



Langley Research Center

LPR 1710.12

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**POTENTIALLY HAZARDOUS MATERIALS-
HAZARD COMMUNICATION STANDARD**

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PREFACE

P.1 PURPOSE

- a. The purpose of this Langley Procedural Requirement (LPR) is to define organizational requirements and procedures for the safe use of potentially hazardous materials, and to facilitate compliance with regulations promulgated by the Occupational Safety and Health Administration (OSHA) and other consensus standards that may be appropriate at Langley Research Center (LaRC).
- b. These procedural requirements implement the requirements of OSHA 29 CFR 1910.1200. It outlines the procedures to be followed to obtain and maintain information on potentially hazardous materials and the requirements for training employees on the use of this information.
- c. Organizational responsibilities and administrative procedures for the acquisition and use of potentially hazardous materials are stated within this LPR, including the requirement that a permit system shall be used for potentially hazardous materials including carcinogens and highly toxic gases.
- d. General and specific health and safety information for various classes of potentially hazardous materials is included in these procedural requirements, which is intended to be used as a general reference and is not intended to necessarily furnish all information required to plan and execute the safe operation for a given material. A list of sources of additional information is maintained by the Safety and Facility Assurance Branch (SFAB), Safety and Mission Assurance Office (SMAO).
- e. The intent of this procedural requirement is not to address all procedures and laws pertaining to potentially hazardous materials, such as the Department of Transportation (DOT) shipping regulations for potentially hazardous materials sent off LaRC. For technical assistance in this area, employees shall contact:
 - (1) LaRC Transportation Officer
 - (2) Logistics Management Branch (LMB)
 - (3) Center Operations Directorate (COD)
- f. Environmental laws and requirements concerning the use, manufacture, emission, and disposal of hazardous materials are not detailed in this LPR, but are presented in LPR 8500.1, "Environmental and Energy Program Manual." For technical assistance on environmental requirements contact the Environmental Management Branch (EMB), COD.

P.2 APPLICABILITY

- a. The provisions of this procedural requirement are applicable within the LaRC organizational elements to both National Aeronautics and Space Administration (NASA) contractors, to the extent required by their contracts, and resident organizations directly concerned with the procurement, handling, use, storage, disposal, and inspection of potentially hazardous materials.
- b. The training of employees to meet the basic hazard communication and laboratory standard requirements shall be the responsibility of NASA for civil servant employees and the contracting company for contractor employees.
- c. As a minimum, contractor requirements shall be in accordance with the LaRC requirements as described in these procedural requirements.

P.3 AUTHORITY

- a. Code of Federal Regulations (CFR), Title 49, Subtitle B, Chapter 1, "Research and Special Programs Administration"
- b. Federal Supply Class (FSC), FED-STD-313C, "Material Safety Data Sheets"
- c. ANSI Z400.1, "Hazardous Industrial Chemicals - Material Safety Data Sheets (MSDS) - Preparation"
- d. ANSI Standard Z87.1, "Practice for Occupational and Educational Eye and Face Protection"
- e. Air Force Inter-service Manual 24-204, TM-38-250, NAVSUP PUB 505, MCO P4030.19H, DLA 414.3, Transportation, "Preparing Hazardous Materials for Military Air Shipments"
- f. National Fire Protection Association (NFPA) 30, "Flammable and Combustible Liquids Code"
- g. NFPA 704, "Standard System for the Identification of Hazardous Materials for Emergency Response"
- h. NFPA 77, "Recommended Practice on Static Electricity"
- i. OSHA 29 CFR, Subpart I, 1910.132, "General Requirements"
- j. OSHA 29 CFR 1910.1200, "Hazard Communication"
- k. OSHA 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories."

P.4 APPLICABLE DOCUMENTS AND FORMS

- a. Langley Policy Directive (LAPD) 1150.2, "Councils, Boards, Panels, Committees, Teams, and Groups"
- b. LAPD 1700.1, "Safety Program"
- c. LAPD 1700.2, "Safety Assignments and Responsibilities"
- d. LPR 1710.4, "Personnel Protection - Clothing and Equipment"
- e. LPR 1710.5, "Ionizing Radiation"

- f. LPR 1710.7, "Handling and Use of Explosives"
- g. LPR 1710.13. "Chemical Hygiene Plan"
- h. LPR 1740.6, "Personnel Safety Certification"
- i. LPR 8500.1, "Environmental and Energy Program Manual"
- j. LPR 8715.12, "LaRC Integrated Spill Contingency Plan"
- k. Langley Management System (LMS) CP-1710, "Student Researchers Process"
- l. LMS-CP-4505, "Purchase Requisition (PR) Initiation/Modification/Cancellation and Supporting Documentation"
- m. LMS-CP-4540, "Purchase Card"
- n. LMS-CP-4703, "Review of Purchase Requisitions by the Safety and Mission Assurance Office (SMAO)"
- o. LMS-CP-4759, "Acquisition of Hazardous Materials"
- p. LMS-CP-4760, "Reporting Injuries, Illnesses, Compensation Claims and Unsafe Working Conditions"
- q. Langley Form (LF) 44, "Hazardous Material--Procurement, Inventory, and Storage Record"
- r. LF 52, "Shipping/Transfer Document"
- s. LF 62, "Chemical Worker's Certification Card"
- t. LF 66, "Worker Appointment and Certification Form"
- u. LF 118, "Safety Permit Request - Hazardous Material"
- v. LF 131, "Receipt and Inspection Report (Non-stocked Items)"
- w. LF 163, "Waste Material Data Sheet"
- x. LF 175, "Material Safety Data Sheet Review Request"
- y. LF 180, "Biological Agent Review Form"
- z. LF 367, "Hazardous Material/Chemical Stability and Reactivity Data Sheet"
- aa. LF 381, "Laboratory Specific Chemical Hygiene Plan (CHP)"
- bb. LF 498, "Safety Permit"
- cc. Matheson Gas Data Book, "Handbook of Compressed Gas," "Encyclopedia of Chemical Technology"
- dd. National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards
- ee. National Science Foundation, Article 49, "Government Performance and Results Act"
- ff. OSHA Form 174, "Material Safety Data Sheet"

P.5 MEASUREMENT/VERIFICATION

NONE

P.6 CANCELLATION

LPR 1710.12 dated June 22, 2006.

Original signed on file

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Distribution:

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Chapter 1

1. INTRODUCTION

1.1 PHM Definition.

Potentially hazardous materials (PHM) are defined as any substance having intrinsic properties, which can pose a risk of injury or illness to personnel or of destruction to property. That is, any material which is a health or physical hazard. Specifically, provisions of these procedural requirements are applicable to materials having toxic, flammable, corrosive, cryogenic, or asphyxiation properties. Radioactive and explosive materials are not included as they are covered in LPR 1710.5 and LPR 1710.7 respectively.

1.2 PHM OSHA Definition.

PHM includes those substances defined by the OSHA as hazardous chemicals. The OSHA definition includes as hazardous chemicals those for which there is statistically significant evidence, based on at least one study, conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. OSHA includes in its definition hazardous chemicals which are:

- a. Carcinogens
- b. Toxic or highly toxic agents
- c. Reproductive toxins
- d. Irritants, corrosives
- e. Sensitizers
- f. Hepatotoxins
- g. Nephrotoxins
- h. Neurotoxins
- i. Agents which act on the hematopoietic systems
- j. Agents which damage the lungs, skin, eyes, or mucous membranes

Note: Reference OSHA 29 CFR 1910.1450, LPR 1710.13.

1.3 Records

1.3.1 The following forms are completed when implementing requirements:

- a. LF 44, "Hazardous Material--Procurement, Inventory, and Storage Record"
- b. LF 52, "Shipping/Transfer Document"
- c. LF 62, "Chemical Worker's Certification Card"
- d. LF 66, "Worker Appointment and Certification Form"
- e. LF 118, "Safety Permit Request - Hazardous Material"
- f. LF 131, "Receipt and Inspection Report (Non-stocked Items)"
- g. LF 163, "Waste Material Data Sheet"
- h. LF 175, "Material Safety Data Sheet Review Request"
- i. LF 498, "Safety Permit"

Chapter 2

2. RESPONSIBILITIES

2.1 Potentially Hazardous Materials Committee

2.1.1 The Potentially Hazardous Materials Committee (PHMC) is established under the authority of LAPD 1700.1 and LAPD 1150.2.

2.1.1.1 Any member of this committee is authorized to investigate any questionable use of a PHM, act in the name of the Center Director to stop work or to prevent use of the material, which is considered unsafe, and initiate action to eliminate the unsafe condition.

2.1.1.1.1 Such action shall be documented within 24 hours by formal letter to the Chairperson, PHMC.

2.1.1.1.2 If line management is not in agreement with the corrective action recommended by the official who stopped the work, these reasons shall be submitted to the Chairperson of the Executive Safety Council (ESC).

2.1.1.1.3 The Chairperson, ESC shall make an appropriate review.

2.1.1.1.4 In these cases, work shall not resume without the approval of the Chairperson, ESC.

2.1.2 Due to the need for the PHMC to maintain an overview of operations at LaRC involving PHMs, a review system has been established.

2.1.2.1 This review system includes LF 498 which is described in Chapter 5 of this procedural requirement.

2.1.2.2 LF 498s shall be required before operations commence.

2.1.2.3 The PHMC shall also overview the activities of the Explosives Support Engineer for control of pyrotechnic materials.

2.1.3 Structure and Organization

2.1.3.1 The PHMC functions as a committee of the ESC. Its position in the organization for control of PHMs is shown in Figure 2.1.

2.1.3.2 Committee members, including the Chairperson, shall be appointed by the ESC, by virtue of their technical and/or educational expertise in such areas as chemistry, hazardous gases, and compatibility of materials.

2.1.3.3 Members are appointed to serve for a 3-year term.

2.1.3.4 During the first meeting of a new calendar year, the committee shall elect a committee secretary from its full membership.

2.1.3.5 The committee secretary's responsibilities include preparing and distributing committee minutes in addition to all other functional responsibilities.

2.1.3.6 Representatives of the SFAB, SMAO shall serve as members of the committee.

2.1.3.7 This representation shall consist of the SFAB Industrial Hygiene (IH) staff and the LaRC Safety Manager or his/her designated representative.

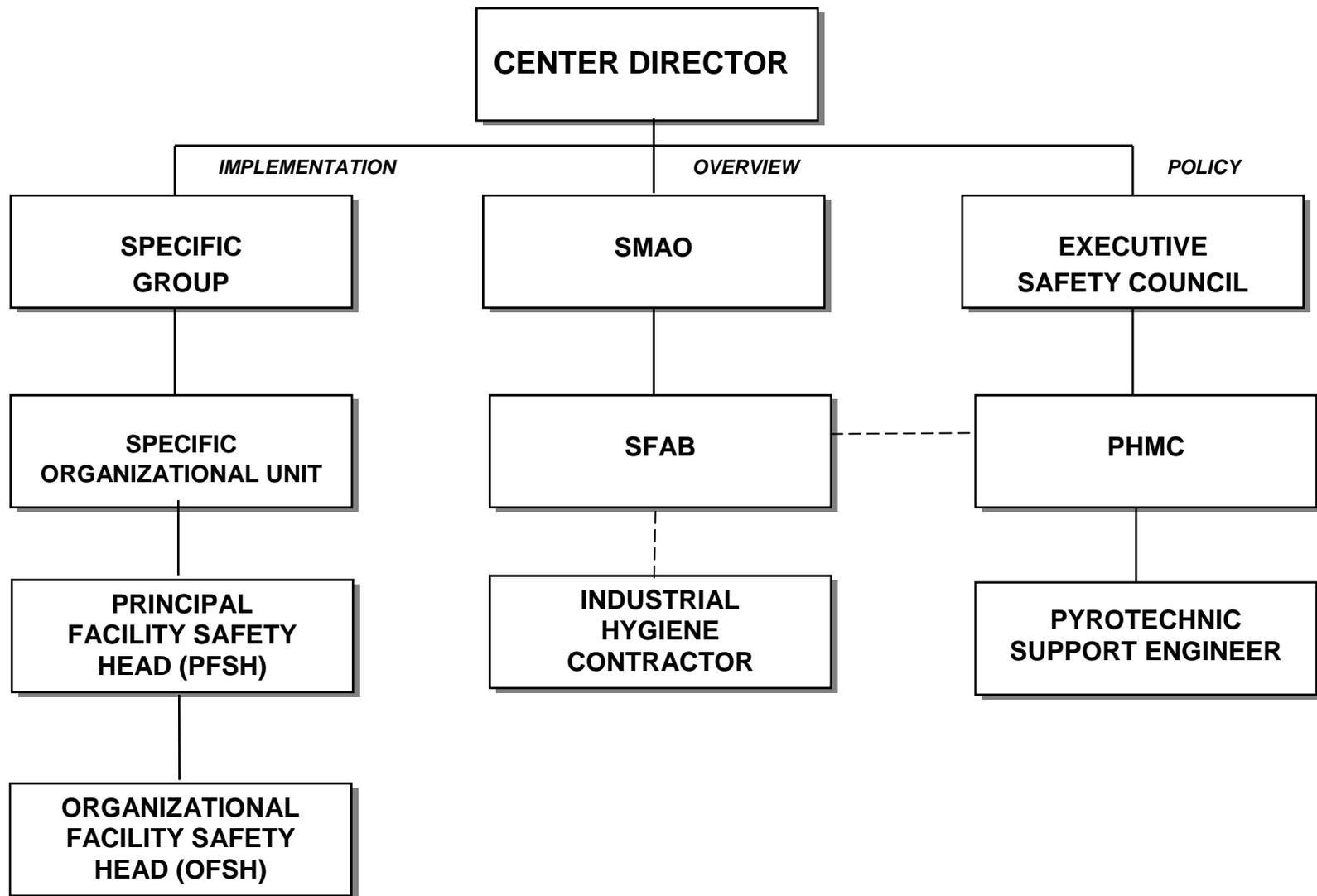


Figure 2.1, LaRC Organization for Control of Potentially Hazardous Materials.

2.1.4 Duties and Responsibilities.

2.1.4.1 The duties and responsibilities of the committee are set forth in LAPD 1150.2.

2.1.4.2 The committee functions as a review and guidance body providing recommendations in applicable areas as required.

2.1.4.3 The committee shall:

- a. Prepare and distribute minutes of committee meetings, which shall contain, as a minimum, a record of persons present and a description of matters discussed and conclusions reached including the opinions of dissenting members, and copies of all reports issued or approved by the committee.
- b. Distribute minutes to all members, the affected operations personnel, the Chairperson, ESC, and the Director, SMAO.
- c. Carry on official correspondence for the committee as needed.

2.1.4.2 Committee members shall:

- a. Be cognizant of matters pertaining to use of PHMs at LaRC. This is chiefly, but not entirely, achieved by attending the committee meetings and participating in the decisions made by the committee.
- b. Serve on ad hoc committees, which are appointed by the Chairperson as needed.

2.2 Safety and Health Functions

2.2.1 The primary responsibility for the safe use of PHMs lies with the individual user. Although this responsibility cannot be delegated, various LaRC functions provide planning, management, and assistance.

2.2.2 Facility Safety Head (FSH)

2.2.2.1 The prime responsibilities of the FSH are the safe operation of the research apparatus and maintenance of a safe working environment.

2.2.2.2 The FSH shall be responsible for:

- a. The establishment and use of normal and emergency operating procedures.
- b. Configuration control.
- c. Safety training.
- d. Preventative maintenance.
- e. Other traditional institutional types of safety considerations.

2.2.2.3 The FSH may appoint an Organizational Facility Safety Head (OFSH) for each operation that is functionally distinct. Procedures for appointments are provided in LAPD 1700.2, "Safety Assignments."

2.2.2.3.1 The FSH or OFSH shall, in each case, be a representative of line management who is thoroughly familiar with the operation.

2.2.2.4 FSHs and/or OFSHs shall be familiar with any LF 498s issued for their facilities.

2.2.2.4.1 For laboratories operating under a Chemical Hygiene Plan (CHP), the FSH shall be the Chemical Hygiene Officer(CHO).

2.2.2.4.2 The CHO is an employee who is qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the CHP and applicable LF 498s. Guidance on development of a CHP is in LPR 1710.13 "Chemical Hygiene Plan."

2.2.2.5 Interfaces

2.2.2.5.1 The FSH or OFSH of the facility where the PHM is to be used shall be the first point of contact for the individual who has the need for the procurement, use, storage, or disposal of a PHM.

2.2.2.5.2 The first point of contact for the FSH or OFSH for assistance with use of PHMs shall be the SFAB IH staff.

2.2.2.6 Responsibilities

2.2.2.6.1 The basic responsibilities of the FSH or OFSH are described in LAPD 1700.2. The FSH or OFSH shall implement these requirements for the safe use of PHMs:

- a. Establish and review normal and emergency operating procedures.
 - (1) These procedures shall include cleanup of Class I ("Integrated Spill Contingency Plan") spills by facility personnel (normally, the using agency).
 - (2) All Class II spills shall be reported to the LaRC Emergency Dispatcher to initiate spill response.
 - (3) The emergency Dispatcher will then notify the LaRC Fire Chief who shall make notifications to other departments (including the LaRC Safety manager) as appropriate.
 - (4) Electronic copies of MSDSs shall be submitted to the LaRC MSDS on-line library in accordance with Chapter 4 of these procedural requirements and LPR 8500.1.
- b. Supervise and coordinate the procurement, use, storage, and disposal of PHMs. Requirements for the initial identification and procurement of hazardous materials is contained in this chapter of this procedural requirement. Disposal is covered in detail in LPR 8500.1 and is mentioned in Chapter 6 of these procedural requirements.
- c. Review and approve or reject LF44s as part of the procurement process.

- d. Maintain an inventory of hazardous materials using the Center's web-based Chemical Material Tracking System (CMTS). Specific requirements are covered in LPR 8500.1, Chapter 19.
- e. Maintain a file of Material Safety Data Sheets (MSDSs), (see Chapter 4) of all PHMs used in the facility.
 - (1) This MSDS file shall be one central file, (several small files for separate work areas in a large facility are permitted).
 - (2) The FSH shall determine the appropriate file location(s).
 - (3) Requirements for these files are as follows:
 - (a) These files shall include all appropriate MSDSs.

Note: For example, several containers of 100 percent acetone (even if from multiple vendors) need only one MSDS since acetone's chemical makeup does not vary. However, files for the generic class "cleaning solvent" or class "black enamel paint, spray, 16 ounce," may contain several MSDSs for each of these items because several vendors may have supplied similar materials. The MSDS may vary from vendor to vendor since the chemicals, and hazards, will differ.

- (1) Each potentially hazardous chemical present shall require a MSDS. This MSDS requirement includes "free" vendor samples as well as LaRC research and development test chemicals in use outside of their manufacturing location (e.g., laboratory hood, batch processor).
 - (b) The MSDS file(s) shall be accessible to all employees working in the facility and its location(s) shall be made known.
 - (c) Exceptions exist for the maintenance of MSDS files under the chemical laboratory standard.
 - (d) Laboratories operating under an LF 498 shall maintain documentation on basic hazardous materials produced. The chemical laboratory safety program relies on process control through procedures, rather than identification of all hazardous components.
 - (e) Hazardous materials including research and development chemicals produced for processing or evaluation in facilities other than the point of manufacture shall have a MSDS completed, with one copy being forwarded for hazard review to the SFAB IH staff for PHMC and SFAB, SMAO review (See Chapter 4).
- f. Ensure that all employees who routinely work in the facility are aware of the physical or chemical hazards of the materials with which they routinely work, and other hazardous materials in the facility that they may encounter in any foreseeable emergency.
- (1) For facilities with highly toxic substances in use or in storage, visitors shall be apprised of special facility emergency procedures in the event of leaks or spills.
 - (2) For example, if warning lights are used to indicate hazardous conditions, visitors (including other on-site LaRC personnel who may periodically enter

the facility) shall be informed of the meaning of the warning light and appropriate actions.

- (3) Warning lights, bells, and so forth, shall include signs indicating the purpose of the alarm (e.g., "Fluorine Gas Alarm").
- g. Provide or acquire periodic refresher training for workers whenever significant changes occur for chemicals in use in the facility.
- h. Maintain a current list of employees in the organization who are trained and certified to use materials under LF 498 (Chapter 5).
- i. Class II spills shall be reported to the LaRC Emergency Dispatcher to initiate spill response.
- j. Accompany SFAB, SMAO, personnel and representatives during all surveys and audits of the organization.

2.2.3 Facility Coordinator (FC)

2.2.3.1 In the absence of the FSH, the FC shall accompany SFAB, SMAO personnel during surveys and audits of the organization.

2.2.4 SFAB Industrial Hygiene Staff

2.2.4.1 The SFAB IH staff has specific interfaces and responsibilities with regard to PHMs. The SFAB IH staff shall be comprised of individuals who are Certified Industrial Hygienists by the American Board of Industrial Hygiene.

2.2.4.2 Interfaces

2.2.4.2.1 The SFAB IH staff reports directly to the LaRC Safety Manager and serves on the PHMC. The SFAB IH staff shall be the primary committee contact for on-site users of PHMs.

2.2.4.4 Responsibilities

2.2.4.4.1 The SFAB IH staff shall:

- a. Provide technical and administrative guidance to LaRC personnel for the safe use of PHMs where such material may pose a health hazard.
- b. Assist personnel in the interpretation of MSDS technical data.
- c. Provide monitoring services to document personnel exposures.
 - (1) Results of these surveys shall be provided to the individual (or to the facility for posting) within 15 business days of receipt of results of laboratory analysis.
- d. Perform pre-operational surveys to identify potential health hazards and recommend control procedures.
 - (1) This shall include assisting in the determination of industrial ventilation to control health hazards.

- e. Perform periodic inspections to assure the effectiveness of control procedures and identify the need for an LF 498.
 - (1) Ventilation systems (fume hoods and paint booths) used to control health hazards shall be surveyed annually.
 - (2) Audit all LF 498s at least annually for compliance and report results to the PHMC.
- f. Provide training and indoctrination of personnel in health hazard control measures such as personal protective equipment (e.g., respirators, gloves).
- g. Review PHM PRs for compatibility with approved policies and procedures and to help identify changes in use, which may require new or additional health hazard control measures.
- h. Advise the LaRC Safety Manager of non-health related hazards associated with the use of PHMs.
- i. Advise the PHMC, the Occupational Health Services (OHS), and SFAB, SMAO of developments in statutory requirements and standards of good practice for the control of PHMs where such materials may pose health hazards.
- j. Supply MSDSs, to the LF 44 Coordinator, from MSDS databases or assist in the acquisition and technical interpretation of proprietary or trade secret MSDS information.
- k. Review and approve or reject LF 44s as part of the PHM procurement process.

2.2.5 LaRC Safety Manager (Head, SFAB, SMAO)

2.2.5.1 The LaRC Safety Manager has specific interfaces and responsibilities with regard to PHMs.

2.2.5.2 Interfaces

2.2.5.2.1 The LaRC Safety Manager shall:

- a. Report directly to the Director, SMAO
- b. Serve on the PHMC as a member (or assign a designee)
- c. Be the principal LaRC contact with federal safety and health regulatory agencies.

2.2.5.3 Responsibilities

2.2.5.3.1 The responsibilities of the LaRC Safety Manager are described in LAPD 1700.2. The LaRC Safety Manager's responsibilities for the safe use of PHMs shall include:

- a. Provide technical and administrative guidance for the safe storage and use of PHMs where such material poses hazards not primarily health related.
- b. Ensure the SFAB IH staff conducts pre-operational reviews of new PHM activities to identify hazards and their control procedures.
- c. Use annual facility safety and health audits to assure the effectiveness of the LF 498 control measures.

- d. Review training data and/or provide training and indoctrination of personnel through the SFAB IH staff, as needed, to assure understanding of the LaRC hazard communication requirements.
- e. Serve as the final reviewing and/or certifying authority for the following:
 - (1) LF 66
 - (2) LF 44
 - (3) LF 498
- f. Provide assistance to facility personnel in Class II spills control (Class II spills are environmentally reportable) through the use of supplies and manpower available on-site or through prior planning and arrangements by SFAB, SMAO with off-site response teams. These activities are outlined in LPR 8715.12 "Integrated Spill Contingency Plan," and LPR 8500.1, "Environmental and Energy Program Manual."

2.2.6 LaRC Safety Manager Designated Representative, SFAB, SMAO

2.2.6.1 In the absence of the LaRC Safety Manager in matters regarding PHMs, full signature authority shall be granted to the LaRC Safety Manager's designated representative.

2.2.7 Occupational Health Services

2.2.7.1 The Office of Human Capital Management (OHCM) through the Occupational Health Officer (OHO) and the OHS contractor shall be the primary contact for LaRC employees for matters relating to occupational health. Responsibilities are described in LAPD 1700.2, "Safety Assignments."

2.2.7.2 The Director, OHCM shall implement these responsibilities for the safe use of PHMs:

- a. Recommend and implement medical surveillance of users of PHMs
- b. Maintain appropriate records of such surveillance
- c. Serve as a qualifying official on LF 66
- d. Stay alert for adverse health incidents, such as possible chemical related contact dermatitis, involving PHMs

2.2.8 Logistics Management Branch (LMB), Capital Assets Management (CAM)

2.2.8.1 The CAM shall ensure the LMB:

- a. Maintains a file of MSDSs for all materials available through the stores stock, and provide a copy of the MSDS to users upon chemical issue.
- b. Transmits a copy of the MSDS provided by suppliers for materials obtained by PR to users.
- c. Attaches NFPA 704A labels to items issued from supply.
- d. Only issue store stock items that have an approved LF 44.

2.2.9 Employee Responsibilities

2.2.9.1 Employees shall:

- a. Participate in training.
 - (1) The Office of Human Capital Management (OHCM) shall incorporate basic hazard communication training information into its NASA LaRC employee indoctrination program.
- b. Review MSDSs prior to using PHMs.
 - (1) New MSDSs on existing materials from vendors shall be changed when the ingredients are changed or technical information is changed.
 - (2) New MSDSs shall be reviewed when received.
- c. Not cover or mark any warning labels used on containers or products received or in use. For transfers to other containers, place labels or legibly mark the containers with the LaRC warning label and the name of the PHM.

(NOTE: This marking is not required if the transfer container is used immediately [usually within a few minutes] in the process.)

2.3 Off Standard Hours Laboratory Work

2.3.1 Standard-shift working hours for laboratory areas are between 6:00 am and 6:00 pm, Monday through Friday, excluding holidays.

2.3.1.1 During off standard hours, employees shall not be alone when conducting their work.

2.3.1.2 Laboratory procedures performed outside of the standard shift are affected by the following requirements:

- a. Routine laboratory operations are permitted during off standard working hours if the “buddy system” is used.
 - (1) The “buddy system” requires having a designated, qualified LaRC employee or “buddy” present in the area that will remain in the same laboratory/room as the employee performing the laboratory operation.
 - (2) The FSH or Branch Head shall maintain a list of qualified persons who may act as a “buddy.” Examples of routine laboratory operations include wet chemistry, film casting, composite preparations, hydraulic systems, any machinery or shop equipment, and permitted operations.
 - (3) Questions concerning whether an operation requires use of the “buddy system” shall be referred to the FSH.

- b. Non-hazardous laboratory operations not requiring the “buddy system” during off standard hours shall be limited to non-invasive type tasks such as making visual checks of experimental apparatus, turning instruments or controls on or off, and data recording.
 - (1) Characterization experiments also shall be performed if the procedure does not involve the handling of hazardous materials (e.g., liquid nitrogen).
- c. All office work is permitted during off standard hours and shall not require using the “buddy system.” Employees performing office work during off standard working hours are reminded to adhere to the Center’s security and safety procedures.
- d. Non-emergency assistance during off standard working hours shall be obtained by calling the Duty Officer at 864-4927. Medical and fire emergency assistance may be obtained by calling 911 from any Center phone or 864-2222 from a cellular phone.

Chapter 3**3. ACQUISITION, RECEIPT, HANDLING, STORAGE, MARKING, PRESERVATION AND DELIVERY OF POTENTIALLY HAZARDOUS MATERIAL****3.1 Procedural Requirements for the Procurement, Acquisition, and on site Transfer of PHMs and MSDS.**

3.1.1 This chapter describes the procedural requirements for the procurement, acquisition, and on site transfer of PHMs and MSDSs.

3.1.2 PHM may be brought on site and stored or used in facilities after approval of the LF 44. Procedures for the shipment of PHMs off-site are briefly outlined in Chapter 6 of this procedural requirement.

3.1.3 Requirements for the storage of PHMs at LaRC are also briefly outlined in Chapter 6.

3.2 Acquisition and Transfer of Potentially Hazardous Material

3.2.1 Refer to LMS Center Procedures (CP) 4505, "Purchase Requisition (PR) Initiation/Modification/Cancellation and Supporting Documentation," LMS-CP-4540, "Purchase Card," LMS-CP-4703, "Review of Purchase Requisitions by the Safety and Mission Assurance Office (SMAO)," and LMS-CP-4759, "Acquisition of Hazardous Materials." These CPs shall be followed for all PHMs brought on-site including purchasing from commercial sources, through contractor sources, research and development engineering samples, and commercial product samples including free and/or complimentary samples.

3.2.1.1 All PHMs brought on-site shall have an MSDS.

3.2.1.1.1 An electronic copy of each MSDS shall be submitted to the LaRC MSDS on-line and tracked in CMTS in accordance with Chapter 19 of LPR 8500.1 and LMS-CP-4759.

3.2.1.1.2 If new containers of existing materials/products from vendors are obtained and include a change in formulation or technical information, a new MSDS shall be collected and associated with the new container (older containers must remain associated with the MSDS version with which they came).

3.2.2 The use of facility maintenance PHMs (e.g., solvent, paints, hydraulic fluids) and cleaning supplies are normally done by on-site contractors.

3.2.2.1 Electronic LF 44s and MSDSs shall not be required for the transfer of maintenance or custodial PHMs between the operating site MSDS file and files at individual job sites.

3.2.2.2 These support contractors shall provide appropriate PHM MSDSs for material in use or stored in the facility to FSHs or their representatives.

3.3 Identification of Hazardous Items By Federal Supply Class

3.3.1 Federal Supply Class (FSC), FED-STD-313C, "Material Safety Data Sheets," contains lists identifying hazardous items.

3.3.1.1 Any FSC item could contain a PHM.

3.3.1.2 The listings in Tables I and II of FED-STD-313C are not intended to be inclusive listings of all hazardous items, but to identify the major classes, which contain PHMs and provide examples of hazardous items in other classes.

3.3.1.3 Contact the SFAB IH staff to obtain the most recent version of these Tables.

3.3.2 MSDSs shall be submitted for all items in the FSC-STD-313C, Table I.

3.3.2.1 MSDSs shall be submitted for the PHMs in FSC-STD-313C not listed in Table I.

3.3.2.2 Some examples of PHMs in other FSC are listed in Table II of FSC-STD-313C.

3.4 Procedure for Acquisition, Receipt, Storage, Issue and Disposal of Hazardous Materials

3.4.1 Acquisition

3.4.1.1 The following procedures shall be used for the acquisition of PHMs. The process for purchasing hazardous material is described within this chapter.

3.4.1.2 NASA Purchase Requisition and SAP.

3.4.1.2.1 Refer to LMS-CP-4505 for specific instructions for NASA Purchase Requisition and SAP.

3.4.1.3 Refer to LMS-CP-4759 for specific instructions on obtaining procurement permission and for material tracking.

3.4.1.4 Refer to LMS-CP-4540 for specific instructions on NASA Procurement Card Order.

3.4.1.5 Contractor Purchase.

3.4.1.5.1 Contractor order, procurement, handling, and disposal of PHMs shall be done in accordance with the Statement of Work (SOW), the terms/conditions of the contract, and the requirements in this section.

3.4.1.6 Free Engineering Samples.

3.4.1.6.1 Many companies will send free samples of materials they normally only sell in bulk quantities. The following method shall be used if the user needs only a small amount of material to test for an application and the supplier is willing to send a free sample:

- a. LF 44 and a MSDS shall be used for this transaction. Be sure to indicate in the obtained by box of the LF 44 that the material is a free sample.
- b. Provide the vendor with an accurate delivery location within your facility, which shall not include office areas.
- c. Receipt of free engineering samples shall be conducted by Receiving or by the individual, depending on where the item was sent.
- d. Notify the FSH (or designated Hazardous Material Inventory Manager) when the item is received so it can be added to the facility chemical inventory.

Note: For more information contact the SFAB IH staff.

3.4.2 Transfer of Hazardous Materials Between NASA Langley Research Center Facilities.

3.4.2.1 Refer to LMS-CP-4759 for further instructions.

3.4.2.2 Shipping Hazardous Materials to an Off-Site Location.

3.4.2.2.1 When a hazardous material must be shipped to an off-site location, use LF 52, LF 44, and a MSDS.

3.4.2.2.2 If the item is research material, a MSDS shall be prepared prior to delivery of the material to the Shipping Office (Chapter 4). For more information contact the Shipping Office or the CMTS Administrator.

3.4.2.3 Transfer of Hazardous Materials to and from an Off-site Location

3.4.2.3.1 Personally transporting PHMs to an outside source shall not be permitted.

3.4.2.3.1 If at all possible, these products shall be shipped off-site.

3.4.2.3.2 Personally transporting PHMs from an outside source shall not be permitted.

3.4.2.3.3 If at all possible, these products shall be shipped.

Chapter 4**4. MATERIAL SAFETY DATA SHEET (MSDS)****4.1 Technical Assistance for MSDSs.**

This chapter contains information for technical assistance in the preparation of MSDSs. The format presented meets basic OSHA requirements and is in accordance with ANSI Z400.1, "Hazardous Industrial Chemicals - Material Safety Data Sheets - Preparation" requirements. Different countries may have additional technical or procedural requirements for this type of information. All LaRC created MSDSs shall be entered in the CMTS. LaRC created MSDSs should be sent to CMTS administrator at cmts@larc.nasa.gov.

4.2 MSDSs are Required for all PHMs.

4.2.1 A copy of the MSDS for each PHM used in facility research or maintenance operations shall be readily accessible to employees in that facility.

4.2.2 The location and set up of MSDS files shall be the responsibility of FSHs. PHMs include metals, solvents, paints and fiberglass.

Note: Review Paragraph 4.8 of this section of "Material Safety Data Sheets," for additional information on which materials require MSDSs.

4.3 MSDS Recordkeeping.

4.3.1 MSDS recordkeeping of facility cleaning and maintenance PHM (including solvents, paints, and hydraulic fluids) is normally done by on-site contractors.

4.3.1.1 These contractor operations can maintain either a central operating site MSDS file or files at individual job sites.

4.3.2 These support contractors shall provide appropriate PHM MSDSs for materials in use or stored in the facility to FSHs or their representative, if requested.

4.4 PHM for LaRC Supply Stock.

4.4.1 For PHM requested by the facility from LaRC supply stock, MSDS information shall be maintained and forwarded by supply personnel when requested by the facility.

4.4.2 An LF 44 shall be noted in the supply catalog when required.

4.5 Trade Secret and Proprietary MSDSs.

4.5.1 Trade secret and proprietary MSDSs exist and their access and distribution is limited (under OSHA regulations) to medical and other selected personnel.

4.5.2 In these situations, the SFAB IH staff shall be contacted to acquire the necessary information to assist in working with authorized personnel to determine safe use of the materials planned for use.

4.5.3 MSDSs so acquired shall be maintained by the SFAB IH staff.

4.6 Preparation of MSDS for Center-Developed Materials

4.6.1 Though a complete MSDS is not required for materials transferred between facilities on Center, communication of basic hazard warning information shall be provided.

4.6.2 MSDSs shall be required by off-site facilities using the material in other applications.

4.6.3 These MSDSs shall be shipped with the material, in compliance with OSHA standards 29 CFR 1910.1200 and 29 CFR 1910.1450.

4.6.4 All MSDSs prepared shall be reviewed by SFAB IH staff, LaRC Safety Manager, and the PHMC.

4.6.5 MSDSs shall be forwarded to the LaRC Safety Manager to start this process.

4.6.6 Copies of the reviewed MSDSs shall be maintained by the LaRC Safety Manager's staff.

4.6.7 The 24-hour emergency point of contact required by OSHA shall be the Emergency Dispatch Officer at the Fire Department.

4.6.8 The Fire Department provides a telephone service only and shall forward emergency calls to the MSDS preparer (IH or responsible researcher) on the item.

4.7 NASA LaRC MSDS Library

4.7.1 The EMB shall maintain an electronic library of MSDSs for all known PHMs at the Center through the CMTS.

4.7.1.1 Information from MSDSs along with inventory information collected in the CMTS shall be used to perform calculations for regulatory reports.

4.7.1.2 These reports shall be submitted to federal, state, and local agencies to keep the Center in compliance with environmental as well as health and safety regulations and permits.

4.7.1.3 The procedures for accessing, searching, and adding MSDSs to the MSDS Library are described herein.

4.7.2 Accessing and Searching the Library.

4.7.2.1 The Library can be accessed by anyone at the Center on-line at <http://emis/cmts/>

4.7.2.2 Instructions on how to use the Library are on-line or you may contact the CMTS Administrator at the following e-mail address cmts@larc.nasa.gov.

4.7.3 Adding MSDSs to the Library.

4.7.3.1 LaRC continues to purchase new items to accomplish its research mission. In order to keep the Center's MSDS Library up-to-date, Center personnel shall ensure that MSDSs for new materials are submitted to EMB for entry.

4.7.3.2 A MSDS shall be submitted for entry to the MSDS Library one of the following ways:

- a. Mail a copy of the MSDS to the CMTS Administrator at MS 217.
- b. E-mail an electronic copy of the MSDS to the CMTS Administrator at cmts@larc.nasa.gov.

4.8 Scope and Application

4.8.1 OSHA 29 CFR 1910.1200 defines the requirements by which MSDSs shall be prepared for chemicals or mixtures of chemicals that are hazardous.

4.8.1.1 MSDSs shall be prepared for all hazardous:

- a. Materials and chemicals
- b. Resins
- c. Adhesives
- d. Powders
- e. Fibers
- f. Prepreg
- g. Towpreg
- h. Abrasive materials
- i. Ceramic powders
- j. Metal alloys
- k. Foams
- l. Colloids
- m. Solutions
- n. Oils and lubricants
- o. Gases produced by NASA or on-site contract employees

4.8.1.2 MSDSs shall be required to transfer materials off-site regardless of quantity.

4.8.2 Preparation of a MSDS shall require specific information on the ingredients of a newly developed material.

4.8.2.1 Because review of a MSDS will take approximately 30 days, it is necessary for researchers and engineers to anticipate the need for MSDSs prior to shipment of their product off-site.

4.8.2.2 MSDSs shall be prepared in advance for materials that may be needed for technology transfer operations.

4.8.3 This chapter shall be used by persons responsible for developing MSDSs for chemicals produced at NASA LaRC.

4.8.3.1 This step-by-step procedural requirement shall aid in the preparation of MSDSs for materials that are invented on-site.

4.8.3.2 Because the information included in a MSDS is from many diverse areas, a team approach shall be used to produce the MSDS, with researchers and engineers collaborating with IHs, occupational physicians, environmental and fire safety engineers, and the shipping officials who have regulatory knowledge in their appropriate fields.

4.8.3.3 The generator (or responsible researcher) of the material shall have primary responsibility for the initiation and review of the MSDS with contributions made from a number of different individuals.

4.8.3.4 When the final document is completed, an LF 175 shall be attached to the document and sent for approval to the Chairperson of the PHMC.

4.8.4 A MSDS template, LF 367, Hazardous Material/Chemical Stability and Reactivity Data Sheet, has been developed to standardize the MSDSs being produced at LaRC. Unknown or unavailable information or data shall be indicated as such. Information in this document has been taken from ANSI Z400.1 and many of the terms and acronyms used here are found in the glossary of that document. The full document contains many useful examples of phrases that may be used in the sections below.

Chapter 5**5. POTENTIALLY HAZARDOUS MATERIAL PERMIT PROCESS****5.1 Preparation of LF 498s, Safety Permits.**

5.1.1 LF 498s, Safety Permit, issued for PHMs shall be one of the administrative controls available to identify the employees and procedures in use for higher risk PHM operation.

5.1.1.1 The need for and use of LF 498, Safety Permit, shall be determined by the FSH and/or the LaRC Safety Manager.

5.1.2 All materials for which OSHA has promulgated a standard based on carcinogenic potential of the material shall be considered for LF 498.

5.1.2.1 Conditions of use, storage and quantity of material used shall be considered when determining the need for a PHM permit.

5.1.2.2 Other potentially high risk PHM where an LF 498 shall be needed are those materials for which data are not fully available.

5.1.2.3 These include research and development research material where toxicity data are limited (including pre-preg material still under research and development and laser dyes). Further information on high hazard material is presented in Chapters 6 and LPR 1710.13.

5.1.3 CHPs shall be used in all laboratories that routinely synthesize chemicals. Laboratory specific CHPs shall be developed in accordance with LPR 1710.13.

5.1.3.1 Process controls and procedures, rather than PHM specific MSDSs, shall be used to manage the risks from the PHM and their chemical intermediaries.

5.1.4 The PHMC or the LaRC Safety Manager shall also require submission of LF 118, "Safety Permit Request - Hazardous Material," and issuance of an LF 498 to use any material it deems significantly hazardous.

5.1.5. LF 498s shall be used to standardize procedures and identify training and personnel involved with high-risk operations associated with PHM.

5.1.5.1 Other options permitted for determining the same risk reduction controls shall be to use other committees of functional risk management organizations available at LaRC.

5.1.5.2 These include the Systems Operation Committee (SOC) and/or the Configuration Management Program (CMP), however the use of SOC and CMP to determine risk reduction controls does not alleviate the requirement for an LF 498.

5.1.5.3 The FSH and/or the LaRC Safety Manager shall determine which of these techniques or combination of programs are best for the situation under consideration.

5.1.5.4 These individuals shall disapprove operations or procedures where they consider the risks to be unacceptable and not issue an LF 498.

5.1.6 The FSH or designated representative, such as the OFSH, shall:

- a. Complete LF 118 and LF 66.
- b. Submit to the Safety Office for each person actively involved in the operation.

5.1.6.1 After completion of any special training or medical requirements, these workers shall be certified as "Chemical Workers" under LF 498.

5.1.7 After review and approval, LF 498 shall be issued to the facility.

5.1.7.1 LF 62, "Chemical Worker's Certification Card" shall be issued to each qualified employee.

5.1.7.2 The worker shall have the card on-hand or readily accessible, as proof of his/her certification, while conducting applicable tasks.

5.1.7.3 The cards shall be revalidated annually by the SFAB IH staff, immediate supervisor and the LaRC Safety Manager.

5.1.8 LF 118 shall be prepared by the FSH, the lead test engineer and/or the researcher performing the work.

5.1.8.1 All LF 118s shall be reviewed and resubmitted by the PFSH who has overall responsibility for the entire facility safety program.

5.2 ELEMENTS REQUIRED TO OBTAIN A SAFETY PERMIT

5.2.1 A summary of topics to consider during the preparation of LF 118 are as follows:

- a. Brief description of activity objectives,
- b. Brief description of the PHM or process to be controlled,
- c. Type and amounts of material present (maximum at site), and
- d. Amount of material in use during the process (including hazardous material quantity, application rate, flow),

- e. List of all operators in the controlled area during use of PHM and their operator responsibilities,
- f. Additional training planned for use of PHM named in LF 498.
 - (1) The minimum training in accordance with LF 498 procedures shall be required for each individual named. For example, if LaRC safety videos (such as Gloves for Composite Materials) are required, describe the additional training to be required.
- g. Regulatory requirements:
 - (1) LF 66 for each civil servant shall be forwarded with LF 118. These forms document training and alert the OHCM OHS contractor to possible new medical exam requirements.
 - (2) For each person added after the issuance of an LF 498, forward an additional LF 66.
 - (3) Non-NASA personnel wishing to operate under the LF 498 shall forward equivalent requests through the FSH to the SFAB, SMAO.
 - (4) Personnel shall not operate under the LF 498 until training, medical exams, and LaRC Safety Manager approvals have been obtained.

5.2.2 The Safety Operating Plan is the main narrative on how the hazards of the PHM are to be controlled through operational procedures and hazard awareness by workers. The goal of the plan is to describe controls to reduce personnel and facility risks.

5.2.2.1 Narratives submitted with LF 118 shall address the following topics as applicable:

- a. How the PHM is to be used and controlled. (Note: Use PHM with lower fire or health hazards where possible).
- b. Planned schedule of operations and estimated frequency of operations. Include comments on weekend operations, and overnight or continuous process schedules, if applicable. These affect risk control procedures. Standard operations shall involve operators always present during normal day shift unless otherwise noted.
- c. Ventilation system use (including, but not limited to, laboratory hoods exhausting to outside with flow monitoring devices, dedicated exhaust systems, low flow alarms, as needed).
 - (1) Ventilation alarm device descriptions shall state whether they alarm locally only or to other Center control points (Duty Officer or Fire Department).
 - (2) Responsibilities for calibration of monitoring devices shall be specified.
- d. Procedural controls planned (e.g., Will hazardous gas piping systems be tested with inert gases for leaks prior to using toxic or flammable gases? Are gas systems to be vented and shut off after each use or remain pressurized? Where will low use PHMs, such as calibration gases or materials be stored [outside for hazardous gases] during prolonged non-use periods?)
- e. Personal protective equipment planned for routine operations. (Note: LaRC procedures require that the Fire Department perform all rescue operations in the event of an accident involving personnel.)

- f. Warning alarms and monitoring devices planned for use in control of leak detection procedures (e.g., hydrogen gas alarm, HF gas alarm for fluorine gas).
 - (1) Plans shall include how these alarms shall be used to alert operators, other facility personnel, and/or the Fire Department.
 - (2) System shutdown or facility evacuation procedures shall be addressed in conjunction with these alarm set points.
- g. PHM spill or leak procedures shall be addressed. Minor spills are usually handled by the operators.
 - (1) Specialized training (OSHA requires a HAZWOPER 8 hour or longer course) shall be required for chemical spills. LPR 8500.1 Chapter 14, "Oil and Hazardous Material Spill Control," contains spill cleanup information.
- h. Sketches of the operational area, the experimental layout, or piping and valve controls, as applicable.

5.3 LF 498 Approvals, Duration, and Renewals

5.3.1 The PHMC shall determine the approval duration of LF 498.

5.3.1.1 Normally, FSHs or OFSHs shall request approvals for the duration of the research and development activity, if known.

5.3.1.2 Initial approvals shall be for a maximum of one year, and the FSH/OFSH/Project engineer shall reapply for LF 498.

5.3.1.3 Reapplications to continue work shall be submitted to a PHMC representative (normally, the SFAB IH staff) at least 30 days before expiration.

5.3.1.4 Maximum renewal periods for existing LF 498s shall be determined by the PHMC.

5.3.1.5 Maximum renewal periods for existing LF 498s shall be up to 4 years.

5.3.2 Modification to existing LF 498s can be submitted at any time during the issuance.

5.3.2.1 When reviewed and approved, the PHMC shall issue a modified form.

5.3.2.2 A PHMC representative from SFAB, SMAO or the SFAB IH staff, shall do initial reviews of new and renewal LF 498s.

5.3.2.3 Final approval of LF 498 shall be conducted by the PHMC and the LaRC Safety Manger.

5.4 Worker Training and Certification.

5.4.1 The LF 498 process shall include a determination of and requirements for PHM employee training and certification including hazard communication, CHP, periodic refresher, and medical surveillance.

5.4.1.1 Employee training and certification shall be conducted in accordance with LPR 1740.6, "Personnel Safety Certification."

5.4.2 Hazard Communication Standard Training.

5.4.2.1 The following information shall be provided or made available to each employee where a PHM is stored or used.

5.4.2.1.1 This information is considered part of the basic hazard communication program and shall be required for all new employees.

5.4.2.1.2 NASA personnel shall receive basic hazard communication training within 90 days of being hired and, if needed, through courses provided by SFAB, SMAO.

5.4.2.1.3 Contractors shall provide an equivalent program for on-site operations.

5.4.2.2 Employees shall receive this training on LaRC procedures for:

- a. Means of identification of PHMs (i.e., labeling and posting, Chapter 6)
- b. Health hazard data
- c. Fire, explosion, and reactivity data
- d. Precautions for safe use, handling, storage, and disposal
- e. Required protective clothing and equipment
- f. Emergency and first aid procedures

5.4.2.3 The MSDSs shall be used as a primary source for this information.

5.4.2.4 Personnel shall be cognizant of this information prior to actually handling the material.

5.4.3 Chemical Hygiene Plan Training.

5.4.3.1 Training for laboratory workers operating under a CHP is in addition to the preceding.

5.4.3.2 All workers involved in processes conducted under a CHP shall be familiar with LPR 1710.13, LF 381, and LF 498 procedures for their operation and/or facility.

5.4.3.3 This training shall be the responsibility of the designated CHO.

5.4.3.4 Support shall be provided by the SFAB IH staff as appropriate.

5.4.4 Periodic Refresher Training

5.4.4.1 Periodic refresher training shall be required if the hazardous materials change or the processes generating hazardous materials change.

5.4.4.2 This training shall be the responsibility of the FSH and/or the CHO, with SFAB, SMAO assistance as needed.

5.5 Medical Surveillance

5.5.1 Medical monitoring of civil service personnel at risk from exposure to PHMs shall be done by the OHCM OHS contractor located at 17 Langley Blvd, Building 1216.

5.5.1.1 The requirements for medical surveillance are identified by Occupational Medical Examination Protocols (OMEPS) determined by the OHCM OHS contractor physician and assessments of risk by the LaRC Safety Manager and his/her staff through periodic audits or special surveys of workplaces when requested by FSHs.

5.5.1.2 Other site or OSHA requirements, such as those determined in past labor management agreements or specific OSHA standards, shall also be used in determining the need for, and procedures in, examinations.

5.5.1.3 Medical surveillance requirements for contract employees shall be the responsibility of the contracting company.

5.5.1.4 The SFAB IH staff shall perform all assessments of site PHM health risks and report these to FSHs and the LaRC Safety Manager.

5.5.2 FSHs and their designated representatives shall establish procedures for periodic reviews of their at-risk employee population for the use of PHMs.

5.5.2.1 At-risk workers shall be identified to the OHCM OHS contractor at the time of initial assignment to work with PHMs through the use of LF 66.

5.5.2.2 Pre-certification and annual examinations, as well as examinations required due to exposure shall be scheduled and conducted by the OHCM OHS contractor in accordance with the applicable OMEP.

5.5.2.3 The completed LF 66s shall be maintained in individual medical records at the OHCM OHS contractor location.

5.5.3 The determination of the need for periodic medical surveillance of workers shall depend on several factors, including the PHM in use, toxicity, manner and duration of use, and potential routes of entry into employees.

5.5.3.1 Depending on the nature of the hazards, medical surveillance shall be recommended.

5.5.3.2 FSHs shall request assistance from the SFAB IH staff in the risk assessments.

Note: Occasionally, such as in the use of research and development mutagenic material, additional input from the OHCM OHS contractor physician may be needed to determine OMEP needs.

5.5.4 FSHs shall identify temporary or transient personnel (civil servant and contractor) who periodically come into their facility to work with PHMs. For example, an engineer may come into their laboratory for 5 days per month over a 6-month period to perform “hands-on” work in PHM research and development of a new process.

5.5.4.1 If the risks warrant clinical monitoring, these temporary or transient personnel shall be identified to the OHCM OHS contractor using LF 66 or equivalent contractor forms.

5.5.4.2 As a general rule, if other workers receive clinical examinations for exposure for their daily work with low to moderately toxic material, these temporary personnel shall also be referred to the OHCM OHS contractor for monitoring if they receive more than one month’s (20 working days) exposure in a year.

5.5.5 All workers named on LF 498 shall be considered Chemical Workers.

5.5.5.1 Specific clinical examinations for Chemical Workers shall be determined by the OHCM OHS contractor physician.

5.5.5.2 Procedures for the use of LF 498, LF 62, and clinical examinations are presented in LPR 1740.6.

5.5.5.3 Chemical Workers shall be the individuals who physically use the material or are, or could be, involved in the permitted operations.

5.5.5.4 Administration and management personnel shall not be considered unless they actually work with the material named.

5.5.6 Reviews or updates to identify personnel needing, or no longer needing, PHM-related clinical examinations shall be conducted by FSHs after consultation with facility personnel, as circumstances warrant.

5.5.6.1 These clinical examination-listing updates shall be conducted during periodic industrial hygiene audits, conducted by the SFAB IH staff, of facility operations.

5.5.7 The OHCM OHS contractor shall, as circumstances warrant, notify the LaRC Safety Manager and FSHs on trends seen in the worker population monitored through its OMEP program.

5.5.8 Clinical examinations required because of workplace exposures to PHMs can be either recommended or mandatory by law.

5.5.8.1 If medical surveillance is recommended and the employee declines to participate, the OHCM OHS contractor shall obtain a statement, which shall be included in the employee's medical records.

5.5.8.2 The statement shall indicate that the employee understands the risk involved by declining to participate in the surveillance program.

5.5.8.3 The LaRC Safety Manager and FSHs shall be notified concerning trends or an individuals declining to participate.

5.5.9 If the medical examination is mandatory by law, appropriate personnel (including supervisors and FSHs) shall be notified if the individual fails to complete medical monitoring examinations for the workplace PHM exposure.

Chapter 6

6. USE AND HANDLING OF POTENTIALLY HAZARDOUS MATERIALS

6.1 Initial acquisition or transfer of PHMs

6.1.1 Prior to initial acquisition or transfer of PHMs, FSHs shall make the initial decision on the use of a particular PHM or PHM process in their facility.

6.1.1.1 The decision shall include the amount to be stored in the facility, and the initial assessments for further safety and process control measures.

6.1.1.2 In cases where PHMs pose a significant hazard because of their toxicity, flammability, or other potentially hazardous properties, control procedures and other operational details shall be documented and approved through the LF 498 process. The LF 498 process is discussed in Chapter 5 of this procedural requirement.

6.1.1.3 Assistance can also be provided by the LaRC Safety Manager, his/her staff, the PHMC, other LaRC committees, and other technical area experts.

6.2 Laboratory operations

6.2.1 Laboratory operations and the production of PHMs include chemical synthesis in laboratories and the transfer of test chemicals.

6.2.1.1 Production or synthesis of chemicals and their intermediaries are usually involved processes.

6.2.1.2 Laboratories performing these processes shall have a CHP as required by LPR 1710.13.

6.2.1.3 The LF 498 process shall be used for each laboratory CHP.

6.2.1.4 Laboratories operating under a CHP shall not be required to have MSDSs for each chemical intermediary involved in the chemical process.

Note: Federal law requires annual review of the CHP.

6.2.2 Transfer of Test Chemicals.

6.2.2.1 On-site operations that produce test specimens of PHMs for use in other facilities and/or special projects shall provide MSDSs for use by other personnel working with the material.

Note: The LaRC MSDS template is discussed in Chapter 4 of this procedural requirement.

6.2.2.2 MSDSs produced shall be forwarded to the SFAB IH staff for review and submittal to the PHMC and LaRC Safety Manager.

6.3 Warning Labels and Hazard Information

6.3.1 Original Manufacturers' Containers (Primary Containers).

6.3.1.1 The material or its container shall be clearly labeled to identify the material (chemical or trade name) and to provide precautionary statements required by regulatory agencies or LaRC. OSHA 29 CFR 1910.1200 requires manufacturers, importers or distributors to label each container of hazardous chemicals.

6.3.1.2 Each container of PHMs received on the Center shall have existing labels that comply with the OSHA requirements.

6.3.1.3 All PHM used and stored at the Center shall have a CMTS label with its inventory record number.

6.3.1.4 Detailed information on CMTS labels is available on-line at <http://emis/cmts/instruct/manuals/>.

6.3.2 Secondary Containers.

6.3.2.1 If PHMs are transferred into unmarked containers, these containers shall bear the name of the chemical, along with the diamond symbol of the NFPA in accordance with NFPA 704 (Figure 6.1). This symbol indicates the severity of the hazard on a numerical scale of 0 to 4, and the type of hazard (health, flammability or reactivity) according to a color code. The ranking of severity of the health hazard is based upon acute exposures, and therefore, may not adequately reflect the actual hazard associated with chronic exposures to relatively small quantities of the material. This labeling requirement also applies to bulk liquid storage and process tanks.

6.3.2.2 LaRC shall use the NFPA diamond as a warning symbol to increase worker awareness of hazardous materials. For example, a laboratory squeeze bottle used to hold the cleaning solvent methyl ethyl ketone will have an NFPA diamond label with numbering for HEALTH = 1, FLAMMABILITY = 3, and REACTIVITY = 0, along with the name "methyl ethyl ketone", or "MEK".

6.3.2.3 Any material subject to a specific OSHA labeling standard shall be labeled in accordance with those requirements in addition to those given above.

6.3.2.4 Figure 6.1 shows the diamond label and the rationale for assigning codes. Codes for several chemicals are found in NFPA 704. Assistance in assigning these codes shall be obtained from the SFAB IH staff.

6.3.2.5 The diamond code information shall be entered on LF 44, when the request for PHMs is submitted.

6.3.2.6 Labeling of all containers of experimental chemical materials shall be in compliance with OSHA 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories."

6.3.2.7 Items that are to be stored and retained within a laboratory where the properties of materials are likely to be well understood, only the sample identification and/or name shall be needed.

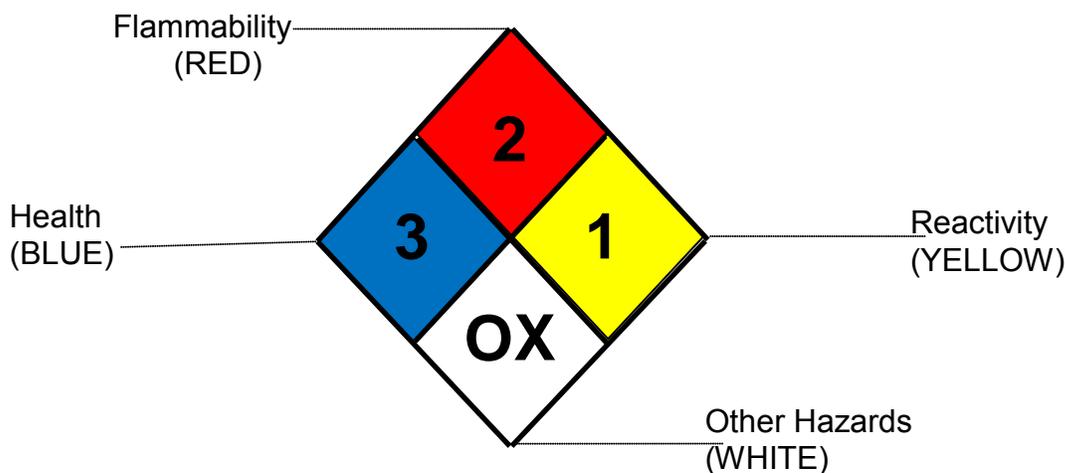
6.3.2.8 Samples that will be transferred outside the laboratory, or that may be handled by individuals not generally familiar with the type of material involved, shall be labeled as completely as possible, including the name, address, and telephone number of the sender and recipient for samples in transit.

6.3.3 Hazard Survey Information.

6.3.3.1 The NFPA diamond symbol is intended to increase worker awareness of the presence of PHMs (see figure 6.1 on the following page). The actual hazard from a material depends on how it is used. Periodic audits and surveys shall be conducted by the SFAB IH staff to determine actual health hazards from hazardous material operations.

6.3.3.1.1 The results of these audits shall be reported back to the facilities.

Note: Workers can request information on past surveys by contacting their supervisors, LaRC Safety Manager or the SFAB IH staff.



Identification of Health Hazards Color Code: BLUE		Identification of Flammability Color Code: RED		Identification of Reactivity Color Code: YELLOW	
Signal	Type of Possible Injury	Signal	Susceptibility of Materials to Burning	Signal	Susceptibility to Release of Energy
4	Materials, which on v ery short exposure could cause death or major residual injury even though prompt medical treatment, is given.	4	Materials, which will rapidly or completely, vaporized at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and	4	Materials, which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials, which on s hort exposure could cause serious temporary or residual injury even though prompt medical treatment, is given.	3	Liquids and solids that can be ignited under almost all ambient temperature conditions.	3	Materials which in themselves are capable of detonation or explosive reaction, but require a strong initiating source or which must be heated under confinement before initiating, or which react explosively with water.
2	Materials, which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment,	2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.	2	Materials, which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. A Iso materials, which may react violently with, water or which may form potentially explosive
1	Materials, which on exposure could cause irritation but only minor residual injury, even if no treatment is given.	1	Materials that must be preheated before ignition can occur.	1	Materials, which in themselves are normally stable, but which can become unstable at elevated temperatures and pr essures, or which may react with water with some, release of energy, but not violently.
0	Materials, which on exposure under fire conditions, would offer no hazard beyond that of ordinary combustible materials.	0	Materials that will not burn.	0	Materials, which in themselves are normally, stable, even under fire exposure conditions, and which are not reactive with water.

Other Hazards - Color Code: WHITE

Ox - Oxidizer

W - Use no water

Figure 6.1, National Fire Protection Association Symbols.

6.4 Storage and Posting Areas with Potentially Hazardous Material

6.4.1 PHM, particularly compressed gases and flammables or combustibles, shall be stored in accordance with Figure 6.2, "Suggested Shelf Storage Pattern;" Figure 6.3, "Partial List of Incompatible Compounds (Toxic Hazards);" Figure 6.4, "List of Incompatible Chemicals" of this procedural requirement.

6.4.1.1 Before using and planning of new operations involving PHMs, the individuals shall incorporate all statutory requirements as promulgated by OSHA and any other national consensus standards.

Note: These include recommendations of the NFPA, Compressed Gas Association (CPA), and American National Standards Institute (ANSI).

6.4.1.2 Requirements for the storage of flammable materials are addressed in this chapter. Contact the LaRC Safety Manager or the LaRC Fire Chief if assistance is needed in determining flammable storage needs and requirements.

6.4.2 Storage of Potentially Hazardous Materials.

6.4.2.1 The requirements for the storage of PHMs in a facility, or adjacent to a facility, are to minimize risks in the event of a fire or an accident. Technical guidance for gases are detailed in LPR 1710.13. Material quality storage requirements, such as the use of refrigerated storage to prolong the quality of the substance, are not considered or detailed in this chapter. For storage of environmentally regulated hazardous wastes, consult LPR 8500.1

6.4.2.2 Fire codes for the storage of flammable materials in facilities have been incorporated into OSHA standards. These mandatory OSHA requirements are included in this chapter. For assistance in interpreting these laws, contact the LaRC Safety Manager or LaRC Fire Chief.

6.4.3 Flammable and Combustible Liquids Storage.

6.4.3.1 This section applies to the storage of flammable or combustible liquids storage in drums or other containers not exceeding 60 gallons of individual capacity and portable tanks not exceeding 660 gallons individual capacity. For further interpretation, contact the SFAB, SMAO.

6.4.3.2 Flammable or combustible liquids storage sites shall be inspected on a routine basis.

6.4.3.2.1 The inspections should include, but not be limited to:

- a. Checking for expired chemicals.
- b. Leaking or corroded containers.
- c. Cleanliness of the site.

- (1) there should be no debris.
 - (2) especially flammable debris.
 - (3) no chemicals other than flammables and combustibles.
- d. Discrepancies should be reported to the appropriate personnel the FSH, FC and the FEC for correction and/or disposal

6.4.3.3 Design and Capacity of Containers

6.4.3.3.1 Only approved containers and portable tanks shall be used.

6.4.3.3.2 Metal containers and portable tanks meeting the requirements of and containing products authorized by Department of Transportation (DOT) 49 CFR, "Transportation," Subtitle B, Chapter 1, "Research and Special Programs Administration, Department of Transportation", shall be deemed to be acceptable.

6.4.3.3.3 The LaRC Fire Chief shall be available to provide guidance in these areas.

6.4.4 Suggested PHM Shelf Storage Pattern

6.4.4.1 Figures 6.2 and 6.3, contain information obtained from a NASA Course on Laboratory Safety and Health. No current regulatory requirements exist for storage lockers; however, the data presented are suggested for use to help avoid storing incompatible materials on the same or adjacent shelves.

INORGANIC	ORGANIC
INORGANIC # 10 SULFUR, PHOSPHORUS, ARSENIC, PHOSPHORUS PENTOXIDE	ORGANIC # 2 ALCOHOLS, GLYCOLS (Store flammables in dedicated cabinet)
INORGANIC # 2 HALIDES, SULFATES, SULFITES, THIOSULFATES, PHOSPHATES	ORGANIC # 3 HYDROCARBONS, ESTERS (Store flammables in a dedicated cabinet)
INORGANIC # 3 AMIDES, NITRATES. (Not AMMONIUM NITRATE). Nitrates	ORGANIC # 4 ETHERS, KETONES (Store flammables in a dedicated cabinet)
INORGANIC # 1 METALS AND HYDRIDES (Store away from water)	ORGANIC # 5 EPOXY COMPOUNDS, ISOCYANATES
INORGANIC # 4 HYDROXIDES, OXIDES, SILICATES	ORGANIC # 7 SULFIDES, POLYSULFIDES
INORGANIC # 7 ARSENATES, CYANIDES (Store above acids)	ORGANIC # 8 PHENOL, CRESOLS
INORGANIC # 5 SULFIDES, SELENIDES, PHOSPHIDES, CARBIDES, NITRIDES	ORGANIC # 6 PEROXIDES, AZIDES
INORGANIC # 8 BORATES, CHROMATES, MANGANATES, PERMANGANATES	ORGANIC # 1 ACIDS, ANHYDRIDES, PERACIDS
INORGANIC # 6 CHLORATES, PERCHLORATES, CHLORITES, PERCHLORIC ACID, PEROXIDE	MISCELLANEOUS
INORGANIC # 9 ACIDS, except NITRIC (Acids are best stored in dedicated cabinets)	MISCELLANEOUS (Nitric Acid)

Figure 6.2, Suggested Shelf Storage Pattern

Arsenical Materials	Any Reducing Agent	Arsine
Azides	Acids	Hydrogen Azide
Cyanides	Acids	Hydrogen Cyanide
Hypochlorites		Chlorine or Hypochlorous Acid
Nitrates	Sulfuric Acid	Nitrogen Dioxide
Nitric Acid	Copper, Brass, Heavy Metals	Nitrogen Dioxide
Nitrites	Acids	Nitrous Fumes
Phosphorus	Caustic Alkalis/Reducers	Phosphine
Selenides	Reducers	Hydrogen Selenide
Sulfides	Acids	Hydrogen Sulfide
Tellurides	Reducers	Hydrogen Telluride

Figure 6.3, Partial List of Incompatible Chemicals (Toxic Hazards)

6.4.4.2 Substances in the left hand column shall be stored and handled so that they cannot under any circumstances accidentally contact corresponding substances in the center column, as toxic materials (right hand column) would be produced.

Chemical	Potentially Incompatible Chemicals/Materials/Conditions
Acetic acid	Chromic acid, nitric acid, perchloric acid, hydroxyl-containing compounds, ethylene glycol, peroxides, and permanganates
Acetone	Concentrated nitric, sulfuric, perchloric, and chromic acid mixtures, and certain plastic materials
Acetylene	Chlorine, bromine, copper, silver, brass (red), fluorine, mercury, and oxygen
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, sulfur, finely divided organics, or combustibles
Ammonium hydroxide	Acids
Ammonium iodine	Acids and oxidizing agents
Ammonium sulfide	Acids
Arsenical materials	Any reducing agent
Bromine	Ammonia, acetylene, butadiene, butane, and other petroleum gases; hydrogen; sodium carbide; turpentine; benzene; and finely divided metals
Carbon, activated	Calcium hypochlorite and ruthenium tetroxide
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, metal powders, sulfur, finely divided organics, or combustibles
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, and turpentine
Chromic acid	Acetic acid, acetone, naphthalene, camphor, glycerin, turpentine, alcohol, and most flammable organic compounds
Copper	Acetylene or hydrogen peroxide
Cyanides	Acids
Diethyl ether	Nitric acid (concentrated and fuming) and other strong oxidizing agents (dichromate, permanganate), heat, or aluminum
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, and halogens

Figure 6.4, List of Incompatible Chemicals (page 1 of 2)

Chemical	Potentially Incompatible Chemicals/Materials/Conditions
Hydrochloric acid	Bases or manganese dioxide
Hydrocyanic acid	Nitric acid or alkalis
Hydrogen peroxide	Copper, chromium iron, most metals or their salts, and flammable liquid, combustible materials, aniline, and nitromethane
Hydrofluoric acid (anhydrous)	Ammonia, aqueous, or anhydrous
Hydrogen sulfide	Fuming nitric acid, oxidizing gases, heat, and most common metals
Hydrocarbons (benzene, butane, propane, gasoline, turpentine)	Fluorine, chlorine, bromine, chromic acid, and sodium peroxide
Mercury	Acetylene, fulminic acid, ammonia, and concentrated nitric acid
Methyl isobutyl ketone	Nitric acid (concentrated and fuming), dichromate, and (hexane) permanganate
Nitric acid (conc.)	Acetic acid, aniline, chromic acid, Hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, nitratable substances such as organic compounds, including diethyl ether and methyl ketone (hexane), and bases
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases
Oxalic acid	Silver and mercury
Perchloric acid	Acetic anhydride, acetone, alcohol, bismuth and its alloys, charcoal, paper, wood, bases, or organic compounds
Potassium chlorate	Acids and organic compounds
Potassium perchlorate	Acids and organic compounds
Potassium permanganate	Glycerine, ethylene glycol, benzaldehyde, and sulfuric acid
Sodium carbide, acetylene	Water (also see acetylene, which is liberated from sodium carbide on exposure to moisture)
Sodium hydroxide	Acids, organic materials, most common metals, and water
Sodium nitrate	Ammonium nitrate and other ammonium salts
Sodium peroxide	Any oxidizable substance, such as ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, and furfural
Sulfuric acid	Chlorates, perchlorates, permanganates, water, and bases
Strong bases	Strong acids, organic materials, water and most common metals

Figure 6.4, List of Incompatible Chemicals (page 2 of 2)

6.4.5 Storage Time Limits of Peroxidizable Compounds.

Note: Some chemicals form peroxides upon prolonged storage and/or contact with air.

6.4.5.1 Peroxides are compounds, which are sensitive to shock, heat, friction, and accidental ignition (sparks). Peroxidizable compounds slowly deteriorate into peroxides when exposed to air. A list of some of these chemicals is provided in Figure 6.5, "Storage Time Limits of Peroxidizable Compounds."

6.4.5.2 To ensure that the storage time limit of the peroxide-forming compound is not exceeded, the date the container is opened shall be prominently displayed on the container.

6.4.5.3 Expired chemicals shall be disposed of immediately. When possible, order peroxidizable compounds containing an inhibitor to slow the formation of peroxides.

6.4.5.4 If research requires the use of an unstabilized solvent, the FSH shall be notified prior to ordering.

6.4.5.5 Distillation or purification of a peroxidizable compound, either stabilized or unstabilized, shall also require the permission of the FSH.

6.4.5.5.1 Only distill or purify the amount of solvent that will be immediately used.

6.4.5.5.2 DO NOT STORE distilled or purified peroxidizable solvents.

6.4.5.6 If crystals are noticed on a container of peroxidizable compounds, exercise extreme caution and notify the FSH and LaRC Safety Manager for assistance as soon as possible. On-site treatment of a peroxidizable compound is strictly prohibited.

6.5 Specific requirements for off- and on-site transport of PHMs are detailed in this section.

6.5.1 PHM Transportation Off-Site.

6.5.1.1 PHMs shall not be introduced into interstate commerce unless in full compliance with applicable regulations of 49 CFR, Subtitle B, Chapter 1, parts 171-177, "Hazardous Materials Regulations."

6.5.1.1.1 For example, materials containing cyanides shall not be transported in vehicles containing acids.

6.5.1.2 Contact the LMB for assistance on shipment and for restrictions on the movement of PHMs off-site. LMB personnel can assist in authorized type of shipments:

- a. pounds of PHMs that are air transportable
- b. performance oriented packaging requirements
- c. PHM transportation packaging
- d. vehicle placarding

6.5.1.3 PHMs transported off-site shall be accompanied by an LF 44 and the appropriate MSDS.

6.5.1.4 The LF 44 shall be used to track transfers of LaRC PHMs both on and off center.

6.5.1.5 Shipments of minor (less than 10 gram) quantities of PHM laboratory samples for off-site testing shall not require an LF 44.

6.5.1.5.1 The package label for these items shall clearly identify the name, address, and telephone number of the individual knowledgeable about the test specimen, a brief description of the samples, and the date shipped, in order to meet federal requirements for shipment of laboratory samples as defined in DOT 49 CFR 173, "SHIPPERS—General Requirements for Shipments and Packagings." Check for other PHM limits on quantity, transportation methods, and packaging that apply to the shipment.

6.5.1.6 Any person transporting PHMs off-site shall be subject to the motor vehicle laws of the federal government and the Commonwealth of Virginia. Current laws require certain classes of motor vehicle operators to have Commercial Driver's Licenses with a Hazardous Materials endorsement for transport of PHMs.

**RED LABEL - PEROXIDE HAZARD ON STORAGE
DISCARD AFTER 3 MONTHS**

isopropyl ether
divinyl acetylene
vinylidene chloride
potassium metal
sodium amide

**YELLOW LABEL - PEROXIDE HAZARD ON CONCENTRATION
DISCARD AFTER 1 YEAR**

diethyl ether	dicyclopentadicene
tetrahydrofuran	diacetylene
dioxane	methyl acetylene
acetal	cumene
methyl isobutyl ketone	tetrahydronaphthalene (TetraUn)
ethylene glycol dimethyl ether (glyme)	cyclohexene
vinyl ethers	methylcyclopentane

**YELLOW LABEL - HAZARDOUS DUE TO PEROXIDE
INITIATION OF POLYMERIZATION*
DISCARD AFTER 1 YEAR**

methyl methacrylate	chlorotrifluoroethylene
styrene	vinyl acetylene
acrylic acid	vinyl acetate
acrylonitrile	vinyl chloride
butadiene-	vinyl pyridine
tetrafluoroethylene	chloroprene

*Under conditions of storage in the liquid state, the peroxide-forming potential increases and certain of these monomers (especially butadiene, chloroprene, and tetrafluoroethylene) should then be considered as A-list compounds.

From H. L. Jackson, W. B. McCormack, C. S. Rondestvedt, K. C. Smeltz, and I. E. Viele: "Safety in the Chemical Laboratory. LXI: Control of Peroxidizable Compounds." *J Chem. Educ.* 47(3): A176 (March, 1970).

Figure 6.5, Storage Time Limits of Peroxidizable Compounds

6.5.2 PHM Transportation On-Site.

6.5.2.1 The on-site transportation of PHMs shall be conducted by personnel trained in hazardous material transportation.

6.5.2.1.1 Contact the LMB for assistance in hazardous material transfer.

6.5.2.1.2 NASA personnel without a Commercial Drivers License may use NASA vehicles for the limited on-site transfer of PHMs. An example would be an emergency transfer of hydraulic fluid from stock or another on-site facility to support pump repair work for a wind tunnel.

6.6 Excess PHM, Accidents Involving PHM, and Disposal of Waste PHM

6.6.1 Information on various other topics associated with the storage, excess turn in, spills, documenting information of new materials (i.e. MSDS), OSHA carcinogens, and hazardous gases is outlined in more detail in other chapters of this procedural requirement, in other safety-related documents or in LPR 85 00.1. Additional general procedures are included herein.

6.6.1.1 Users shall consider the use of alternative material, ventilation, and personal protective equipment in all processes.

6.6.1.2 Whenever possible, less hazardous material shall be substituted first in processes.

6.6.1.3 If substitution is not possible, process ventilation shall be used to minimize hazards.

6.6.1.4 Ventilation design guidelines, as found in the American Conference of Governmental Industrial Hygienists Ventilation Manual, shall be used.

6.6.1.5 As a last resort, personal protective equipment shall be relied on to minimize risks from PHM. Procedures for obtaining individual personal protective equipment (e.g. gloves, eye wear, respirators) are presented in LPR 1710.4, "Personnel Protection - Clothing and Equipment."

6.6.1.6 FSHs shall contact the SFAB IH staff for recommendations.

6.6.2 Accidents, Spills, and First Aid Involving PHM.

6.6.2.1 In the event of a PHM emergency, personnel at the site or involved in the emergency shall:

- a. Evacuate the immediate area, if there is a danger to personnel. If there is a danger to personnel beyond the initial accident or spill site, pull the fire alarm on the way out of the facility.
- b. Call 911 from any Center phone or 864-2222 from an off Center (cell phone) line to obtain emergency assistance and report the accident or spill. Calling 911 is preferred when an accident occurs even if it appears to be minor; chemical accidents can escalate quickly. Also, having emergency responders transport injured personnel reduces the possibility of larger contamination. If the person(s) involved in the incident chooses to report to the clinic, a buddy needs to accompany the person(s).
- c. Secure the site. If there is no danger to personnel, shut down as much of the operation as feasible (e.g., power to a heat source, flow to delivery lines) and cordon off the area.
- d. Only authorized personnel shall be permitted to enter the site until it has been declared safe to enter by the appropriate level of responder (e.g., once the site has been declared safe by the First Responder team, the site may be turned over to the Safety Office for accident investigation and so forth).
- e. Proper PPE shall be worn by all First Responders, Safety, Environmental and Investigation Team members and Supervisory personnel responding to the emergency and/or investigating the accident or spill.
- f. Only after the site has been declared safe and the Investigating Team has completed their investigation shall the site be opened to other personnel.

6.6.2.2 All accidents involving PHM, no matter how small, shall be reported to the FSH, the FC and the EMB.

6.6.2.2.1 Personnel using the material shall be responsible for the cleanup of minor spills in their work area.

6.6.2.3.2 Minor accidents, when reported, can lead to a recognition of potential trends and the identification of needs for better equipment or procedures. For example, a minor break and splash of a PHM from a beaker in a laboratory hood could lead to the identification of a need for laboratory chemical splash barriers.

6.6.2.4 Establishing accident and first aid procedures is an integral part of planning for the use of PHMs. It shall be the responsibility of the user to effectively contain PHMs in the event of a minor spill and to perform clean-up operations.

6.6.2.4.1 Consultation with EMB in developing emergency procedures shall be required.

6.6.2.4.2 All spills of PHM shall be reported by calling 911 from any Center phone or 864-2222 from an off Center (cell phone) line.

6.6.2.4.3 PHMs shall be deleted from inventory via the CMTS.

6.6.2.5 Professional first aid services are available from the OHCM OHS contractor located at 17 Langley Blvd. (Building 1216), 7:00 a.m. – 3:00 p.m., Monday through Friday. On-site ambulance service can be obtained at anytime by calling 911 from any Center telephone or by calling 864-5600 from a cellular telephone.

6.6.2.6 Preplanning for accidents involving PHMs shall always be required.

6.6.2.6.1 Specialized training (OSHA HAZWOPER 8 hour or longer course) shall be required for chemical leaks of PHM, depending upon the situation involved.

6.6.2.6.2 Spill cleanup information and procedures to request assistance for spills beyond facility capabilities shall be in accordance with LPR 8500.1, Chapter 14, "Oil and Hazardous Material Spill Control," LPR 8715.12, and on-line at <http://emis/cmts/instruct/manuals/>.

6.6.3 Waste PHM disposal shall be in accordance with federal, state, and local regulations, and LaRC procedural requirements presented in LPR 8500.1. Contact the EMB for more information or the EMB web page listed above.

6.7 OSHA / IARC / NTP Select Carcinogens

6.7.1 Carcinogenic materials shall be used only under an approved LF 498.

6.7.1.1 Carcinogenic materials include any material for which OSHA has promulgated an emergency temporary or permanent standard that reflects its carcinogenic potential.

6.7.1.2 A list of materials having this status is provided in OSHA 29 CFR 1910.1450, LPR 1710.13, and thereby are regulated chemicals. Additions to this list may occur.

6.7.2 The PHMC shall include any other materials it deems appropriate.

6.7.3 OSHA has worked with other agencies on a list of "select carcinogens."

6.7.3.1 These in which materials are suspect as possible human carcinogens.

6.7.3.2 These materials are suspect carcinogens are defined in OSHA 29 CFR 1910.1450(b) and published by the IARC and the NTP. Additions to the list may occur.

6.7.3.3 It shall be noted that materials appearing in OSHA carcinogen standards, on NTP lists, and on IARC lists are on the select list presented.

6.7.3.4 Under the OSHA 29 CFR 1910.1200, materials having OSHA carcinogen standards, or appearing on the NTP Carcinogen Report, or being listed in IARC Group 1

or 2A, shall have references to their carcinogenic effects in both MSDSs and on material labels.

6.7.3.5 At LaRC, these “select carcinogens” shall be considered for use under an LF 498, issued to define the procedures for use.

6.8 Biological Agents

6.8.1 Scope and Application.

6.8.1.1 All operations requiring the use of biological agents at LaRC shall be permitted through the PHMC. This committee reviews the Standard Operating Procedures (SOP) drafted by the researcher for the control and use of biological agents.

6.8.1.2 This SOP shall:

- a. Identify hazards
- b. Specify standard and specific micro bacterial laboratory techniques
- c. Create regulated areas
- d. Provide for employee training and medical monitoring
- e. Detail the requirements for exposure monitoring
- f. List the required personal protective equipment
- g. Specify the proper procedures for the disposal of wastes
- h. Anticipate spills and emergency response actions that may be required

6.8.1.3 Each different etiological species or new activity shall require an individual LF 180, "Biological Agent Approval Form."

6.8.1.4 At present, biological agent use is restricted to biosafety level (BSL) 1 operations; however, facility requirements shall be built and maintained at BSL-2.

6.8.1.4.1 No research involving human body fluids or blood, human or primate cells, animals, whole plants or toxic gene products shall be permitted.

6.8.1.4.2 Work with ionizing or non-ionizing radiation materials shall require clearance through the Ionizing or Non-ionizing Radiation Committee in addition to the PHMC.

6.8.2 Principles of Biosafety.

6.8.2.1 Levels of protection based on the relative ability of the organism to cause disease in normal healthy adult humans and the potential for transmission during laboratory manipulation are assigned to all biological agents.

6.8.2.2 Based on the BSL, laboratory employees shall be protected from hazards by:

- a. employing specific and special microbiological laboratory practices
- b. using containment and barriers and assuring personal safety through training
- c. medical surveillance and immunization when applicable

6.8.2.2.1 The following procedures have been adapted from "Biosafety in Microbiological and Biomedical Laboratories", fourth edition, Centers for Disease Control (CDC) and Prevention and National Institutes of Health (NIH), and "NIH Guidelines for Research Involving Recombinant DNA Molecules." Some practices are stricter than in the CDC or NIH recommendations because their application seems appropriate for all microbiological laboratories.

6.8.2.3 In addition to the risk level of the organism, it is also important to evaluate the operation to determine additional hazards. The biosafety level of the entire operation shall be raised if aerosols or splashes could be released, large amounts of materials are used, or hazardous gene products are produced during an operation.

6.8.2.4 BSL 1 is suitable for work involving well-characterized agents not known to cause disease in healthy adult humans. These agents are of minimal potential hazard to laboratory personnel and the environment. These agents are not known to cause disease in healthy adults.

6.8.2.5 BSL 2 is suitable for work involving agents of moderate potential hazard to personnel and the environment. These agents are associated with human disease and hazards exist from percutaneous injury, ingestion, and mucous membrane exposure to the agent. It differs from BSL-1 in that:

- a. Laboratory personnel have specific training in handling pathogenic agents and are directed by a competent scientist
- b. Access to the laboratory is limited when work is being conducted
- c. Extreme precautions are taken with contaminated sharp items
- d. Certain procedures where infectious aerosols or splashes may be created are conducted in biological safety cabinets or other physical containment equipment.

6.8.3 BSL Operational Conditions and Procedures.

6.8.3.1 BSL 1

6.8.3.1.1 Standard Microbiological Practices:

- a. Access to the laboratory is limited or restricted at the discretion of the principal investigator when experiments or work with cultures and specimens are in progress.
- b. Hand washing shall be required after handling viable materials, after removing gloves and prior to leaving the laboratory.
- c. Eating, drinking, smoking, handling contact lenses, applying cosmetics and storing food for human use shall be prohibited in the laboratory.

- d. Wearing contact lenses in the laboratory shall not be permitted.
- e. Mechanical pipetting devices shall be used.
- f. Mouth pipetting shall be prohibited.
- g. An effective "sharps" handling program shall be used.
- h. All procedures, which could produce splashes, spills or aerosol formation, shall be documented and procedures followed to eliminate or minimize the hazards of these operations.
- i. Prior to the start of project, decontamination methods shall be determined and these procedures used to decontaminate all cultures, stocks and other regulated wastes prior to proper disposal.
- j. Materials to be decontaminated shall be placed in a durable, leak proof container and closed when not in use.
- k. Work surfaces shall be decontaminated upon completion of work, at the end of the day and after a spill of any viable organism.
- l. The workstation shall be left decontaminated at the end of the work shift and all viable organisms stored in proper storage areas.
- m. A biohazard sign shall be posted on the entrance to the laboratory whenever biological agents are being used.
- n. A biohazard sign shall also be posted on all areas where biological agents are stored.
- o. The name of the principal investigator, telephone number, classification and names of agents shall be listed on all signs
- p. An insect and rodent control program shall be in effect.

6.8.3.1.2 Safety Equipment (primary barriers):

- a. Special containment devices or equipment such as biological safety cabinets are generally not required for manipulations of BSL-1 agents.
- b. Lab coats and gloves shall be recommended to prevent contamination of street clothes and skin.
- c. These items shall be left in the laboratory and not worn into other work areas to prevent cross contamination.
- d. All protective clothing shall be either disposed of in the laboratory, or placed in special bins to be laundered by the employer.
- e. It shall never be taken home.
- g. Protective eyewear shall be worn in the laboratory at all times.

6.8.3.1.3 Facility Requirements (secondary barriers):

- a. Laboratories shall have doors that allow access control.
- b. An open bench top sink for hand washing shall be required.
- c. The materials of the laboratory shall be designed to be easily cleaned and decontaminated.
- d. Bench tops, walls and floors shall be impervious to water and resistant to moderate heat and the organic solvents, acids, alkalis and chemicals used to decontaminate the work surfaces and equipment.
- e. Chairs and other furniture used in the laboratory shall be covered with a non-fabric

- material that can be easily decontaminated. Carpets and rugs are not appropriate.
- f. Laboratory furniture shall be capable of supporting anticipated loading and uses.
 - g. Spaces between benches, cabinets, and equipment shall be accessible for cleaning.
 - h. An eyewash station shall be readily available and inspection conducted and documented weekly.
 - i. If the laboratory has windows that are open to the exterior, they shall be fitted with fly screens.
 - j. Mechanical ventilation systems shall be balanced to provide an inward flow of air without recirculation to spaces outside the laboratory.
 - k. Illumination shall be adequate for all activities, avoiding reflections and glare that could impede vision.

6.8.3.2 BSL 2

6.8.3.2.1 Standard Microbiological Practices listed under BSL-1 in addition to:

- a. If materials are required to be transported outside the laboratory for decontamination or disposal, they shall be packaged in accordance with applicable local, state and federal regulations prior to moving from the laboratory.
- b. The principal investigator shall establish policies and procedures, which insure that only persons who have been advised of the potential hazards and meet specific entry requirements (i.e. immunizations) may enter the laboratory.
- c. In addition to the information listed in BSL-1, any required immunizations, personal protective equipment, and special procedures needed to exit the laboratory shall be listed on all biohazard signs.
- d. Laboratory personnel shall receive all appropriate immunizations or tests for the agents handled or potentially present in the laboratory.
- e. When appropriate, baseline serum samples for laboratory and other at risk personnel shall be collected and stored.
- f. Additional periodic sampling shall be required.
- g. The principal investigator shall insure that laboratory and support personnel receive and document appropriate training on the potential hazards associated with the work involved, the necessary precautions to prevent exposures and the exposure evaluation procedures.
- h. Annual refresher training shall be required.
- i. Needles and other sharp instruments shall be restricted in the laboratory for use only when there is no alternative.
- j. Plastic ware shall be substituted for glassware whenever possible.
- k. Only needle locking units or disposable syringe-needle units (needle is integral to the syringe) shall be used when needed.
- l. Cultures, and other materials containing biological agents or potentially infectious wastes, shall be placed in a container with a cover that prevents leakage during collection, handling, processing, storage, transport or shipping.
- m. In addition to BSL-1 decontamination procedures, any equipment that could be contaminated shall be decontaminated according to any local, state or federal

regulations before it is sent for repair or maintenance or packaged for transport before removal from the laboratory.

- n. Spills and accidents that could result in exposures to infectious materials shall be immediately reported to the FSH.
- o. The employer shall provide medical evaluation, treatment and surveillance as appropriate and written records of the event shall be maintained.

6.8.3.2.2 Safety Equipment (primary barriers):

- a. Class II Biological Safety Cabinets (BSCs) or other personal protective equipment and containment devices shall be used whenever work with BSL-2 agents can create aerosols or splashes. These activities could include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, or opening containers of materials whose internal pressures may be different from ambient pressures.
- b. High concentrations or >10 liters of infectious agents shall also require containment to prevent spills or aerosol release.
- c. These materials shall be centrifuged in the open laboratory if sealed rotor heads or centrifuge safety cups are used and if these rotors or safety cups are opened only inside a biological safety cabinet.
- d. Biosafety cabinets shall be evaluated on an annual basis and comply with standards listed in NSF-49.
- e. Face protection (goggles, mask, face shields or other splatter guards) shall be used for anticipated splashes or sprays of infectious material when microorganisms must be manipulated outside the BSC.
- f. Protective laboratory coats designated for laboratory use only shall be used while in the laboratory.
- g. Glove use shall also be required during manipulations.
- h. Disposable gloves shall not be washed and reused or used to touch "clean" surfaces such as keyboards, telephones, writing utensils or notebooks.

6.8.3.2.2 Facility Requirements (secondary barriers):

- a. Install and locate biological safety cabinets to ensure that fluctuations of the room supply and exhaust air do not cause the cabinets to operate outside the regulated levels for containment bases on NSF-49.
- b. Facilities that house restricted agents (as defined by 42 CFR 72.6, 42 CFR 73.3, and 42 CFR 73.4) shall provide lockable doors.

6.8.4 Addition of Biologically Active Materials to a Permitted Operation

6.8.4.1 New agents or projects shall be added by the Principal Investigator and the FSH by submitting an LF 118 and an LF 180, "Biological Agent Review Form," to the PHMC.

6.8.4.2 Since biological agent research is of a continuously changing nature, the review of these materials shall be accomplished in 3 months to enable the research to remain flexible and workable.

6.8.5 Addition of Certified Workers.

6.8.5.1 A list of Certified Workers shall be included in each LF 180:

- a. New workers shall be added by the FSH by submitting an LF 66 to the PHMC and OHCM OHS contractor.
- b. A copy of the LF 180 shall accompany the LF 66.
- c. The submission and approval of these forms shall be required before the person can conduct work with this agent.
- d. Upon approval, the PHMC and OHCM OHS contractor physician shall sign the form.
- e. Contractors shall submit equivalent information to the SFAB.

6.8.6 Recordkeeping for the Biological Agent Operations.

6.8.6.1 The records required for Biological Agent Operations:

- a. The laboratory shall keep a copy of the current permit and a list of approved LF 180 in the laboratory.
- b. These forms shall be amended as required and submitted to the PHMC for review.
- c. A list of personnel trained to use the particular agent, the date of the training and the person conducting the training. These records shall be maintained in a computer database in the FSH or his/her designee's office and the dates of the training shall be listed on the LF 180 for the project.
- d. The time personnel will be working with the specific agents shall be specified.
- e. This information shall be logged on an LF 62, "Chemical Worker's Certification Card," attached to each fact sheet.
- f. Copies of this form shall be sent to the PHMC and to OHCM OHS contractor.
- g. This LF 62 shall be attached to the PHM permit behind each the LF 180.

6.8.6.2 Biological agent permits shall be reviewed annually during the SFAB IH audit.

6.9 Storage, Use and Disposal of "Sharps"

6.9.1 Exposure to chemicals and biological agents can occur by several different routes inhalation, ingestion, absorption through skin or eyes, and injection. The purpose of this section is to control exposures caused by injecting chemicals or biological agents through the skin barrier.

6.9.2 Exposure to toxic agents by injection does not happen frequently in the laboratory, but it can occur inadvertently by mishandling "sharps" such as glass, syringes or metals contaminated with toxic agents. The intravenous route is especially dangerous because it introduces the toxicant directly into the bloodstream, eliminating the process of absorption. Non-laboratory personnel such as custodial or maintenance workers, as well as laboratory workers shall be protected from this form of exposure.

6.9.3 Hand injuries are the most common injuries in laboratories. Keeping all cutting and puncturing devices fully protected, and employing utility knives instead of single edge razor blades as cutting tools can prevent many of these injuries.

6.9.3.1 Syringes with needles shall be used once, if possible, and then placed in a suitable disposal container. Injuries are more likely if the syringes are used more than once.

6.9.3.2 Kevlar gloves of different thicknesses shall be made available and shall be used when handling sharp objects, such as metal foil or picking up broken glass.

6.9.3.3 If a cutting tool does not do the job, users shall select a better tool and should not simply apply more pressure.

6.9.4 When ordering razor blades, foil or syringes with needles, order only the amount that will be used in the project. Do not stockpile these materials. Items shall be:

- a. Stored in protective boxes out of sight
- b. Inside drawers or cabinets
- c. Shall not be left out on countertops or workstations where they could cause injury to others
- d. Special holding devices shall be ordered if the needles are required to be used over and over.
- e. Always order the blunt tip needles for laboratory work, if possible.
- f. Beveled tip needles are usually used in medical situations where easy injection into the skin and tissues is desirable
- g. Special attention shall be paid to the storage of disposable sterile hypodermic syringes that could be pilfered for illegal uses

6.9.5 The janitorial/custodial staff shall not pick up glass, even unbroken glass drink containers, from the regular trash. Use large cardboard disposal boxes to dispose of broken glass, bottles, capillary tubes and Pasteur pipettes.

6.9.5.1 These boxes shall be:

- a. Purchased specifically for this purpose.
- b. Printed on the exterior of the box "broken glass" warnings.
- c. When full, these boxes shall be taped shut.
- d. Placed in the hallway for pickup.

6.9.6 There are two types of red "sharps" containers that may be found in the work area, those labeled with the universal biohazard label and those not so labeled. The chemically contaminated sharps shall be:

- a. Collected separately from the biologically contaminated sharps.

- b. Biological agents shall never be placed inside the cardboard "broken glass" boxes.
- c. Used hypodermic syringes shall never be recapped and shall be dropped into the properly marked red "sharps" containers for disposal.
- d. Special one-handed safety devices shall be ordered if the recapping of needles is required by the project.

6.9.7 Razor blades and scalpels shall be placed in the red "sharps" containers after use.

6.9.7.1 They shall not be left out on countertops in the work area.

6.9.8 All types of sharps containers shall be turned in to the Chemical Manager for proper disposal when almost full. Never overfill the box because this increases the possibility of accidental injury.

6.9.8.1 The Chemical Manager shall issue a replacement container acceptable to the regulatory requirements with proper warning labels attached.

6.9.8.2 Sharps shall not be collected in containers that have not been approved by the Chemical Manager or FSH.

6.9.9 Nanotechnology

6.9.9.1 Nanotechnology is the engineering and manipulation of materials at the molecular level and is an emerging field, which offers the potential for new and better materials and products; however, the impacts of nanomaterials and nanoproducts on the environment and human health are unknown. Nanoparticles have different properties than bulk materials due to the influence of quantum effects at the nanometer scale, which changes essential material properties (optical, magnetic, and electrical) and increased relative surface area per unit mass, which increases strength and chemical reactivity.

6.9.9.2 All operations requiring the use and manufacturing of engineered nanomaterials at LaRC shall comply with NPR 1800.1C section 4.6 Nanotoxicology and be reviewed through the IH and/or PHMC.

6.9.9.2.1 Nanomaterials, nanoparticles, and nanotubes are classified as hazardous materials and require an LF 44 for procurement.

6.9.9.2.2 The particle properties (size, flammability, toxicity, etc.), the quantity of material being used or manufactured and the working conditions (airborne, encapsulated in a liquid or solid) will determine whether the process will require a PHM permit. Many materials classified as nanoparticles are categorized as hazardous materials presently requiring permits.

6.9.10 Peroxide Forming Materials Usage.

6.9.10.1 All operations requiring the use of peroxide forming materials falling in the categories “Red Label - Peroxide Hazard on Storage; Discard after 3 Months” and “Yellow Label - Peroxide Hazard on Concentration; Discard after 1 Year” listed in Figure 6.5: “Storage Limits of Peroxidizable Compounds” shall be permitted through the PHMC. This committee reviews the SOP drafted by the researcher for the control and use of the peroxide forming materials stated above.

6.9.10.1.1 This SOP shall include an introduction with the scope and background of the research, approved personnel, procedures, safety precautions, required employee training, medical monitoring (if required), storage, transporting, waste disposal and an emergency spill plan.

APPENDIX A**Definitions**

- A.1 Acute Exposure** Short duration contact, typically minutes or hours.
- A.2 Asphyxiatory** Capable of causing injury by depriving the body of oxygen. Substances producing this effect by dilution of atmospheric oxygen are referred to as simple asphyxiants.
- A.3 Autoignition Temperature** The temperature at which a material will self-ignite and sustain combustion in absence of a spark or flame.
- A.4 Carcinogenic** Capable of causing cancer. (NOTE: MSDSs are required to list any carcinogens present.)
- A.5 Chronic Exposure** Long duration contact, typically days, months, or years.
- A.6 Class I Spill** A Class I Spill is relatively small in volume and presents low hazard potential to personnel or the environment. It can be contained and cleaned up with only minor difficulty by the user/custodian. Outside support is not necessary. A Class I Spill results in:
- No discharge of oil or hazardous materials to adjacent waters at LaRC and no violation of applicable water quality standards.
 - No discharge of oil or hazardous materials to the environment (ex: spill contained completely inside building structure)
 - No sheen upon or discoloration of surface waters at LaRC.
 - A release of material that is *below* the Hazardous Substance Reportable Quantity.
- A.7 Class II Spill** A Class II Spill involves a large volume of material and may present significant hazard to personnel or the environment. Any spill reportable under EPA Regulations, 40 CFR 302, 355, or 372 shall be considered a Class II Spill. A Class II Spill results in:
- Discharge of oil or hazardous materials to adjacent waters at LaRC and/or is a violation of applicable water quality standards.
 - Discoloration of or sheen upon surface waters at LaRC.
 - Amount of released material is above the Hazardous Substance Reportable Quantity.
 - No release of oil or hazardous materials to the environment
- A.8 Cryogenic** Maintained at extremely low temperatures.

- A.9 Explosive Range** Range of concentration of a gas or vapor in air above and below which the mixture will not burn. Usually described as Lower and Upper Explosive Limits (LEL and UEL) and expressed in percentage.
- A.10 Flash Point** Lowest temperature at which a liquid will give off enough flammable vapor at or near its surface so that it will ignite upon introduction at an ignition source.
- A.11 IDLH** Immediately Dangerous to Life or Health Concentration (IDLH). Concentration at which serious health impairments, or irreversible biological effects possibly leading to death in a period of seconds or several days later, could occur.
- A.12 Narcotic** Capable of causing depression of the central nervous system; drowsiness, stupor, loss of coordination, unconsciousness.
- A.13 PEL** Permissible Exposure Level (PEL) Airborne concentration exposure standards are specified by Federal Regulation (OSHA, 29 CFR). Concentrations may be for 8-hour workdays, or shorter periods (usually 15 minutes). (See also Threshold Limit Values.)
- A.14 RCRA** The Resource Conservation and Recovery Act (RCRA) of 1976 gave the U.S. Environmental Protection Agency (EPA) the authority to control hazardous waste from “cradle-to-grave.” This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.
- A.15 TLV** Threshold Limit Value (TLV) Airborne concentration at or below which it is believed nearly all workers may be repeatedly exposed day after day with no adverse effect. Usually expressed in parts per million (ppm) for gases or vapors and milligrams per cubic meter (mg/m³) for dusts, fumes, and mists. Threshold Limit Values are specified by the American Conference of Governmental Industrial Hygienists and several have been adopted for use by OSHA.
- A.16 Vapor Density** Ratio of the specific gravity of a vapor to that of air. Materials having a vapor density greater than one are heavier than air.
- A.17 Vapor Pressure** The measure of tendency for a liquid to go into a gaseous state. Usually expressed in millimeters of mercury (mm Hg). More volatile materials have higher vapor pressures.

APPENDIX B**Acronyms**

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
BSCs	Biological Safety Cabinets
BSL	Biosafety Level
CA	California
CAA	Clean Air Act
CAM	Capital Assessment Management
CAS	Chemical Abstract Service
CDC	Centers for Disease Control
CEPA	Canadian Environmental Protection Agency
CERCLA	Comprehensive Environmental Response Compensation
CFR	Code of Federal Regulations
COD	Center Operations Directorate
CP	Center Procedures
CHO	Chemical Hygiene Officer
CHP	Chemical Hygiene Plan
CMP	Configuration Management Program
CMTS	Chemical Material Tracking System
CSPA	Consumer Specialty Products Association
CWA	Clean Water Act
DEA	Drug Enforcement Agency
DOT	Department of Transportation
EINECS	European Inventory of Existing Commercial Chemicals
EPA	Environmental Protection Agency
EMB	Environmental Management Branch
ESC	Executive Safety Council
FC	Facility Coordinator
FDA	Food and Drug Administration
FSH	Facility Safety Head
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FSC	Federal Supply Class
HF	Hydrofluoric Acid
IARC	International Agency for Research on Cancer
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life or Health
IH	Industrial Hygiene
IMO	International Maritime Organization

LAPD	Langley Policy Directive
LaRC	Langley Research Center
LEL	Lower Explosive Limit
LF	Langley Form
LMS	Langley Management System
LPR	Langley Procedural Requirement
LMB	Logistics Management Branch
MITI	Ministry of International Trade and Industry
MSDSs	Material Safety Data Sheets
NASA	National Aeronautics and Space Administration
NFPA	National Fire Protection Association
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety and Health
NTP	National Toxicology Program
OHO	Occupational Health Officer
OHS	Occupational Health Services
OSHA	Occupational Safety and Health Administration
OHCM	Office of Human Capital Management
OFSH	Organizational Facility Safety Head
OMEP	Occupational Medical Examination Protocols
PA	Pennsylvania
PFSH	Principal Facility Safety Head
PHM	Potentially hazardous materials
PHMC	Potentially Hazardous Materials Committee
PPE	Personal Protective Equipment
PR	Purchase Requisition
RID	Rapid Inventory Development
SARA	Superfund Amendments and Reauthorization Act
SCBA	Self-Contained Breathing Apparatus
SDWA	Safe Drinking Water Act
SFAB	Safety and Facility Assurance Branch
SMAO	Safety and Mission Assurance Office
SOC	Systems Operation Committee
SOP	Standard Operating Procedures
SOW	Statement of Work
TSCA	Toxic Substances Control Act
UEL	Upper Explosive Limit
USDA	United States Department of Agriculture
VOC	Volatile Organic Compounds
WHMIS	Workplace Hazardous Materials Information System

APPENDIX C**OSHA Regulated Suspect and Potential Carcinogens**

The chemical listed herein are considered to be particularly hazardous substances as defined in OSHA 29 CFR 1910.1450, and they are considered regulated chemicals for the purpose of this handbook.

CHEMICAL-SPECIFIC OSHA REGULATIONS

The following chemical-specific OSHA regulations are found in OSHA 29 CFR 1910.

<u>OSHA Regulation</u>	<u>Material</u>	<u>CAS Number</u>
1910.1001	Asbestos	
	Tremolite	77536-68-6
	Anthophyllite	77536-67-5
	Actinolite	77536-66-4
	Amosite	12172-73-5
	Chrysolite	12001-29-5
	Crocidolite	12001-28-4
1910.1002	Coal Tar Pitch Volatiles (except Asphalt)	65996-93-2
1910.1003	4-Nitrobiphenyl	92-93-3
1910.1004	Alpha-Naphthylamine	134-32-7
1910.1006	Methyl Chloromethyl Ether	107-30-2
1910.1007	3,3'-Dichlorobenzidine (and salts)	91-94-1
1910.1008	bis-Chloromethyl Ether	542-88-1
1910.1009	beta-Naphthylamine	91-59-8
1910.1010	Benzidine	92-87-5
1910.1011	4-Aminobiphenyl	92-67-1
1910.1012	Ethyleneimine	151-56-4
1910.1013	beta-Propiolactone	57-57-8
1910.1014	2-Acetylaminofluorene	53-96-3
1910.1015	4-Dimethylaminoazobenzene	60-11-7
1910.1016	N-Nitrosodimethylamine	62-75-9
1910.1017	Vinyl Chloride	75-01-4
1910.1018	Inorganic Arsenic	7440-38-2
1910.1025	Lead	7439-92-1
1910.1027	Cadmium (MDA)	7440-43-9
1910.1028	Benzene	71-43-2
1910.1029	Coke oven emission	None
1910.1043	Cotton dust	None
1910.1044	1,2-dibromo-3-chloropropane (DBCP)	96-12-8
1910.1045	Acrylonitrile	107-13-1
1910.1047	Ethylene Oxide	75-21-8
1910.1048	Formaldehyde	50-00-0
1910.1050	Methylenedianiline (MDA)	101-77-9
1910.1051	1.3-Butadiene	106-99-0
1910.1052	Methylene Chloride	75-09-2