorized entry so that employees of one crew do not endanger the employees of other crews.

e. The designated official shall review entry operations when there is reason to believe that the measures taken under the PRCS program may not be sufficient to protect personnel and shall revise the program to correct any deficiencies before subsequent entries are authorized.

f. On at least a yearly basis, the designated official shall review the canceled permits for the past 12 months and revise the program as necessary to ensure that employees participating in entry operations are protected from PRCS hazards.

06.I.06 Training.

a. All employees shall be instructed not to enter PRCSs without the proper permit and without following the procedures and practices outlined in the permit.

b. Employees who are required to enter PRCSs or act as an attendant or entry supervisor shall be trained to acquire the understanding, knowledge, and skills necessary for the safe performance of their assigned responsibilities and duties. These employees must also be familiar with the kinds of hazards they might face during entry and understand the modes, signs, symptoms and consequences of exposure.

c. Entrants, attendants, and supervisors shall receive training as specified in Table 6-2.

d. Training shall be conducted:

(1) before the employee is first assigned confined space duties (initial training),
(2) before a change in assigned duties,
(3) whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained, and
(4) whenever installation officials have reason to believe that or that there are inadequacies in knowledge or use of these procedures.

e. When complete, training shall be certified by the instructor. The certification shall list the names of the personnel presenting and receiving the training and the dates of training.

06.I.09 On-site rescue/emergency teams.

a. Each member of the rescue/emergency team shall be provided with, and trained in the proper use of, PPE and equipment necessary for making rescues from PRCSs.

b. Each member of the rescue team/emergency shall practice making PRCS rescues at least once every 12 months. Practice drills shall simulate emergencies and rescue operations and shall involve the removal of dummies, manikins, or persons from simulated PRCS. The simulated PRCS shall mock the configurations and hazards of the PRCS from which rescue is to be performed.

Table 6-2: Permit-Required Confined Space Training

c. Each member of the rescue/emergency team shall receive the same level of training as authorized entrants and shall be trained in basic first-aid and in CPR. Provisions shall be made so that whenever the team is on call, at least two members of the team shall have current certification in first aid and CPR.

06.I.10 Off-site rescue and emergency services.

a. The rescue/emergency service will be informed of the hazards they may confront when called on to perform rescues.

b. The rescue/emergency service shall be provided access to all permit spaces from which rescue may be necessary so that the service can develop appropriate rescue plans and practice rescue operations.

06.I.11 To facilitate non-entry rescues, retrieval systems or methods shall be used whenever an authorized entrant enters a PRCS, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

a. Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near the shoulder level or above the entrant's head (wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative).

b. Retrieval lines shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescues can begin as soon as the rescuer becomes aware that rescue is necessary.

c. A mechanical device shall be ready to retrieve personnel from vertical PRCSs more than 1.7 m (5 ft) deep.

06.J INCLEMENT WEATHER AND ENVIRONMENTAL HAZARDS

06.J.01 When there are warnings or indications of impending severe weather (heavy rains, damaging winds, tornados, hurricanes, floods, etc.), weather conditions shall be monitored and appropriate precautions taken to protect personnel and property from the effects of the severe weather.

06.J.02 Employers shall develop a comprehensive written site-specific heat/cold stress monitoring plan, in accordance with guidance provided in the ACGIH "Threshold Limit Values and Biological Exposure Indices" and other references the employer determines

applicable to protect employees exposed to temperature extremes. The plan shall be incorporated in the employer's accident prevention plan or project safety and health plan.

06.J.03 In hot environments, drinking water shall be made available to workers and workers shall be encouraged to frequently drink small amounts, e.g., one cup every 15-20 minutes: the water shall be kept reasonably cool.

06.J.04 In situations where heat stress may impact worker safety and health, worker acclimatization shall be assessed and work-rest regimens shall be established. Environmental monitoring of the Wet Bulb Globe Temperature Index shall be conducted and work loads and work rest regimens categorized for workers wearing normal permeable work clothing (lightweight pants and shirt) as specified in the ACGIH's "Threshold Limit Values and Biological Exposure Indices." For workers wearing impermeable clothing, use the guidelines contained in the NIOSH, OSHA, United States Coast Guard (USCG), EPA document "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" and other references deemed applicable.

06.J.05 Employees working in air temperatures of -26° C (-15° F) or less shall use the work-/warm-up regimen specified in the ACGIH "Threshold Limit Values and Biological Exposure Indices."

06.J.06 At air temperatures of 2° C (36° F) or less, workers who become immersed in water or whose clothing becomes wet shall immediately be provided a change of clothing and treated for hypothermia.

06.J.07 When manual dexterity is not required of a worker, he or she shall be provided thermally protective gloves when exposed to the following temperatures.

a. for light work, 4° C (40° F) and below, and
b. for moderate and heavy work, -7° C (20° F) and below.

06.J.08 When fine work is required to be performed with bare hands for more than 10-20 minutes in an environment below 10° C (50° F), provisions shall be established for keeping workers' hands warm.

06.J.09 Metal handles and control bars shall be covered by thermal insulating material at temperatures below -1° C (30° F).

06.J.10 Cold weather clothing requirements.

a. If wind chill is a factor at a work location, the cooling effect of the wind shall be reduced by shielding the work area or providing employees an outer windbreak layer garment.

b. Extremities, ears, toes, and nose shall be protected from extreme cold by protective clothing.

c. Employees performing light work whose clothing may become wet shall wear an

outer layer of clothing which is impermeable to water.

d. Employees performing moderate to heavy work whose clothing may become wet shall wear an outer layer of clothing which is impermeable to water.

e. Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat.

Table 6-3: Wind Chill Factors

f. If clothing is wet, the employee shall change into dry clothes before entering a cold environment

g. Workers shall change socks and removable felt insoles at regular daily intervals or use vapor barrier boots.

h. Due to the added danger of cold injury due to evaporative cooling, workers handling evaporative liquid (such as gasoline, alcohol, or cleaning fluids) at air temperatures below 4° C (40° F) shall take precautions to avoid soaking of clothing or contact with skin.

I. Eyewear providing protection against ultraviolet light, glare, and blowing ice crystals shall be provided to workers employees in snow- and/or ice-covered terrain.

06.J.11 Environmental monitoring shall be conducted as follows:

a. At air temperatures below 7° C (45° F) the temperature shall be monitored.

b. At air temperatures below -1° C (30° F) the temperature shall be measured and recorded at least every four hours. In indoor workplaces the wind speed should be measured and recorded at least every four hours when the rate of air movement exceeds 0.22 m/s (5 mph); in outdoor work situations the wind speed should be measured and recorded with the air temperature.

c. The equivalent chill temperature shall be determined using Table 6-3.

06.J.12 Workers shall be excluded from work in cold (30° F or below) if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments.

06.J.13 Where employees are exposed to solar radiation for short periods and there is the potential for sunburn or are exposed for prolonged periods where long term exposure could lead to health effects such as skin cancer, they shall be provided sun screen with a sun protection factor (SPF) appropriate for their skin type and exposure. Sun screens shall be used only in accordance with the manufacturer's recommendations.

06.K CUMULATIVE TRAUMA PREVENTION

06.K.01 Work activities that require workers 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 shall be evaluated by a competent person to ensure the activities are designed to match the capabilities of the workers.

06.K.02 When work activities that stress the body's capabilities are identified, the employer shall establish a cumulative trauma disorders prevention plan and incorporate it in the accident prevention plan. The plan shall incorporate processes that recognize cumulative trauma hazards, isolate causative factors, inform and train workers, and implement controls.

06.K.03 Control measures to minimize hand-arm vibration shall include: adherence to the TLV guidelines as specified in the ACGIH in "Threshold Limit Values and Biological Exposure Indices"; the use of antivibration tools and/or gloves; implementation of work practices that keep the worker's hands and body warm and minimize the vibration coupling between the worker and the vibration tool; and application of specialized medical surveillance to identify personnel susceptible to vibration.

DEFINITIONS

Abrasive blasting: the forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

Absorbed dose: energy imparted to matter by ionizing radia-tion per unit mass of irradiated material at the place of interest in that mate-rial. The units of absorbed dose are the rad or the Gray (1 Gray equals 1 Joule/Kilogram equals 100 rad).

Committed dose equivalent: The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by a person during the 50-year period following the intake.

Committed effective dose equivalent: the sum of the prod-ucts of the weighting factors applicable to each of the body organs or tissues irradiated and the committed dose equiva-lent to these organs or tissues.

Confined space: a space that (1) is large enough and so configured that a person can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit such that the entrant's ability to escape in an emergency would be hindered (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry; doorways are not considered a limited means of entry or egress); and (3) is not designed for continuous worker occupancy.

Cumulative trauma disorders - disorders of muscles, tendons, peripheral nerves, or vascular system. These can be caused, precipitated, or aggravated by intense, repeated, or sustained exertions, motions of the body, insufficient recovery, vibration, or cold.

Dose equivalent: the product of the absorbed dose in tissue, qual-ity factor, and all

other necessary modifying factors at the location of in-terest. The units of dose equivalent are the rem or Sievert (Sv) (1 Sievert equals 100 rem).

Dosimetry: the measure of radiological exposure.

Dust: solid particles generated by handling, crushing, grinding, or detonation of organic or inorganic materials.

Effective dose equivalent: the sum of the products of the dose equiva-lent to the organ or tissue and the weighting factors applica-ble to each of the body organs or tissues irradiated.

Engulfment: the surrounding and effective capture by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry permit (permit): the written or printed document provided to allow and control entry into a permit space and that contains the information specified in ENG Form 5044-R.

Entry supervisor: the person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

Exposure: a measure of the ionization produced in air by X or gamma radia-tion, equal to the sum of the electrical charges on all ions of one sign pro-duced per unit mass of air. The special unit of exposure is the Roent-gen equal to 2.58×10^{-4} Coulombs per Kilogram of air at standard temperature and pressure.

Fume: very small suspended solid particles created by condensation from the gaseous state. Hazardous (physical) agent: noise, nonionizing and ionizing radiation, and temperature exposure of durations and quantities capable of causing adverse health effects.

Hazardous atmosphere: an atmosphere that may expose persons to the risk of death, incapacitation, impairment of ability to self rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL);

(2) airborne combustible dust at a concentration that meets or exceeds its LFL;

(3) atmospheric oxygen concentration below 19.5% or above 23.5%;

(4) atmospheric concentration of any substance for which a dose or permissible exposure limit is published and which could result in team member exposure in excess of its dose or permissible exposure limit;

(5) any other atmospheric condition that is immediately dangerous to life or health.

Hazardous environment: an environment with an atmosphere that poses a risk of death, incapacitation, injury, or illness due to flammable or explosive hazards;

hazardous substances or agents; oxygen concentrations below 19.5% or above 22%; or any other atmospheric condition recognized as IDLH.

Hazardous substance: any substance defined as a hazardous substance under 29 CFR 1910.120, 1926.65, or 40 CFR Part 302; any chemical determined to be a hazard as specified in 29 CFR 1910.1200 or 1926.59 to include a chemical (as a gas, liquid, vapor, mist, dust, or fume) which has been identified as causing adverse health effects in exposed employees.

High radiation area: any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 100 millirem.

Hot work permit: written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH): any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Ionizing radiation: electromagnetic and particulate radiation that causes molecular ionization; includes alpha particles, beta particles, gamma rays, x-rays, neutrons, high speed electrons and protons, and other atomic matter.

Laser: a device that produces an intense, coherent, directional beam of light.

Linebreaking: the intentional opening of a pipe, line, or duct that is or has been carrying flammable, toxic, or corrosive material, an inert gas, or any fluid at a pressure or temperature capable of causing injury.

Nonionizing radiation: those electromagnetic radiations that do not cause ionization (but may be absorbed) in biological systems; includes low frequency ultraviolet light, infrared light, heat, laser, microwaves, and radio waves.

Non-permit confined space: a confined space that does not contain, or with respect to atmospheric hazards does not have the potential to contain, any hazard capable of causing death or serious physical harm.

Normally unoccupied remote facility: a facility operated, maintained, or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from all other buildings, processes, or persons.

Oxygen deficient atmosphere: an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen enriched atmosphere: an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space (permit space): a confined space that has one or more of the following characteristics:
(1) contains or has the potential to contain a hazardous atmosphere;
(2) contains a material that has the potential for engulfing an entrant;
(3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; or
(4) contains any other recognized serious safety or health hazard.

Prohibited condition: any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rad: a measure of the dose of ionizing radiation to the body tissue in terms of the energy absorbed per unit of mass of the tissue.

Radiation area: any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 millirems, or in any 5 consecutive 8-hour days a dose in excess of 100 millirems.

Radioactive material: any material that emits, by spontaneous nuclear disintegration, electromagnetic or particulate emanations.

Radiological device: machinery or equipment that produces or contain ionizing radiation, such as nuclear density meters and radiographic testing machines.

Rem (roentgen equivalent in man): a measure of the dose of ionizing radiation to body tissue in terms of its biological effect; the dose required to produce the same biological effect as one roentgen of high-penetration of x-rays.

Restricted area: when used in conjunction with ionizing radiation, any area to which access is controlled by the employer for purposes of protecting individuals from exposure to ionizing radiation.

Shallow dose equivalent: applies to the external exposure of the skin or an extremity. It is taken as the dose equivalent at a tissue depth of 0.007c-m averaged over an area of 1 cm^2.

Specular reflections: reflections from a smooth surface, such as a mirror, glass, metal, etc.

Total effective dose equivalent: the sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Work load classification:
- sedentary: sitting
- light: sitting or standing to control machines; performing light hand or arm work.
- moderate: walking about with moderate lifting or pushing.
- heavy: physical labor such as pick and shovel work.

Weighting factor: factor that represents the proportion of the total stochas-tic (cancer plus genetic) risk result-ing from irradi-ation to tissue to the total risk when the whole body is irradiated uniformly.

Wet bulb globe temperature index: a measurement of environmental factors that correlate with human deep body temperature and other physiological responses to heat.

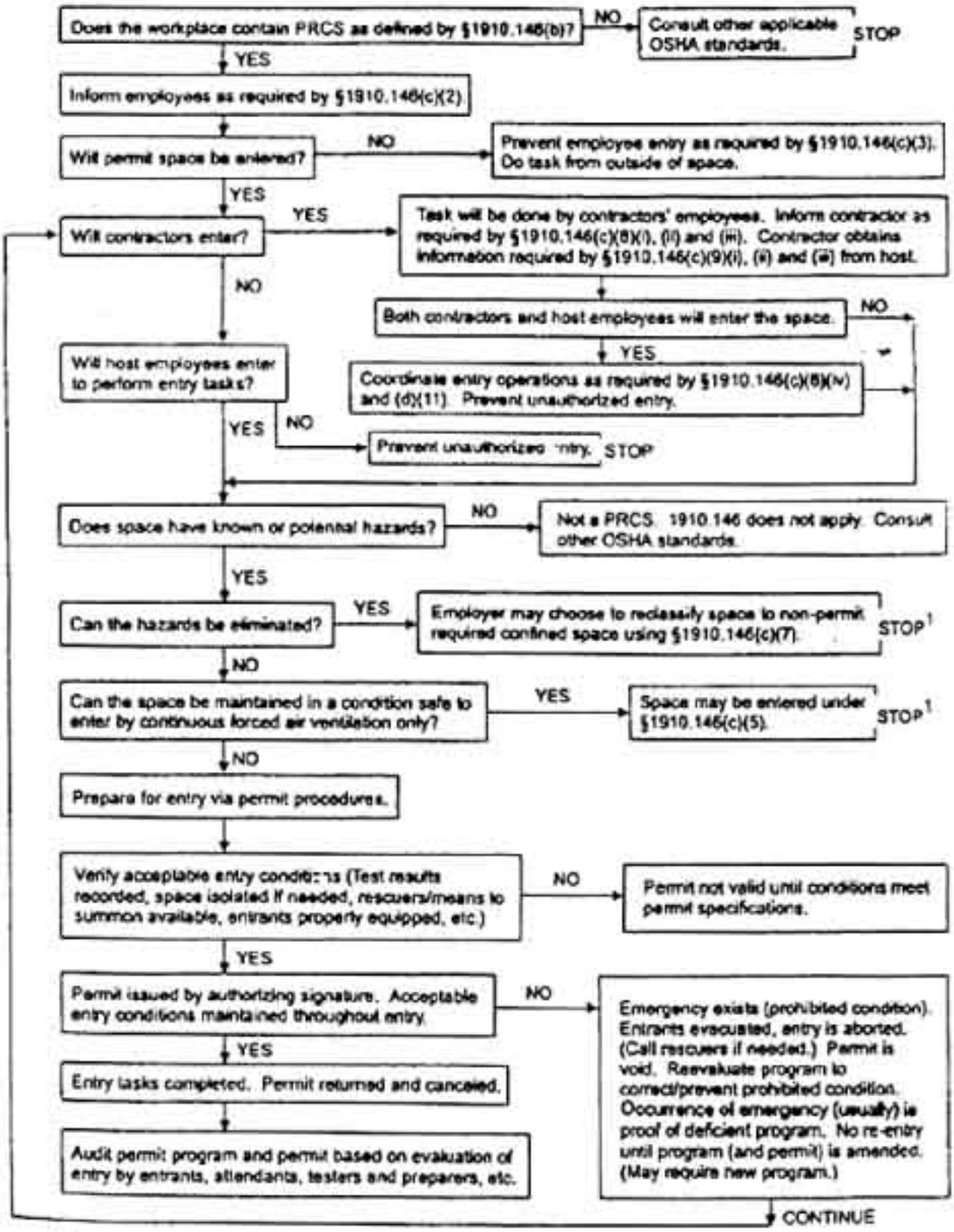
TABLE 6-1

Part	Annual limits (NRC) per RSO	Annual limits (NRC) w/o RSO	Suggested ALARA limits
Whole body	5 rem	0.5 rem	0.1 rem
Individual organ	50 rem	5 rem	0.5 rem
Lens of eye	15 rem	1.5 rem	0.15 rem
Skin	50 rem	5 rem	0.5 rem

Intensity, continuous wave maximum power density (watts/cm^2)	Attenuation	
	Optical density	Attenuation factor
0.01	5	10,000
0.1	6	100,000
1.0	7	1,000,000
10.0	8	10,000,000

FIGURE 6-1

PERMIT-REQUIRED CONFINED SPACE EVALUATION PROCEDURES AND DECISION LOGIC



[1] Spaces may have to be evacuated and re-evaluated if hazards arise during entry.

FIGURE 6-1, continued

Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin. If isolation of the space is infeasible because the space is large or is part of a continuous system (e.g., sewer system), pre-entry testing shall be performed to the extent feasible before entry is authorized. If entry is authorized, entry conditions shall be continuously monitored in the areas where authorized entrants are working. Test or monitor the permit space as necessary to determine if acceptable entry conditions are maintained during entry operations. The space will be tested first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.

TABLE 6-1

PRCS PROGRAM ELEMENTS

Hazard identification: identification of the PRCS hazards.

Hazard control: procedures, practices, and controls developed and implemented to eliminate or control PRCS hazards.

Permit system: written system for preparing, issuing, implementing, and canceling entry permits, including provisions for closing permit-required spaces and returning them to service after work is completed.

Specialized equipment: specialized equipment (e.g., monitoring instruments, ventilation equipment, PPE, communication equipment, rescue equipment) that shall be provided and used.

Personnel: designation and responsibilities of employees who have a role in the PRCS entry.

Testing and monitoring: provisions for testing and monitoring the PRCS to determine if it is safe for entry and that conditions remain acceptable for the duration of the entry.

Emergency procedures: emergency procedures and provisions, including personnel and equipment, which will be implemented.

Outside contractors: coordination of activities of any contractors who will be required to work in or around PRCSs.

Information and training: procedures and requirements for informing/training employees on PRCS responsibilities and hazards.

Program review: requirements for noting on the permit any problems encountered during the entry; procedures for reviewing canceled permits at least once a year to determine if there are needs to modify existing procedures to ensure continued employee protection.

TABLE 6-2

PERMIT-REQUIRED CONFINED SPACE TRAINING

Entrants shall receive training on:
- the methods used to communicate with attendants and the means attendants will use to notify them of emergencies;
- the operation of any specialized equipment they are expected to use, including monitoring and rescue equipment; and
- evacuation signals and procedures and the need for entrants to notify the attendant and evacuate the PRCS if they detect any dangerous condition.

Attendants shall receive training on:
- procedures for monitoring inside and outside the PRCS and in recognizing conditions that might be hazardous to entrants;
- procedures for communicating with entrants;
- procedures for evacuating entrants from the PRSC and under what conditions evacuation is required;
- procedures for controlling access to the PRCS and to warn unauthorized people away from the space;
- their responsibility to remain outside the PRCS during entry, unless they are relieved by another attendant; and
- non-entry rescue procedures.

Supervisors shall receive training on:
- verifying that the permit has been completed properly;
- procedures for verifying that all tests specified by the permit have been conducted;
- requirements for verifying that all procedures and equipment specified by the permit are in place before allowing entry to begin;
- procedures for determining if conditions are acceptable for entry;
- authorizing entry;
- supervising entry operations; and
- terminating entry;

c. Each member of the rescue/emergency team shall receive

Table 6-3
Wind Chill Factors

Wind Speed	Cooling Power of Wind as Equivalent Chill Temperature*																				
m/sec	Temperature, degrees C																				
calm	4	2	-1	-4	-7	-9	-12	-15	-18	-21	-23	-26	-29	-32	-34	-37	-40	-43	-46	-48	-51
2.2	2	-1	-4	-7	-9	-12	-15	-18	-20	-23	-26	-29	-32	-34	-37	-40	-43	-46	-48	-51	-57
4.5	1	-7	-9	-12	-15	-18	-23	-26	-29	-32	-37	-40	-43	-46	-51	-54	-57	-59	-62	-68	-71
6.7	-4	-9	-12	-18	-21	-23	-29	-32	-34	-40	-43	-46	-51	-54	-57	-62	-65	-68	-73	-76	-79
8.9	-7	-12	-15	-19	-23	-26	-32	-34	-37	-43	-45	-51	-54	-59	-62	-65	-71	-73	-79	-82	-84
11.2	-9	-12	-18	-21	-26	-29	-34	-37	-43	-46	-51	-54	-59	-62	-68	-71	-76	-79	-84	-87	-93
13.4	-12	-15	-18	-23	-29	-32	-34	-40	-46	-48	-54	-57	-62	-65	-71	-73	-79	-82	-87	-90	-96
15.6	-12	-15	-21	-23	-29	-34	-37	-40	-46	-51	-54	-59	-62	-68	-73	-76	-82	-84	-90	-93	-98
17.9	-12	-18	-21	-26	-29	-34	-37	-43	-48	-51	-56	-59	-65	-71	-73	-79	-82	-87	-90	-96	-101
winds above 18 m/s have little additional effect	little danger					increasing danger (flesh may freeze within one minute)						great danger (flesh may freeze within 30 sec)									