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IN REPLY REFER TO

NMRCDINST 5100.6A
15 Mar 2004

NMRCD INSTRUCTION 5100.6A

From: Officer-in-Charge, U.S Naval Medical Research Center
Detachment Lima, Peru

Subj: CHEMICAL HYGIENE PLAN

Ref (a) OPNAVINST 5100.23 Series
(b) 29 CFR 1910.145
(c) WRAIR/NMRC Chemical Safety and Environmental
Management Program Guide

Encl 1 NMRCD Chemical Hygiene Plan

1 Purpose

a. To protect laboratory workers from health hazards caused by hazardous chemicals in NMRCD laboratories.

b. To eliminate and/or safety reduce the risk of exposure from chemicals of a toxic nature or that cause a physical injury, illness, or even death.

c. To keep toxic exposures below published exposure limits using proper work practices, engineering controls and protective equipment. This Plan is not a substitute for safe working practices but rather augments them.

2. Cancellation. NMRCD Instruction 5100.6

3. Background. References (a) through (c) require activities with laboratories to implement chemical hygiene plans. Reference (b) contains guidelines for developing a chemical hygiene plan.

4. Scope. Laboratories using hazardous materials (HM) and employees who use or are exposed to HM in laboratories (see Appendix A of Enclosure (1) for definitions of laboratory, HM and other terms). General rules of safety or chemical hygiene stated in this plan apply to all workplaces.

5. Policy. NMRCD's policy is to eliminate or minimize the exposure of personnel to HM.

6. Responsibilities. The entire workforce and management are held responsible for chemical hygiene, particularly the:

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a. Officer-in-Charge. Ultimately responsible for chemical hygiene, and shall ensure the support of all levels of management for this Plan.

b. Chemical Hygiene Officer. Appointed by the Officer-in-Charge and qualified by training/experience, this officer will:

(1) Work with management and all employees to develop, implement and enforce chemical hygiene policies and practices.

(2) Monitor procurement, use and disposal of chemicals in laboratories

(3) Assist researchers in developing procedures and obtaining adequate facilities for research involving HM.

(4) Know the current legal requirements concerning regulated substances.

5 Seek ways to improve the chemical hygiene program

c Safety Officer shall

(1) Assist the Officer-in-Charge with oversight and review of the Chemical Hygiene Plan.

(2) Provide guidance to Laboratory Safety Managers and other managers, and provide assistance to the Chemical Hygiene Officer.

(3) Schedule the annual Industrial Hygiene/Workplace Monitoring Surveys conducted by NEPMU-2.

d. Department Heads and Supervisors are responsible for:

(1) Overall safety, health, and chemical hygiene in their areas and enforcement of requirements.

(2) Performing housekeeping and chemical hygiene inspections as needed to ensure compliance with this plan.

(3) Ensuring that required employee training is completed and documented.

e Command Medical Officer/Infectious Disease Officer shall

(1) Perform medical examinations and annual workplace inspections per reference (a)

(2) Revise and update medical surveillance lists after

annual input from supervisors or workplace inspections.

Laboratory Safety Managers shall

(1) Assist Department Heads to ensure that workers know and follow the chemical hygiene rules, use Personal Protective Equipment (PPE) properly, that PPE is available when and where required, and that PPE is properly stored, maintained and used.

(2) Assess adequacy of training and facilities for the materials and equipment used

3 Attend periodic Safety meetings.

(4) Report chemical hygiene problems to their Supervisor Department Chemical Hygiene Officer, and the Safety Officer.

(5) Assist supervisors to promote chemical hygiene identify and minimize toxic risks.

(6) Accompany supervisor and inspection teams during chemical hygiene, safety, or safety-related inspections.

g Bio-medical Repair:

(1) Shall provide assistance in the certification of fume hood(s) and the biological safety cabinets annually.

(2) Shall perform repairs as required or necessary to the fume hood(s) and biological safety cabinets. Once repairs have been completed assist with re-certification.

h Employees are responsible for

(1) Planning and conducting operations to conform to this Chemical Hygiene Plan.

(2) Reporting safety and chemical hygiene problems to laboratory supervisor for correction.

h. Good personal chemical hygiene habits per the contents of this plan, at a minimum, adhere to section 2 and 4 and Appendix B of Enclosure (1).

7 Action.

a. Implement and comply with enclosure (1). Departments shall ensure that personnel are familiar with this instruction and have it available in laboratories for reference.

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b. Annual review. This Plan shall be reviewed annually by the Chemical Hygiene Officer and updated when reviewed if necessary.



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**U.S. NAVAL MEDICAL RESEARCH CENTER
DETACHMENT LIMA, PERU
(U.S. NMRCD)**

CHEMICAL HYGIENE PLAN

Enclosure (1)

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1. Introduction.

a. Authority. References (a) (the Navy Occupational Safety and Health Program Manual) and (b) (the Occupational Safety and Health Administration (OSHA) Laboratory Standard) require a Chemical Hygiene Plan for all laboratories and guide their content.

b. General Applicability. This Plan emphasizes laboratory practices, but it includes broadly applicable rules of safety and industrial hygiene. Therefore, the following sections apply to all NMRCDC workplaces:

General Principles of Chemical Handling - paragraph 2

(2) Standard Operating Procedures and Basic Rules
paragraph 4

Material Safety Data Sheets (MSDSs) - paragraph 10.

Definitions - Appendix A

c. Availability. Copies of this Plan shall be available for review in departments, Command files and the Safety Office.

2. General Principles of Chemical Handling.

a. Minimize Chemical Exposures. Because few laboratory chemicals are hazard-free, keep exposure to a minimum. Specific guidelines for corrosives, allergens, carcinogens and highly toxics are in this instruction and MSDS; supervisors may require other guidelines. Always avoid skin and eye contact.

b. Accurate Estimation of Risk. Even substances of no known hazard may entail risk. Assume that mixtures are more hazardous than their most hazardous component and that substances of unknown toxicity are toxic. Do not underestimate risks of chemical use.

c. Engineering Controls. The best way to prevent toxic exposure is to avoid using hazardous materials (HM) at all; if they must be used, use engineering controls with them. Installed devices that separate the worker from airborne hazards, such as laboratory hoods, are preferred over reliance on Personal Protective Equipment (PPE) such as respirators. Supervisors shall require local ventilation when handling highly toxic chemicals or biologicals, and all HM shall only be handled where ventilation is adequate.

d. Exposure Limits. The purpose of establishing exposure limits is to prevent disease and injury caused by acute or chronic exposures to hazardous materials. Supervisors shall enforce Permissible Exposure Limits (PEL's) established by OSHA, Threshold

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Limit Values (TLV's) published annually by the American Conference of Government Industrial Hygienists (ACGIH), standards published by the American National Standards Institute (ANSI) and any standards recommended by the Safety Officer or Navy directives. When standards differ for the same chemical, Navy policy requires the most stringent standard shall apply.

e. Safety. Although this Plan focuses on HM, accidents in laboratories are common and can cause both toxic exposures and physical injury. Navy safety directives fully apply to laboratories; employees shall adhere to HM, hazardous waste, electrical, flammable storage and all other safety directives.

3. Exposure Control Supervisors and employees shall ensure:

a. Exposure Limits. Observance of exposure limits; allowing exposures at levels above standards is prohibited.

b. Design

(1) Proper general ventilation with air intakes and exhausts located separately to avoid intake of contaminated air.

(2) Adequate, well-ventilated, storage that does not expose other employees to hazardous chemicals.

3 Properly working laboratory hoods and sinks

(4) Other safety equipment required by law, including eyewash stations, drench showers and glassware washer.

(5) Safe waste disposal per NMRCINST 5100.5 and other applicable instructions.

c. Maintenance

(1) Maintenance of equipment per legal and manufacturer guidelines with a maintenance log that includes dates and results of maintenance, performance checks and repairs.

(2) Annual Certification of biological safety cabinets and chemical fume hoods and ventilation systems. If found inadequate, do not use hoods until the problem is repaired or the equipment is replaced.

d. Usage. Ventilation and safety equipment is capable of the volume and type of work performed; do not perform work when exposure controls are inadequate.

e. Ventilation

(1) General Ventilation. Shall provide fresh air for breathing and for input to local ventilation devices such as

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vacuums and exhausts; shall not be relied upon to protect from toxic substances released into the laboratory; laboratory air shall be continually replaced with no increase in air concentrations of toxic substances during the work day; direct air flow into the laboratory from non-laboratory areas, and out to the outdoors.

(2) Chemical (or fume) Hoods. A laboratory hood with 2.5 linear feet of hood space is required for every two workers who spend at least half of their time working with HM. Hoods shall have continuous flow monitoring devices to conveniently indicate performance before use; otherwise, do not use the hood until checked by qualified personnel.

(3) Performance. Four to 12 room air changes/hour are normally adequate general ventilation if hoods are the primary method of exposure control.

(4) Quality. General airflow should not be turbulent and should be uniform throughout the laboratory with no high velocity or static areas. Airflow in the hood should not be turbulent; face velocity should be adequate at 60-100 lfm (linear feet/meter).

(5) Special Ventilation Areas. Exhaust air from BSL-3 isolation rooms shall go through high efficiency particulate air filters (HEPA) or other treatment before release into the regular exhaust or to outside.

(6) Evaluation. The annual Industrial Hygiene Survey reports the quantity and quality of-airflow and worker protection provided by general ventilation and chemical hoods. Also, (and for different purposes), perform maintenance and medical repair inspection and certifications per section 5.c.

f Exposure Monitoring

(1) General need. Instrument monitoring of airborne concentrations of HM may be indicated when a highly toxic chemical is used regularly (e.g. 3 times weekly) or when testing hoods; Annual Industrial Hygiene Surveys and any periodic Safety or Command Inspection can require such monitoring.

(2) Initial and periodic monitoring. Annual Industrial Hygiene Surveys include a Workplace Monitoring Plan. This identifies laboratory operations that may expose employees to HM levels that exceed action levels (i.e. levels that require medical surveillance). When exposures end or fall below action levels, monitoring may be terminated.

(3) Employee notification. The Occupational Health Physician shall place monitoring results into employee health records; the Safety Office shall post results in workplaces for employee review within 15 days of receipt.

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4. Standard Chemical Hygiene Procedures and Basic Rules.

a. Appendix B lists Standard Operating Procedures for Laboratories covering chemical and personal safety. Other general HM procedures and guidelines are specified here.

b. Chemical procurement, distribution and storage

(1) Procurement. As a condition of purchase the Supply Office shall require HM's to be properly labeled (including labeling on the container) and with a Material Safety Data Sheet (MSDS); if either is missing the HM shall not be issued until the MSDS is received. The MSDS shall be made available immediately to employees and the Safety Office.

(2) Storage. Store chemicals per the requirements of their MSDS, with MSDSs available. Segregate HM in a well-defined area with its own ventilation. Place highly toxic chemicals and open chemical containers in unbreakable secondary containers. Use and store them only in restricted access areas, marked by warning signs. Laboratory safety managers shall visually inspect chemical stocks weekly for deterioration and container integrity.

(3) Distribution. When hazardous chemicals are handcarried employees shall place the chemical's container in a protective outside container or bucket

(4) Workplace Storage. Employees shall store as small a quantity of HM as practical, away from direct sunlight, heat and other physical risks. Keep only a one-day supply on working areas of laboratory benches, avoid routine storage on benches, and store chemicals per MSDS guidelines.

c. Personal Protective Equipment (PPE)

(1) Apply NMRCINST 5100.7 series to general PPE use; enroll personnel into medical surveillance programs for eye and respiratory protection per reference (a).

(2) Eye Protection. Personnel using HM that may produce aerosols shall be enrolled and trained in the Sight Conservation Program before HM use. All persons (including visitors) shall use proper eye protection where HM's are used or stored. Avoid wearing contact lenses around HM; if they must be worn, the supervisor shall ensure that chemical splash goggles are provided and worn by the individual.

(3) Gloves. Wear gloves when skin contact with HM may occur, using a type of glove prescribed for the chemical(s) used. Inspect gloves before each use, wash them before removal and replace them periodically.

4) Respirators. Personnel requiring respirators shall be

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enrolled in the Respiratory Protection Program. Use appropriate respirators when air contaminant concentrations are not sufficiently reduced by engineering controls. Inspect the respirator before use; clean it after use.

(5) Protective coats/aprons. Supervisors shall assign use of such clothing before HM use. Remove immediately if contaminated. Do not wear protective clothing in common areas.

(6) Other protective equipment. The Command shall outfit laboratories with safety showers, eyewash fountains, fire extinguishers rated for type A, B and C fires, telephones, access to fire alarms, and any other equipment required by reference (b).

d Records

(1) Mishap and spill records shall be kept in the Safety Office and in departments where incidents occur.

(2) The Safety Officer shall keep formal inspections and safety inspections copies of the annual Industrial Hygiene Survey.

(3) The Command Medical Officer shall maintain medical records referable to HM, per reference (a)

e. Inspections. The Safety Office shall record safety inspections. The Command shall receive written annual reports of the Hazardous Material Survey (by the Command Chemical Hygiene Officer) and the Industrial Hygiene Survey; the latter includes an assessment of respiratory protection, ventilation, and laboratory hoods. Command zone inspections may evaluate safety issues at any time.

f. Signs and Labels. Supervisors shall post the following where using or storing HM:

(1) Telephone numbers of emergency personnel and facilities

(2) On HM and waste containers, labels showing contents and associated hazards per Federal and Navy directives.

(3) Location signs for safety showers, eyewash stations, other safety equipment, exits, and to identify carcinogens, reproductive, radiation and other special hazards.

5. Medical Program

a. Requirements Per reference (a) the annual Industrial Hygiene survey includes a review of exposure monitoring and recommends employee medical surveillance examinations. The annual Industrial Hygiene/workplace monitoring survey will be scheduled by the Safety Officer and conducted by NMRCDC per local agreement.

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b. The Command Medical Officer or contracted Peruvian Licensed Physician (PLP) shall perform the following medical examinations for employees who work with HM:

(1) Acute Exposures. Employees who develop signs or symptoms associated with possible HM exposure at work, or related to events such as a leak, explosion or spill shall be offered a medical examination and any necessary follow-up examinations.

(2) Periodic Surveillance. Employees who are exposed to HM (per exposure monitoring) above action levels (per OSHA, ACGIH, ANSI or Public Health Service recommendations) for chemicals that have Navy medical surveillance requirements shall be given medical evaluations. The Command Medical Officer shall review the annual Industrial Hygiene Survey and identify workplaces with exposures that requires surveillance and any changes since earlier reports. Supervisors shall annually update lists of employees who are exposed, and notify the Clinic of any employee with signs or symptoms of exposure.

c. Medical examinations shall be performed or supervised by the Command Medical Officer.

d. Examination Results. The Command Medical Officer shall send the employee written results of the examination, not noting any medical condition that requires further examination or treatment. The employee's supervisor shall receive the following results: a limited written statement indicating that the employee has been informed of his/her results, recommendations for further medical follow-up for the employee, any occupational diseases found and the presence of any medical condition that may place the employee at increased risk as a result of workplace exposure to a hazardous chemical. The supervisor's letter shall not include findings or diagnoses unrelated to occupational exposure.

e. For medical emergencies after chemical exposures (e.g. chemical burns, acute inhalation injury, etc.), refer employees to Command Medical Officer, or to local hospitals per existing medical care agreements.

6. Training.

a. Employee training shall include

(1) Methods and techniques to detect the presence or release of HM (e.g., monitoring conducted by Industrial Hygiene,

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continuous monitoring devices, appearance or odor of HM, etc.)

(2) Physical and health hazards of chemicals in the workplace, and the exposure limits for those chemicals.

(3) Measures to protect employees from these hazards, including standard operating procedures in this Plan (or others), proper work practices, emergency procedures and PPE to be used;

(4) The location and availability of the Chemical Hygiene Plan and other safety and health documents.

(5) The contents of 29 CFR 1910, section 1450, subpart z, and appendices shall be available to employees.

(6) Emergency and Personal Protection Training. Every laboratory employee must be trained in the location and proper use of protective apparel, procedures and laboratory safety.

b. When to Train. Training is required upon initial assignment to the Command, before starting work involving new exposures, annually and when new chemical use begins, per reference (a).

c. References and Consultation. The Safety and HAZMAT Coordinator shall maintain chemical safety and health, reference libraries and be available for consultation.

d. Documentation. Forward copies of lesson plans and attendance rosters to the Safety Officer.

7. Work with Allergens and Reproductive Toxins. For chemicals so-listed, follow Section 6 and Appendix B, plus the following:

a. Allergens (sensitizers) Wear suitable PPE to prevent skin, eye, and respiratory contact with allergens or substances of unknown allergenic potential.

b. Reproductive toxins. Use such chemicals only with approved PPE, especially gloves to prevent skin contact, and in a certified chemical hood (per sections 5.c. and e.). Store such chemicals with proper ventilation and in unbreakable secondary containers.

c. Prior approval. Before procurement or use evaluate these chemicals. Review use annually or with new procedures. Upon the occurrence of pregnancy, female employees working with such chemicals shall inform their supervisor, who shall ensure scrupulous preventive measures to avoid adverse reproductive effects, including modifying work procedures or transferring

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employee to different projects to avoid exposure to such chemicals, for the duration of her pregnancy.

8. Additional Rules for Work with Carcinogens and Chemicals with Moderate or High Chronic or Acute Toxicity. For chemicals (i.e. aldehydes, azides, benzene, chlorinated solvents, heavy metals, and picric acid), follow the Basic Rules for Chemical Use (section 6 and Appendix B) plus the following:

a. Location, access, labeling. Use and store these substances only in areas of restricted access, designated for their use, with special warning signs. Use a certified chemical hood (per sections 5.c. and e.) or other containment device for procedures that may generate aerosols or vapors containing the substance. Trap released vapors with the hood exhaust. Warn employees with access of the substances being used and necessary precautions. Label containers with proper identity and warning labels.

b. Personal Protection. Avoid skin contact by using gloves and long sleeve laboratory coats. Remember - Wash hands and arms immediately after working with these chemicals.

c. Records. Each laboratory shall maintain records of amounts of these materials on hand and the names of the employees involved, and shall submit copies of these records to the Occupational Health and the Safety Officers.

d. Additional special precautions. At all times at least two people must be present when using a compound of high or unknown toxicity. Store breakable containers of these substances in chemically resistant trays. Work and mount apparatus on or above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper.

e. Spills. If a spill occurs outside the hood, evacuate the area and activate the Spill Plan.

f. Waste. Decontaminate or incinerate contaminated clothing and shoes. If possible, chemically decontaminate by chemical conversion. Before disposal store waste in closed, properly labeled, impervious containers; store liquids (including washing from contaminated flasks) in glass or plastic bottles half-filled with vermiculite. Move waste containers from the controlled area in a protective outer container.

g Non-contamination/Decontamination Protect vacuum pumps

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against contamination, through use of scrubbers or HEPA filters, and vent them into a hood. Decontaminate equipment including glassware in the hood before removing them from the controlled area and decontaminate the controlled area before normal work is resumed.

h. Exiting. When leaving a controlled area remove PPE, place it in a properly marked container and wash hands, forearms, face, neck and other exposed skin.

i. Housekeeping. Keep controlled areas clean and orderly. Keep benches free of HM, equipment and glassware when leaving at the end of the day. Use a wet mop or a vacuum cleaner with a HEPA filter, not dry sweeping, if the substance is powder.

j. Glove Boxes. Negative pressure glove boxes require ventilation of at least 2-volume changes/hour and pressure of least 0.5 inches of water. For positive pressure glove box, thoroughly check for leaks before each use. For both, trap exit gases or filter them through a HEPA filter then release them into the hood.

k. Medical Surveillance. Annually, supervisors send the Command Medical Officer a list of employees using toxicologically significant quantities of hazardous materials (e.g. more than three times weekly), to be considered for enrollment in medical surveillance program.

l. Prior Approval. Before procurement or use, evaluate these materials. Review use annually or with new procedures.

9. Animal Work with Chemicals of High Chronic Toxicity. For highly toxic chemicals that may be excreted by test animals, follow-Section 6 and Appendix B, plus the following:

a. Access. Divisions shall post warning signs and keep MSDS at entrances to laboratories doing such work. Restrict access to personnel involved in the study; keep rosters of those entering the area.

b. Administration of Toxic Substance. If possible, administer the substance by injection or gavage, not in the diet. If administration must be in the diet, keep cages under negative pressure or in laminar air flow directed toward HEPA filters.

c. Aerosol Suppression. Minimize formation and dispersal of contaminated aerosols, including those from food, urine and feces. Use HEPA filtered vacuum equipment for cleaning; moisten contaminated bedding before removal from cages. Mix diets in closed

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containers in a hood. Clean cages and small re-usable items separately, avoiding aerosol formation

d. PPE. When cleaning cages and other contaminated equipment wear plastic or rubber gloves, a fully buttoned laboratory coat or jumpsuit and, if needed because of persistent aerosols, other PPE such as shoes, head covering, respirator, and chemical splash goggles.

e. Waste Disposal. Incinerate contaminated animal tissues, wastewater, contaminated bedding and excreta if the incinerator can render them nontoxic. Otherwise, package the waste for disposal per hazardous waste directives.

10. Material Safety Data Sheets (MSDSs). An MSDS for each HM must be readily available where the HM is used. One hour annual Command refresher training is required on MSDS use. MSDSs must be immediately available, with a copy in both, English and Spanish languages, from the manufacturer of the HM. A duplicate copy of the MSDSs shall be maintained in the Supply Office readily available for review.

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APPENDIX A

DEFINITIONS:

1. Action Level. A concentration designated by OSHA, ACGIH, or Navy instruction for a specific chemical, calculated as an eight (8) hour time-weighted average, which initiates certain required actions such as exposure monitoring and medical surveillance; usually one-half the PEL or TWA-TLV.

2. Carcinogen. Meets one of these criteria:

a. Regulated by OSHA as a carcinogen.

b. Listed as "known to be a carcinogen," in the Annual Report on Carcinogens, National Toxicology Program.

c. Listed in Group 1 (carcinogenic to humans by the International Agency for Research on Cancer (IARC)).

d. Listed in either Group 2A or 2B by IARC or as "reasonably anticipated to be carcinogens" by NTP and causes significant tumor incidence in experimental animals.

4. Combustible liquid. Any liquid having a flashpoint at or above 100 F (37.8 C) and below 200 F (93.3 C).

5. Corrosive. A gas, liquid or solid that causes visible destruction of human skin tissue or a liquid that rapidly corrodes steel. The RCRA definition for corrosivity is pH less than 2.0 or greater than 12.5, or it corrodes steel at a rate greater than 0.25 inch per year at 1300F.

6. Explosive. A chemical that causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature.

7. Flammable. A chemical that meets any of these criteria:

a. Aerosol. When tested, yields a flame protection exceeding 18 inches at full valve opening or a flashback at any degree of opening (extends back to the valve).

b. Gas. At ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less.

c. Liquid. Having a flashpoint below 100 F

d. Solid. Can cause fire through friction, absorption of moisture spontaneous chemical change or retained heat from manufacturing or processing, which can be ignited readily and when

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ignited burns so vigorously and persistently as to create a serious hazard.

8. Flashpoint. The minimum temperature at which a liquid emits a vapor in sufficient concentration to ignite when tested.

9. Hazardous Material (HM). A chemical that is a physical hazard or a health hazard, meeting any of the following criteria:

a. A flashpoint below 200 F (93.30C) closed cup, or may spontaneously heat or polymerize with release of large amounts of energy when handled or moved without adequate control;

b. A threshold limit value below 1000 ppm for gases and vapors or below 500 Mg/M3 for fumes;

c. A single oral dose causes 50% fatalities to test animals in doses of less than 500 mg/kilogram of animal weight;

d. Is a strong oxidizing or reducing agent

e. Causes first degree burns to skin in short time exposure or is systemically toxic by skin contact;

f. Normal operations produce dust, gas, fumes, vapor, mist or smoke with one or more of the above characteristics;

g Produces sensitizing or irritating effects;

h Is radioactive or

i. Has special characteristics that could cause harm to personnel if used or stored improperly; and/or

j. There is documented medical evidence that acute or chronic health effects may occur in exposed employees.

10. Health hazard. HM for which there is statistically significant evidence (based on at least one study conducted per established scientific principles) that acute or chronic health effects may occur in exposed employees. The term "health hazard" Includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, neurotoxins, and agents that damage the lungs, skin, liver, kidneys, eyes, hematopoietic systems or mucous membranes.

11. Immediately Dangerous to Life or Health (IDLH). A condition that immediately threatens loss of life or serious injury; the exposure level of any HM listed as IDLH by any U.S. agency, or ambient oxygen levels fewer than 15%.

12. Irritating Agents. Liquids or solids that, upon contact with fire or exposure to air, give off dangerous or intensely irritating fume.

13. Laboratory. A workplace where relatively small quantities of HM are used on a non-production basis; where laboratory use of chemicals occurs; where multiple chemicals or chemical procedures and manipulations are used; where protective laboratory practices and equipment are used.

14. Oxidizer. Initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

15. Physical Hazard. A combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, or unstable or water-reactive substance.

16. Pyrophoric. Ignites spontaneously in air at 1300F (54.4 C or below).

17. Reproductive Toxin. A chemical that harms reproductive capabilities including causing chromosomal damage (mutations) and effects on fetuses (teratogenesis).

18. Unstable (Reactive). Will vigorously polymerize, decompose, condense or become self-reactive under conditions of shock, pressure, or temperature.

19. Water-Reactive. Reacts with water to release a gas

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APPENDIX B

STANDARD OPERATING PROCEDURES IN LABORATORIES

1. Authority. The Occupational Safety and Health Administration (OSHA) lists basic laboratory rules and procedures in 29 CFR 1910.1450 ("The OSHA Laboratory Standard"). Per OPNAVINST 5100.23 Series and other directives these rules apply to Navy shore-based-commands, and are listed here.

2. Scope. All laboratory personnel, specific tasks may be assigned to certain employees, such as laboratory safety managers, shall be trained in the contents of this section. Supervisors are responsible for enforcing these rules.

3. Housekeeping, Maintenance, and Inspections.

a. Cleaning. Keep work areas clean and uncluttered, with chemicals and equipment properly labeled and stored. Clean up the work area at the end of an operation or workday.

b. Passageways. Do not block passageways or obstruct utility and emergency equipment. Passageways will be kept clear (minimum = 44 inches) and not be used for storage.

c. Maintenance. Test eyewash stations weekly and drench showers monthly. Record these results on the record tag and/or written in a log book or electronic database program.

d. Inspections. Department heads shall inspect their own spaces at least semi-annually for the following: housekeeping and chemical hygiene, including emergency equipment such as spill kits, eyewash stations, and safety showers. Laboratory safety managers shall assist them. Other internal NMRCDC inspections are: Safety, Respiratory Protection Program, and Hazardous Material Survey. Also, Command materiel ("zone") inspections may address safety issues at any time. External (Navy) inspections include annual Industrial Hygiene Surveys and Environmental inspections.

e. Emergencies - acute toxic exposures. Refer to the Spill Plan for specific actions with acid, caustic or organic solvent exposures during spills. Other general guidelines:

(1) Eye or skin contact: Promptly flush the affected area with water for a prolonged period (15 minutes); remove any contaminated clothing; seek immediate medical attention.

(2) Ingestion or Inhalation: Seek immediate medical attention; refer to the MSDS and medical literature for guidance.

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f. Emergencies with Spills, Fire or Explosive Threat. Activate the Command Spill Plan. Immediately evacuate the area and notify the supervisor, Safety Officer and AO for a spill of 4 liters or more of flammable liquid, 1 kg flammable solid, 100 ml or 100 gm of a carcinogenic or explosive material, or any flammable/explosive gas leak. Promptly clean up spills per the Spill Plan.

g. Departments shall report laboratory accidents on standard mishap report forms and report injuries on standard NAVOSH forms. Submit reports to the Safety Office within 3 days of the incident. Reports and analysis of accidents and spills will be distributed to appropriate Safety, department and division personnel for action or training.

5. Avoidance of Routine Exposure

a. Develop and encourage safe habits. Avoid unnecessary exposure to chemicals by any route.

b. Do not smell or taste chemicals, or apply any chemical to skin.

c. Vent apparatus that may discharge toxic chemicals (e.g. vacuum pumps, distillation columns) to exhaust ventilation. Do not release toxic chemicals into cold or warm rooms, since these have contained, re-circulated atmospheres.

d. Inspect gloves and glove boxes before each use

6. Choice of Chemicals. Use only chemicals for which the available ventilation system and personal protective equipment (PPE) is adequate. Use the minimum quantity necessary and substitute less toxic chemicals if possible.

7. Equipment, Glassware, and Pressurized Work.

a. Handle and store laboratory glassware with care to avoid damage; discard damaged laboratory glassware.

b. Shield or wrap pressurized or vacuum glassware (e.g. Dewar flasks) to contain chemicals and fragments in case of breakage.

c. Use equipment only for its designed purpose

8. Personal Laboratory Habits and Hygiene

a. Eating, smoking, drinking, chewing gum or applying cosmetics in laboratories are prohibited. Wash hands before any of these activities. Do not store, handle, or consume food or beverages in HM storage areas, do not store food or beverages in HM refrigerators, glassware, or utensils used for laboratory procedures. The use of personal cellular telephones in the laboratory is prohibited.

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b. Wash exposed skin before leaving the lab

c. Horseplay. Avoid practical jokes, which might confuse or distract another worker.

d. Mouth Pipetting and Suction No pipetting or starting a siphon by mouth is allowed.

e. Personal Apparel. Confine long hair and loose clothing. Wear closed-toe shoes (no sandals, perforated shoes, or sneakers). Remove laboratory coats immediately on significant contamination and before entering common areas.

f. Planning. Before beginning a new operation, seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment. Locate MSDS's for the chemicals you will use during the procedure.

g. Supplies. Keep only a one-day supply on working areas of laboratory benches; avoid routine storage on benches or in hoods.

9. Unattended Operations. When operations are not attended, leave lights on, place an appropriate sign on the door and provide for containment of toxic substances in the event of utility failure.

10. Use of Fume or Chemical Hood.

a. Use chemical hoods for any operation, which might release toxic vapors or dust. Use a chemical hood or other local ventilation device when working with a volatile substance with a TLV of less than 50 ppm, or with any carcinogen.

b. Confirm adequate hood performance before use. Keep the hood closed at all times except to make adjustments within the hood. Avoid storing materials in a hood and do not block vents or airflow.

c. Leave the hood "ON" when not in active use if toxic substances are in it, or if it is uncertain whether there is adequate general laboratory ventilation when it is off.

d. Do not use hood to store equipment, materials, or supplies

11. Vigilance. Be alert to unsafe conditions or practices, report them, and ensure that these deficiencies are corrected.

12. Waste Management

a. Departments shall follow Command guidelines/instructions and contact the HAZMAT Coordinator regarding waste disposal.

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b. Collection. Deposit chemical waste in labeled containers compatible with the contents; use original container when possible. Mark the date you begin to accumulate waste and identify the waste on each container. Close the containers during storage and separate incompatible wastes. Within 7 days (beginning when first placing waste into the container), notify the HAZMAT Coordinator to arrange disposal. The Supply Department shall document transactions related to waste disposal. The HAZMAT Coordinator will retain document copies and log transactions in a waste disposal log.

c. Discarding chemical stocks. Discard HM that is expired, unusable or missing labels. Small residual, diluted amounts of the following may be flushed into sewers: acid, caustic, sugar and other water-soluble organic matter, and water-soluble solvents (before putting other chemicals into sewers obtain guidance from the HAZMAT Officer or Maintenance to avoid damage to sewer systems or human injuries)

13. Corrosive agents.

a. Storage. Store amounts more than 100 g of solid or 100 ml of concentrated solution in corrosive lockers. Separate incompatible chemicals (e.g. acids and caustics). Store smaller amounts safely (e.g. in cabinets), away from eye level or where likely to be spilled.

b. Benches. Keep only a one-day supply of HM on working areas of a laboratory bench. Return to storage unused amounts and larger containers after dispensing a working amount.

c. Other safety measures. Wear appropriate PPE. If exposed (eye, skin, inhaled or swallowed), begin emergency measures per section d. ("Accidents and Spills").

14. Low-temperature Operations

a. Cold rooms and walk-in refrigerators and freezers shall have an operable, regularly inspected safety-release latch and any other provision needed for rapid escape.

b. Perform low-temperature bench work in designated, appropriate areas, with required PPE available in advance.

c. PPG. Wear the appropriate protective apparel to prevent frost burns to hands.

15. Fire, Explosion, and Electrical Hazards.

a. Stop work if there is a major threat of fire, explosion, or electrical injury. Report the threat immediately to the supervisor and other authority as needed. When the threat is from an accident or spill, follow the guidelines set forth in the NMRC Laboratory Safety Manual. Activate fire alarms with any fire or explosion.

b. Do not use flammable materials near heat and electrical sources. Use approved fire extinguishers, not water, on electrical and chemical fires.

c. Store explosive and highly reactive chemicals away from flammables and combustibles and, if possible, by themselves.

16. Working Alone. Do not work alone in a laboratory with hazardous chemicals or procedures. Inform the Security office of your location when working alone and check out when you leave.