Richard B. Russell Agricultural Research Center

USDA, ARS

 SAFETY PROGRAM



 Adopted JULY 2013, updated JAN. 2014

 **USDA, ARS, RRC**

 **SAFETY PROGRAM**

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**I. Introduction**

1. **Purpose.**

The objective is to establish policies and assign responsibilities for implementation of the Richard B. Russell Agricultural Research Center (RRC) accident prevention program.

1. **Responsibilities.**

 As defined be the USDA Research, Education, and Economics (REE) Safety, Health, and Environmental Management program manual 160.0M June 2, 2011, program relevant responsibilities are as follows:

* 1. **The Location Coordinator, along with the Research Leaders will:**
* Implement, manage, monitor, and comply with applicable Federal, State, and local laws and regulations to ensure safe, healthful, and environmentally protected workplaces.
* Inform and hold subordinate supervisors responsible for implementing and managing the REE safety, health, and environmental requirements, and ensure that they and their employees are properly educated, trained, and prepared to carry out these responsibilities.
* Provide the necessary financial resources, training, equipment, facilities and management support to subordinate employees to ensure compliance with the Federal, State, and local laws and regulations.
* Acquire and/or appoint personnel (e.g., by direct hire, contract, collateral duty, etc.) to assist in solving safety, health, environmental, radiological and biological issues and to provide a safe and healthful work environment.
* Furnish location employees with places and conditions of employment that are free from recognized hazards. Ensure recognized hazards are abated, and, if abatement is beyond the resources or ability of /location, request resources from the next higher management level to abate them. If abatement cannot be immediately achieved, ensure interim protective measures are in place to protect employees from illness and injury.
* Ensure that the Occupational Medial Surveillance Program and Employee Assistance Program (EAP) are available for the identification and treatment of employees’ work-related illness and/or personal difficulties that may affect their safety, health, and/or productivity.
* Respond promptly to reports of unsafe or unhealthful conditions that threaten people, property, or the environment, and establish procedures designed to ensure that no employee is subject to any interference, discrimination, or other type of reprisal for reporting such conditions or participating in REE Safety, Health, and Environmental Management (SHEM) program activities.
* Ensure that location workplaces are inspected and audited at least annually by qualified and properly equipped personnel and adequate employee representation is provided.
* Provide prompt abatement of unsafe and unhealthful working conditions that threaten people, property, or the environment. Request resources from the next higher management level to abate hazards or conditions beyond the ability of location to abate, and ensure proper posting of notices for identified unsafe and unhealthful conditions that cannot be abated immediately.
* Provide for regulatory required and site specific safety, health, and environmental education/training including periodic updates for location employees to ensure they are current with program requirements and policies.
* Require participation by, and consultation with, employees or their representatives (i.e., unions) in the locations’ safety, health, and environmental operations and activities.
* Integrate safety, health, and environmental responsibilities into the performance standards of managers, supervisors, and employees under their jurisdiction and appraise their performance accordingly.
* Obtain the necessary data and furnish safety, health, and environmental reports (e.g., annual, evaluation, accident/illness/injury, facility, investigation, etc.); statistical reports (e.g., injury, illness, property/environmental damage, loss, costs, etc.); and hazardous waste cleanup (HWC)/funding reports to the next higher management organizational level.
* Ensure OSHA’s Form 300, Log of Work-Related Injuries and Illnesses, and other applicable forms are maintained at each location.
* Recommend actions that enable REE to comply with the intent and purposes of applicable standards impacting safety, health, and environmental legislation.
* Report within required deadlines environmental releases (i.e., any spilling, leaking, pumping, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment) to appropriate Federal, State, or local regulatory officials and Location/Area/Headquarters officials.
* As required, provide support and make formal recommendations to the appropriate official concerning environmental issues and building permit procedures related to National Environmental Policy Act (NEPA).
* Develop, implement, and maintain a viable Environmental Management System (EMS).
	1. **The Location Safety Officer will:**
* Recommend actions that enable REE to comply with the intent, purposes, and standards of Federal, State, and local safety, health, and environmental laws and regulations.
* Assist managers/supervisors in developing and implementing the SHEM program for REE location employees, cooperators, and visitors according to USDA and Federal, State, and local laws and regulations.
* Assist managers/supervisors in designing programs at REE locations being serviced to be consistent with the SHEM program policy.
* Assist managers/supervisors in designing safety, health, and environmental compliance into location research operations, construction, repair and maintenance, and modernization projects.
* Recommend Location/Area goals and objectives for reducing or eliminating accidents, injuries, illnesses, and damage to the environment.
* Arrange, conduct, and assist the Location in obtaining appropriate safety, health, and environmental education/training programs and orientations for present and new employees.
* Ensure that managers/supervisors are complying with applicable Federal, State, and local laws and regulations. Report violations to higher levels of management.
* Conduct inspections and environmental audits of workplaces within the locations being serviced on a regular basis.
* Recommend prompt abatement and corrective actions for unsafe and unhealthful working conditions, facilities, equipment, and practices.
* Assist Center Directors/Location Coordinators/Research Leaders with safety, health, and environmental related plans to bring the location into compliance by developing project requirements with cost estimates, reports of violations, corrective action plans, training requirements, supporting statistics, and/or other information for the locations being serviced.
* Provide safety, health, and environmental guidance and assistance to location officials in their administration of the location programs; assist in setting safety, health, and environmental program priorities; and assist in evaluating program implementation/ effectiveness.
* Assist managers/supervisors in implementing policies/procedures that minimize or eliminate potentially hazardous conditions or adverse personal effects through chemical management strategies that reflect best practices.
* Assist Area/location officials in reporting to the appropriate Federal, State, or local regulatory officials and Area/Headquarters officials on all environmental releases (i.e., any spilling, leaking, pumping, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment) of a listed hazardous substance in quantities equal to or greater than listed quantities.
* Collect data and assist managers/supervisors in preparing location submittal for SHEM-related reporting requirements.
* As required, assist in preparing Statements of Work (SOWs) for preliminary assessments/site inspections or other pre-remedial/remedial work for locations being served. Serve as a technical evaluation panel member for pollution prevention/abatement/remediation projects when assigned and serve as the Contracting Officer’s Representative as required.
* As required, provide technical support and make formal recommendations for location construction and research-related issues involving NEPA and building permit procedures for facility construction projects and/or Architect-Engineer (A-E) requirements.
	1. **Location Administrative Officer will:**
* Assist line managers in identifying and allocating necessary staffing, education/training, and financial resources to develop and manage a comprehensive and viable REE location program.
* Provide administrative management assistance to the Center Director/Location Coordinator/Research Leader in establishing location goals/objectives for reducing or eliminating accidents, injuries, illnesses, or damage to the environment.
* Provide administrative management assistance in compiling location safety, health, and environmental related reports, inventories, and statistics required by REE.
* Recommend actions that enable the Center Director/Location Coordinator/Research Leader to comply with the intent and purpose of standards and ARS policies impacting safety, health, and environmental legislation.
* Assist in the development of improvements, plans, and follow-up reports for corrective action measures to meet standards.
* Assist location supervisory personnel and employees in accessing applicable safety, health, and environmental standards.
* Ensure that accidents, injuries, illnesses, known exposures, near misses, and environmental releases are properly reported; that appropriate forms are prepared; and that investigations are conducted to identify causes and determine corrective actions; and corrective actions are taken to prevent recurrence and are properly documented. Verifies corrective actions have been taken. If corrective actions are beyond the resources of the location to implement, assists the Location Coordinator in requesting resources from the next higher level of management.
* Ensure OSHA’s Form 300, Log of Work-Related Injuries and Illnesses, and other applicable forms are maintained.
* Participate in the development of location-wide and, in some cases, Agency-wide or Area-wide SHEM programs to ensure compliance with Federal, State, and local laws and regulations.
* As applicable, monitor location Hazard Waste Cleanup (HWC) fund expenditures to ensure compliance with USDA guidelines; ensure quality and accuracy of HWC Status of Funds reports for location projects; and ensure that quarterly reviews of HWC activities are conducted, and the findings are reported to Safety, Health, and Environmental Management Branch (SHEMB).
* Administratively supervise, assign tasks, and monitor the performance of individual Cluster Environmental Protection Specialist (CEPS), Industrial Hygienists, and other safety, health, and environmental employees under their supervision. Assignments will be congruent with Agency-wide or Area-wide program goals, priorities, and objectives.
	1. **Supervisors will:**
* Furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or physical harm.
* Comply with applicable Federal, State, and local laws and regulations.
* Ensure that supervised employees receive new employee orientation as well as initial and recurring specialized job training appropriate to the work performed.
* Provide employees access to safety, health, and environmental related materials including regulations, EOs, standards, codes, departmental regulations, P&Ps, injury and illness statistics, etc.
* Ensure that employees are provided an opportunity to participate in the Occupational Medical Surveillance Program (OMSP), where there is recognized potential exposure to hazardous chemicals, materials, noise, radiation, or biological agents.
* Take appropriate actions to identify and correct hazardous situations caused by chemical, radiological, biological, physical, and ergonomic exposures through engineering controls, administrative controls, or as a last resort, through the use of personal protective equipment (PPE).
* Provide, train, and ensure proper use of applicable PPE and clothing.
* Monitor employee performance to ensure that work is accomplished in a manner conducive to the health and safety of themselves, their fellow employees, and the environment.
* Ensure that the AD-1010OSHA safety poster or equivalent informing employees of the provisions of the OSHAct is posted conspicuously in the work area.
* Investigate accidents, injuries, illnesses, known exposures, near-misses, and environmental releases in order to identify causes and determine corrective actions to prevent recurrence; and prepare the appropriate paperwork in accordance with Federal, State, and local laws and regulations.
* Investigate in a timely manner, any employee reports of unsafe/unhealthy working condition, and abate any hazards within their capability to abate.
	1. **All Employees will:**
* To the extent and scope of their authority, ensure safe and healthful workplaces.
* Comply with applicable Federal, State, and local laws and regulations.
* Ensure the proper and timely reporting of accidents, injuries, illnesses, known exposures, near misses, and environmental releases (i.e., at the time they happen or as soon as practicable); prepare the appropriate forms; and make timely notification to supervisory/management employees of the causes and corrective actions recommended to prevent recurrence which may include training.
* Perform assigned tasks (including those activities not specifically addressed by existing Federal, State, and local laws and regulations) in a manner conducive to the safety and health of themselves, their fellow employees, the public, and the environment.
* Properly use applicable safety, health, environmental, and PPE and clothing.
* Avail themselves of medical surveillance and/or counseling through the OMSP and/or Employee Assistance Program (EAP) and other voluntary programs to maintain their physical and mental health and safety in accordance with REE policies and regulations. Supervisory approval/concurrence will be acquired except where confidentiality is guaranteed.
* Participate fully in the REE program with freedom from restraint, interference, coercion, discrimination, or reprisal.
* Participate in and maintain appropriate training and certification as required to work safely.
* Correct safety, health, and environmental hazards, and notify the next level of management if they are not within their ability and resources to rectify.

**3. Explanation of Terms**

**Acid:** Compounds that contain one or more H+ ions and are very active chemically. Examples include: Acetic acid, Benzoic acid, Carbolic acid, Nitric acid, Phosphoric acid and Sulfuric acid.

**Action Level:** A concentration designated in title 29 Code of Federal Regulations (CFR), part 1910 for a regulated substance which initiates certain required activities such as exposure monitoring and medical surveillance. Also ½ of the PEL or TLV for a chemical or whichever is more stringent.

**Antimicrobial:**  An agent that kills or suppresses the growth of microorganisms.

**Antiseptic:** A substance that prevents or arrests the growth or action of microorganisms, either by inhibiting their activity or destroying them.

**Bases:** Corrosive compounds that contain the OH- ion and are active chemically. Examples include: Ammonium hydroxide, Calcium hydroxide, Potassium hydroxide and Sodium hydroxide.

**Biohazard:** An infectious agent, or hazardous biological agent, or part thereof, regardless of origin (naturally occurring, bioengineered, or synthesized component of any such microorganism or infectious substance), that presents a real or potential risk to humans, animals or plants, either directly through infection, or indirectly through the disruption of the environment. Biohazards include certain types of recombinant DNA; organisms and viruses infectious to humans, animals or plants (e.g., parasites, viruses, bacteria, fungi, prions, and rickettsia); and biologically active agents (i.e., toxins, allergens, and venoms) that may cause disease in other living organisms or significantly affect the environment, community, commerce, or trade agreements.

**Biohazard Incident:** An incident that may include human exposure to an infectious, potentially infectious, or zoonotic agent; a release of a biohazard into the environment; escape of infected animals or vectors; biohazard spills outside of a primary containment device; loss or theft of biohazardous agents; or other loss of containment or equipment failure in conjunction with a biohazard which may lead to a release of a hazardous agent within the laboratory environment or outside the laboratory environment.

**Biohazardous waste types:** Waste items as described in section 7 of this manual generated at USDA facilities.

**Biological Indicator (BI):** A standardized preparation of nonpathogenic (surrogate) microorganisms (in many cases bacterial endospores) that are highly resistant to specific sterilization methods. BIs are used during the sterilization process to provide additional evidence that the sterilization method was effective in achieving sterilization. BIs can be dried preparations on filter paper (spore strips), stainless steel coupons, or aluminum foil, or can be a combined unit consisting of a paper carrier of the BI and a vial of growth medium containing a pH indicator system.

**Biological Toxin or Biotoxin:** A broad range of substances, predominantly of natural origin but increasingly accessible by modern synthetic methods, that may cause death or severe incapacitation at relatively low exposure levels. Biological toxins include metabolites of living organisms, degradation products of dead

**Biosafety:** The application of knowledge, techniques and equipment to prevent personal, laboratory and environmental exposure to potentially infectious agents or biohazards. Biosafety defines the containment conditions under which infectious agents can be safely manipulated. The objective of containment is to confine biohazards and to reduce the potential exposure of the laboratory worker, persons outside of the laboratory, and the environment to potentially infectious agents.

**Biosafety Level (BSL):** Four BSLs are described in the 5th edition of *Biosafety in Microbiology and Biomedical Laboratories*, published by the Centers for Disease Control (CDC) and the National Institutes of Health. These consist of increasingly protective combinations of laboratory practices and techniques, safety equipment, and laboratory facilities. Each combination is specifically appropriate for the operations performed, the documented or suspected routes of infectious agent transmission, and the laboratory function or activity.

**Biosafety Plan:** The predetermined plan for the recognition, evaluation, minimization, and control of biohazards within the work environment.

**Carcinogen:** a chemical or mixture which contains at least 0.1% of a chemical which meets one of the following criteria: (1) it is regulated by OSHA as a carcinogen, (2) it is a human carcinogen listed under the category “known to be carcinogenic”, in the annual report on carcinogens published by the National Toxicology Program (NTP), latest edition, (3) it is listed under Group I, “Carcinogenic to humans” by the International Agency for Research on Cancer (IARC), latest edition, (4) it is listed in either Group 2A or 2B by IARC or under the category “reasonably anticipated to be carcinogens” by NTP. Examples include: Benzene, Benzidine, Chromium Oxide, Acrylonitrile, Carbon Tetrachloride, Formaldehyde, and Chloroform.

**Chemical Hygiene Officer:** The employee designated by the Research Leader, who is qualified by training or experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

**Chemical Hygiene Plan:** A written program which sets forth polity and procedures capable of protecting employees from the health hazards associated with their work place.

**Combustible Liquid:** Any liquid having a flash point at or above 100 degrees Fahrenheit (F), but below 200 degrees F, except any mixture having components with flash points of 200 degrees F or higher, the total volume of which makes up 99% or more of the mixture.

**Compressed Gas:** A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 degrees F, or a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 degrees F regardless of the pressure at 70 degrees F.

**Designated Area:** An area that is used for work involving carcinogens, reproductive toxins or acutely toxic chemicals; a designated area may be the entire laboratory, a controlled area within a laboratory or engineering controls such as a chemical hood.

**Emergency:** Any occurrence such as, but not limited to, equipment failure, container rupture or engineering control failure, which results in the release of a hazardous chemical into the work place.

**Employee:** An individual employed in a laboratory who may be exposed to hazardous chemicals in the course of their employment.

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

**Flammable aerosol:** An aerosol that when tested by the method described in title 16, CFR part 1500.45 yields flame protection exceeding 18 inches at full valve opening, or a flashback at any degree of opening of the valve.

**Flammable gas:** A gas that, at ambient temperature and pressure forms a flammable mixture with air at a concentration of 13% by volume or less, or a gas that at ambient temperature and pressure forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit. Examples include: Acetylene, Butane, Hydrogen, Propane and Natural gas.

**Flammable liquid:** A liquid having a flash point below 100 degree F, except any mixture having components with flash points of 100 F or higher, the total of which make up 99 % or more of the total volume of the mixture.

**Flash Point:** The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested using the Tagliabue Closed Tester, the Pensky-Martens Closed Tester or the Setaflash Closed Tester.

**Flammable solid:** Any solid material, other than an explosive, which is liable to cause fires through friction, through retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a**s** hazard. Examples include: Ammonium Nitrate, Phosphorus, and Picric acid.

**Hazardous Chemical:** A chemical 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 an exposed employee. This includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic (blood-forming) systems, and agents which can damage the lungs, skin, eyes or mucous membranes.

**Highly Toxic:** A chemical falling within any of the following toxicity categories: (1) a median lethal dose (LD50) of 50 mg/kg of body weight or less when administered orally to rats, (2) an LD 50 of 200 mg/kg of body weight or less when administered to the skin of rabbits, (3) a median lethal concentration (LC50) in air of 200 ppm or less of gas or vapor, or 2 mg/liter or less of mist, fume or dust when administered by inhalation to rats. Examples include: Aldrin, Sodium cyanide, Osmium tetroxide, Sodium azide and Dieldrin. An example of an acutely toxic gas is Hydrogen cyanide, and Nitrogen dioxide.

**High Risk Operations:** Experimental procedures involving the manipulation, handling or reaction of hazardous chemicals where the potential for release of gas, vapor or aerosol contamination is high. This includes but is not limited to (1) rapid exothermic reactions, (2) transfer of electrostatic powders (3) heating, mixing or transfer of volatile chemicals, (4) pressurized operations where there is potential for uncontrolled release, and (5) work involving aerosol generation.

**Laboratory:** A facility or individual room where the “laboratory use” of hazardous chemicals occurs.

**Laboratory hood (fume hood):** An engineering control enclosed on five sides with a movable sash or fixed partial enclosure on the remaining side designed to draw air from the laboratory into the enclosure to prevent or minimize the escape of contaminants into the laboratory space.

**Laboratory Scale:** Work with substances in which the equipment used of reactions, transfers, and other handling are designed to be easily and safely manipulated by one person.

**Laboratory Use:** The handling or use of chemicals in which (1) chemical manipulations are done on a “laboratory scale”, (2) multiple procedures or chemicals are used, (3) procedures are not part of a production process, and (4) “protective laboratory practices and equipment” are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

**Low Risk Operations:** Experimental procedures where the potential for release of gas, vapor or aerosol contamination is remote.

**Medical Consultation:** A consultation which takes place between an employee and a licensed physician for the purpose of determining what medical exams or procedures are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

**Oxidizer:** A chemical other than a blasting agent or explosive as defined in Title 29 CFR, part 1910.109 (a), that initiates or promotes combustion in other material, thereby causing fire either by itself or through the release of oxygen or other gases. Examples include: Oxygen, Hydrogen peroxide, Sodium peroxides, Nitrates, Nitrates, Chlorates and Chlorites.

**Permissible exposure Limit (PEL):** An occupational standard promulgated by OSHA as regulatory requirement. The PEL can be an 8-hour time weighted average (TWA), a ceiling value or a 15 minute short term exposure limit (STEL). A list of PELs can be found in 29CFR 1910.

**Protective laboratory practices and equipment:** Those laboratory procedures, engineering/administrative controls, work practices and protective clothing and equipment used to minimize employee exposure to hazardous chemicals.

**Reproductive Toxin**: A chemical which affects the reproductive system and may produce chromosomal damage (mutations) and/or adverse effects on the fetus (teratogenesis). For the purposes of this guidance any chemical with a mutagenic or teratogenic quotation in the Registry of Toxic Effects of Chemical Substances (RTECS) shall be considered a reproductive hazard.

**Shock Sensitive Chemicals:** Materials that can detonate by shock or heat given the proper conditions. Examples include: Lead azide, Silver azide, Picric Acid, Urea nitrate, Calcium nitrate, and organic peroxides which can develop in Tetrahydrofuran, S-Dioxane, and Ethyl ether.

**Threshold Limit Value (TLV):** Airborne concentrations of substances published by the ACGIH to which it is believed workers may be exposed day after day with no adverse effects.

**Toxic Chemical:** A chemical falling within any of the following toxicity categories: (1) an LD 50 of more than 50 mg/kg but not more than 500 mg/kg to 5 g/kg of body weight when administered orally to rats, (2) and LD50 of more than 200 mg/kg but not more than 5 grams/kg of body weight when administered to the skin of rabbits, (3) an LC 50 in air of more than 200 ppm but not more than 20,000 ppm of gas or vapor, or more than 2 mg/liter but not more than 20 mg/liter of mist, fume or dust when administered by inhalation to rats. Examples include: Methyl iodide, Hydrogen sulfide and Formaldehyde.

**Water-reactive chemicals:** Materials that will react in some manner when in contact with water. Can produce flammable, toxic gases or other hazardous condition if they come in contact with water. Examples include: Alkali metals (lithium), Carbides, Inorganic chlorides, and Nitrides.

**II. Safety Inspections**

**1. Purpose**

Safety and Occupational Health Inspections will be conducted to identify and eliminate unsafe acts and conditions.

**2. Responsibilities**

1. The Location Safety Officer (LSO) will conduct safety, biosafety, and occupational health related inspections of all ARS locations and assist as needed the FSIS Safety Officer within RRC to identify hazards and to verify compliance with applicable OSHA, USDA, and other applicable standards. At a minimum all areas will be inspected once a year and documented. Research Unit employee representatives will be requested to be present during inspections.

b. The LSO will track and periodically (every 30 days) follow-up hazard abatement efforts until abatement is complete.

c. Research Leaders and Supervisors will be provided copies and review inspection results to ensure appropriate corrective action is taken and post a copy of the inspection in their work area. Notice of repeat and serious violations will be provided to the Location Coordinator for action.

d. Supervisors will conduct informal daily inspections of their area of responsibility and correct unsafe acts or conditions.

e. In performance of their duties, all personnel must informally survey their operations, activities, equipment, and procedures to identify safety hazards, to report and initiate corrective action as necessary.

**3. Corrective Action.** Identified hazards noted during inspections will be abated on a worst-first basis. Hazards will be risk assessed in terms of hazard severity and accident probability and assigned a risk assessment code (Figure 2-1). Unsafe acts or conditions which require corrective action or funding by a higher authority will be recorded and corrective action initiated through proper channels. Interim corrective action to reduce the hazard will be taken while awaiting final abatement.

**Table 2-1**

**Hazard Severity**

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Category I

Description: Catastrophic

Definition: Loss of ability to accomplish mission. Death or permanent total disability. Severe environmental damage.

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Category: II

Description: Critical

Definition: Significantly degrades ability to conduct mission. Permanent partial disability, temporary total disability exceeding 3 months time. Major damage to equipment or systems. Significant damage to property or the environment.

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Category: III

Description: Marginal

Definition: Degrades ability to conduct mission. Minor damage to equipment, property or the environment. Lost full workday due to injury or illness.

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Category: IV

Description: Negligible

Definition: Little or no adverse impact on mission capability. First aid or minor medical treatment that does not result in a lost full work day. Slight equipment or system damage. Little to no equipment damage.

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**Accident Probability**

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Category: A

Description: Definite (greater than an 80% chance)

Definition: Can be expected to occur and perhaps occur often.

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Category : B

Description: Likely (between 60-80% chance)

Definition: Can be expected several times during life of equipment, facility, or individuals career

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Category: C

Description: Occasional (50/50% chance)

Definition: Injury or accident can be expected to occur sporadically (sometimes)

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Category: D

Description: Seldom

Definition: Risks that have a low probability of occurrence but still cannot be ruled out.

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Category: E

Description: Unlikely (less than 10%)

Definition: Can assume accident will not occur, but not impossible.

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**Risk assessment matrix**

|  |  |  |
| --- | --- | --- |
|  |  | **Accident Probability** |
|  |  | **Frequent** | **Likely** | **Occasional** | **Seldom**  | **Unlikely** |
| **Hazard Severity Rating** | **Catastrophic (I)** | **E** | **E** | **E** | **H** | **H** |
| **Critical (II)** | **E** | **E** | **H** | **H** | **M** |
| **Moderate (III)** | **E** | **E** | **H** | **M** | **M** |
| **Marginal (IV)** | **E** | **H** | **M** | **L** | **L** |
| **Negligible (V)** | **H** | **M** | **L** | **L** | **L** |
|  | **Figure 2-1** |  |  |  |  |  |

**Using the Risk Assessment Matrix**

Once the risks have been placed in the matrix, in cells corresponding to the appropriate likelihood and consequences, it becomes visibly clear as to which risks must be handled at what priority. Each of the risks placed in the table will fall under one of the categories, for which different colors have been used in the sample risk assessment template above. Here are details on each of the categories:

**Extreme:** The risks that fall in the cells marked with ‘E’ (red color), are the risks that are most critical and that must be addressed on a high priority basis. The LSO and Safety Committee should gear up for immediate action, so as to eliminate the risk completely.

**High Risk:** Denoted with ‘H’ (orange color), are risks that also call for immediate action or risk management strategies. Here in addition to thinking about eliminating the risk, substitution strategies may also work well. If these issues cannot be resolved immediately, strict timelines must be established to ensure that these issues get resolved before the create hurdles in the progress.

**Medium:** If a risk falls in one of the yellow cells marked as ‘M’ , it is best to take some reasonable steps and develop risk management strategies in time, even though there is no hurry to have such risks sorted out early. Such risks do not require extensive resources; rather they can be handled with smart thinking and logical planning.

**Low Risk:** The risks that fall in the green cells marked with ‘L’, can be disregarded as they usually do not pose any significant problem. However still, if some reasonable steps can help in fighting these risks, such steps should be taken to improve overall performance of the project.

**Imminent Danger**

When an imminent danger (Extreme or High Risk) situation is discovered, the immediate supervisor and research leader will be notified as soon as possible.

The LSO will provide technical advice to the supervisor on the scene, who will correct the condition, minimize the hazard to an acceptable level or cease operations and withdraw personnel from the exposure.

Imminent Danger hazards in which personnel were withdrawn from will be noted on form located in Appendix A. Completed form will be posted at all entrances to the area where hazard is located. The LSO along with the operations & maintenance director will take necessary measures to restrict all access to the affected area until the danger has been mitigated or eliminated.

**III. RRC Safety Committee**

* + 1. **The RRC Safety Committee will** be implemented in accordance with 29 CFR 1960.36. The committee shall be composed of a representative from each research group, the Location Safety Officer, Operation & Maintenance Director, Location Administrative Officer, and Location Engineer.

**2. The purpose of the RRC Safety Committee shall be to:**

* 1. Monitor the locations safety and health program and make recommendations to the Location Safety Officer for areas of improvement;
	2. Monitor findings and reports of workplace inspections to confirm that appropriate corrective measures are implemented;

c. Participate in RRC inspections when requested by Location Safety Officer,

d. Review internal and external safety/security evaluation reports and make recommendations for improving RRC’s safety and health program;

e. Review, and comment, as appropriate, to safety and health suggestions and recommendations from employees;

f. When requested by the Location Safety Officer, or when the committee deems necessary, comment on proposed OSHA Standards;

g. Monitor and recommend changes, as required, in the level of resources allocated and spent on RRC’s safety and health program;

h. Review agency responses to reports of hazardous conditions, safety and health program deficiencies, and allegations of reprisal;

i. Report dissatisfaction to OSHA if half the committee determines there are deficiencies in the RRC’s safety and health program or are not satisfied with the agency’s reports of reprisal investigations; and

j. Request OSHA conduct an evaluation or inspection if half the members are not satisfied with an agency’s response to a report of hazardous working conditions.

**3. Safety Committee Member Positions and Terms.** Committee members should serve overlapping terms. Such terms should be of at least two years duration. The committee chairperson shall be elected by the committee members. Form S&E 809, See Appendix B, shall list committee members and be posted in a central location.

**4. Safety Committee Meetings.** The safety committee shall meet at least quarterly and at the call of the chairperson.

**IV. Reporting of Unsafe or Unhealthful Condition**

**1. General.** Reports of unsafe or unhealthful conditions by personnel are important for the correction of hazards that may cause accidents. It is not only a right, but a responsibility of all personnel to report unsafe or unhealthful conditions. Such reports will normally be handled at the lowest level to ensure prompt and effective corrective action and do not have to be in writing. However, reports may also be made directly to the safety office, by passing supervisory elements. All reports will be handled so as not to cause the originator any fear of reprisal.

**2. Reports.**

* 1. All reports of hazards in the workplace should first be made to the supervisor responsible for the workplace. Supervisors will investigate the basis for the report and advise the originator of action taken.
	2. Types of incidents that should be reported should include but are not be limited to the following:
* The accidental release of any substance which could cause injury to any person or the environment.
* Any accident or incident which results or could have resulted in the release or escape of a biological agent likely to cause severe human infection or illness.
* Any explosion or fire caused by an electrical short circuit or overload (including those resulting from accidental damage to the electrical plant) which either—
	+ results in the stoppage of the equipment; or
	+ results in an increased risk of injury or death.
* An accidental leakage of gas.
* Any **incident** which nearly resulted in an injury.
	1. Personnel can report workplace hazards to the LSO if dissatisfied with supervisor’s response verbally or by using the RRC Employee Report of Alleged Unsafe or Unhealthful Working Conditions form located in Appendix C. Written reports should be signed; however, anonymous reports will be investigated in the same manner as other reports. Names of employees submitting signed reports who request anonymity will not be revealed to personnel outside the safety office.

**3. Investigations.**

a. If a report is submitted that appears to involve an imminent danger situation the LSO will conduct an investigation of the condition within 24 hrs. All other conditions will be investigated 3 to 10 days depending on the seriousness of the situation. (Exceptions may occur due to availability of Safety Officer). Note if LSO is not available notify the Location Administrative Officer if a serious hazard exists.

b. All reports will be investigated by the LSO. The originator, if known, will be notified in writing of the results of the investigation within 10 working days of receipt of the hazard report. If the **10-workday** suspense cannot be met, the originator should be provided an interim response.

**4. Corrective Action.**

a. If it is determined that a hazard exist, the reply will include a summary of the actions to be taken and the anticipated date for corrective action.

b. If it is determined that a hazardous condition does not exist, the reply to the employee will include the basis for that determination. This reply will encourage informal contact with the safety officer if additional explanations are desired.

c. If the originator is dissatisfied with the LSO response, they may appeal to the Location Coordinator and/or Safety Committee. The Location Coordinator and/or Safety Committee will review the findings and take appropriate action.

d. Although personnel have the right to report hazards directly to the Department of Labor, they are encouraged to follow the review levels described above.

**5. Recordkeeping.** The Safety Office shall maintain a log of all written reports of unsafe and unhealthful working conditions received and response. Reports will be maintained by the safety office for at least 5 years following the end of the calendar year to which they relate.

**V. Accident and Close Call Investigations and Reporting**

**1. Purpose.** To identify the cause and any contributing causes to an accident or close call involving RRC ARS personnel or which occur at the RRC location, and to develop measures to prevent the reoccurrence of a similar incident. Accidents are identified as incidents which result in personnel injury, illness or property damage. Close calls are incidents where there was the potential for a serious personnel injury or significant property damage.

**2. Responsibilities:**

a. Supervisors and the Location Safety Officer will investigate accidents and close calls to identify their cause(s), and also develop methods and techniques for preventing accidents. Findings will be reported to the Location Coordinator and Safety Committee.

b. The RRC Safety Committee will review accidents and close calls to determine their cause(s); review accident reports; and identify accident trends. The Safety Committee will report its findings to the Location Coordinator.

c. Employees must report accidents and close calls promptly and participate in the investigation process. Employees are encouraged to share insights with investigators about ways to prevent future accidents or close calls.

**3. Investigations.** All accidents and close calls are required to be reported to the Safety Office and responsible supervisor. Upon notification of an accident or close call the LSO and responsible supervisor(s) shall conduct an investigation with all parties involved or having knowledge of the accident. Accidents involving medical treatment, fire or property damage greater than $200 will be documented using an accident investigation form. Accident investigation forms will be maintained by the safety office for 5 years.

**4. Motor Vehicle Accidents.** All Motor vehicle accidents involving USDA vehicles must also be investigated and reported in accordance with information provided in the motor vehicle accident report kit AD 651 which is required to be located in the glove compartment of all USDA vehicles.

**5.** **Laboratory Acquired Infections.** If you work around potential pathogens then you are at risk from laboratory acquired infections (LAIs). In order to properly protect yourself and your coworkers from potential pathogenic exposures there are some things you need to know and do.

*Prior to beginning work:*

* You should have an awareness of what pathogen(s) you will be working with including antibiotic resistances for the strain you are working with. This information can help your doctor pick the correct antibiotic for you; if needed.
* You should have a plan in place with your physician or a rapid treatment facility to get access to a physician in case of exposure.
* You should be familiar with all BSL2 working practices and containment equipment **and use them.**

If potentially exposed follow these **Immediate Action Steps** by route of exposure:

* **Mucous membrane (eye, mouth) exposure** – If contaminated material is ingested or splashed, wash mouth out with water; do not swallow.  Use emergency eyewash for eyes and flush for 15 minutes.
* **Parenteral Inoculation** – Wash the area with soap and running water.  Do not apply bleach, alcohol or other disinfectant to the skin.
* **Contact with intact skin and clothing** – Remove contaminated clothing (lab coat) using gloves and place objects in an autoclave bag.  Clothing is autoclaved and then laundered.   Wash skin with soap and water.
* In all cases **immediate notification of your laboratory manager is required**, as well as notification of your safety officer.

*After exposure occurs:*

* Complete immediate action steps, making sure to notify your lab manager and safety officer.
* Make note of the specific pathogen(s) you are working with so that you can report that information to your physician.
* Complete CA-1 “Federal Employee’s Notice of Traumatic Injury and Claim for Continuation of Pay Compensation.”
* Acquire a CA-16 “Authorization for Examination and/or Treatment” from the LSO or your safety office. Workman’s compensation, if appropriate to the situation, requires that the employee be seen by a physician and not a nurse or a physician’s assistant. This requirement may mean a trip to a hospital emergency room if there is no other way to access a physician quickly.
* Seek medical attention as soon as possible.  Be sure to notify your doctor as to what specific pathogen(s) you were working with to include any antibiotic resistances.

**5. Reporting.** In the event of a fatality or hospitalization of three or more employees, due to a single incident, the Occupational Safety and Health Administration (OSHA) and the USDA Safety and Health Management Division must be notified within eight hours. Phone and fax numbers for OSHA and the USDA Safety and Health Management Division are located in appendix A of the RRC Emergency Action Plan Information Binder.

**Injury Reporting Procedure:**

In the event that you are injured at work, the following steps are necessary:

1. Follow standard first aid protocols and seek medical attention, if necessary.
2. Contact your supervisor and the Location Administrative Officer (3029) or Location Safety Officer (3137) within 24 hours of the accident/incident.
3. Complete the "Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation" [**(CA-1)**](http://ars.usda.gov/SP2UserFiles/Place/36550000/CA1.pdf)report available from the Administrative Office within 24 hrs. This should be filled out even if you do not feel that the injury was bad enough to see a doctor.
4. If you need to see a doctor with 48 hours of the injury, the Location Administrative Officer will issue a CA-16 to you so that you may get emergency care.
5. Follow instructions provided by the attending physician and/or your immediate supervisor for returning to work.

**6. Corrective Action.** All accidents and findings will be reviewed by the RRC Occupational Safety and Health Committee to ensure identification of appropriate corrective action and to detect and develop means to correct any adverse trends.

**7. Log of Occupational injuries and Illnesses.** The Location Safety Officer will maintain and complete OSHA Form 300.

**VI. Job Hazard Analysis (JHA) /** **Risk Assessment**

**1. Purpose:**

This section establishes a uniform and effective method for identifying and developing controls for hazards in the workplace.

**2. Scope:**

This procedure applies to all RRC, ARS employees and visitors on and off the location. Other Tenants of the RRC facility must implement, at a minimum, an equivalent method for the evaluation of job hazards associated with their personnel and provide a copy of those evaluations to the LSO on an annual basis.

**3. Responsibilities:**

* 1. Research Leaders and supervisors are encouraged to implement this program as a means to ensure safety hazards are adequately addressed.
	2. The LSO will conduct a JHA for all ARS Unit positions by CRIS project within the RRC.

c. Supervisors will approve JHAs for all operations under their supervision.

d. RRC safety committee will assist supervisors in developing and reviewing JHAs for complex jobs.

e. Employees will be involved in the development and updates of JHAs

**4. Procedures:**

a. Completed JHAs must involve employees in all phases of the analysis, from reviewing and identifying key steps to the job to discussing potential hazards and recommended solutions

The completed JHA breaks jobs down into three basic sections:

(1) Principal Steps - Provides a detailed analysis which breaks down the job into individual key steps

(2) Hazard Identification - includes a list of potential or existing hazards with each key step of the job and analyzes tools, equipment, chemicals used or other items involved in the work process.

(3) Controls - Lists of one or more prevention or control measures for each identified hazard (e.g., engineering, equipment PPE, etc).

Before actually writing a JHA, determine the general conditions under which the job is performed.

b. Principal Steps

(1) Break the job into a sequence of key steps, each describing what is being done. The two most common errors are, making the breakdown too detailed or making the breakdown so general, basic key steps are lost.

(2) Observe the employee performing the job and record basic key steps. If it is a new job simulate what would have to be performed.

(3) Describe each key step and number them consecutively. The wording for each key step should begin with an action word/verb like remove, open or pour. Example: pour acid into tube.

c. Hazard Identification:

Identify all hazards for each key step, both those produced by the environment and connected with the job procedure. Example chemical burns when pouring acid.

d. Controls:

(1) After each hazard or potential hazard has been listed and reviewed, determine whether the job could be performed in another way to eliminate the hazards, such as combining steps or changing the sequence, or whether safety equipment or other precautions are needed to reduce the hazards. Example, use a pipette to transfer acid instead of pouring from a full container.

(2) If safe and better job steps can be used, list each new step. List exactly what the worker needs to know to perform the job using a new method. Do not make general statements about procedures, such as “Be careful”. Be as specific as possible in the requirements.

(3) If no new procedure can be developed, determine whether any physical change as redesigning equipment, changing tools, adding machine guards, material substitution, PPE or ventilation, will eliminate or reduce the danger. Example wear chemical splash goggles, rubber apron, nitrile gloves and lab coat when pouring acid.

(4) Measures must be developed to protect workers from hazards that are present.

e. Finally, review the JHA for accuracy and completeness. Review and update the JHA as needed or when an accident occurs involving the work performed or when a safer procedure is identified.

f. Training: JHAs will be used by supervisors when training new personnel and when refresher training is necessary.

g. Supervisors must sign off that they approve the JHA and employees must sign and date that they have been trained and understand the requirements of the JHA. A blank JHA is located in Appendix D.

**VII. Chemical Hygiene Program Plan**

**1. Purpose**

 The Chemical Hygiene program (CHP) is implemented at the RRC location in accordance with 29 CFR 1910.1450, commonly known as the “Laboratory Safety Standard.” The Chemical Hygiene Plan establishes responsibilities, policy and procedures for handling hazardous chemicals in USDA, ARS, RRC laboratories.

**2. Scope**

 The CHP applies to all employees and visitors both on and off the ARS, RRC location while on duty. Other Tenants of the RRC facility must implement, at a minimum, an equivalent CHP and provide a copy of that plan to the LSO along with any updates as they occur.

**3. Policy**

a. This plan establishes the minimum regulatory requirements for the safe use of hazardous chemicals in the laboratory. Chemical exposure shall be minimized through the following order of priority; use of engineering controls, work practices, and protective equipment.

b. Laboratory personnel shall not be exposed to airborne concentrations, which exceed the more stringent of either the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) for a specific compound or mixture. The safety office will maintain a copy of PELs and TLVs.

c. Highly toxic compounds, carcinogens and reproductive toxins shall be handled using the special procedures found in paragraph 17 of this program.

**4. Responsibilities**

**a. The safety committee or LSO will recruit a volunteer to serve as a Chemical Hygiene Officer (CHO) for ARS, RRC who shall:**

(1) Provide guidance for safely handling hazardous chemicals in ARS, RRC laboratories as needed.

(2) Participate in the annual review of this plan to ensure it adequately addresses regulatory requirements and hazards associated with the research group’s laboratories.

(3) Review Standing Operating Procedures (SOPs) / Job Hazard Analysis (JHA) for all laboratory operations using hazardous chemicals.

(4) Participate as needed in the annual survey conducted by the Location Safety Officer and ensure proper follow-up of identified hazards.

1. **Each Research Leader (RL) will appoint a Chemical Control Officer who shall:**

(1) Ensure a chemical inventory is being maintained for all labs and chemical storage areas within their research unit. The inventory must be completed by March 15 of each year in accordance with Appendix E and be submitted to the safety office at that time. The use of the format found in Appendix E serves as evidence that the hazards of each chemical with the laboratories are readily accessible to laboratory employees. [1910.1200(h)(3)(ii)]. Chemical list must be updated as new chemicals are introduced to the individual lab spaces.

(2) Ensure a **chemical inventory for each lab and corresponding MSDSs** are **posted on or next to the entry door to each lab** in order to make them **readily accessible to the laboratory employees**. [1910.145(h)(1)(ii)] [1910.1200(b)(3)(ii)].

(3) Periodically review and inspect laboratories within their research group to ensure material safety data sheets (MSDS) are available for all chemicals used for stored by the research group.

(4) Coordinate with supervisors within their research group to ensure proper training of new employees specific to their research unit assignment.

**c. The Location Safety Officer shall:**

(1) Conduct annual inspections of all laboratories.

(2) Assist Chemical Hygiene Officers with review and development of SOPs/JHAs for laboratory operations using hazardous chemicals and equipment.

(3) Review plans and specifications for all laboratory construction or renovations to ensure appropriate design criteria are incorporated.

(4) Provide guidance on hazardous waste handling and disposal.

(5) Coordinate or conduct air sampling of all laboratory operations where there is a reasonable probability that employee exposures exceed the action level for a chemical (29 CFR 1910.1045).

 **d. RLs shall:**

(1) Ensure requirements of this plan are enforced.

(2) Provide necessary resources to ensure the safety of personnel.

(3) Ensure requirements of NFPA 45 (most current addition) are enforced.

 **e. Supervisors shall:**

(1) Ensure that a SOP / JHA is prepared for all laboratory operations using hazardous chemicals or equipment.

(2) Ensure that laboratory personnel receive job-related medical surveillance if required.

(3) Ensure that chemicals stored within their laboratories are segregated at a minimum by hazard classes as describe in the chemical segregation and storage section of this chemical hygiene plan.

(4) Ensure that personnel working with hazardous chemicals are trained on the health and safety aspects of their job.

(5) Ensure that personnel are provided, and have received, adequate training in the use of protective clothing and equipment necessary for the operations they are to perform.

(6) Perform inspections of laboratory operations using hazardous chemicals to ensure compliance with the SOP/JHA, this plan, and applicable regulations.

(7) Ensure new employee training, and training for new operations, is completed and documented before personnel are allowed to work with hazardous materials or equipment, See Appendix F for specific training requirements and documentation.

(8) Ensure that no chemicals or hazardous materials are left unattended in a non-secured location (i.e. hallway, walkway).

 **f. Laboratory personnel shall:**

1. Plan and conduct laboratory operations using hazardous chemicals in accordance with procedures found in the SOP/ JHA, this plan, and applicable regulations.
2. Maintain their laboratories in a manner consistent with chemical segregation and storage section of this chemical hygiene plan.
3. Report hazardous conditions, exposures, or abnormal circumstances

 associated with an operation to their supervisor.

(4) Report for any job-related medical surveillance examinations.

(5) Manage laboratory waste in accordance with the RRC Hazardous Waste Plan.

(6) Not work with any hazardous materials or equipment you have not been trained to use, or are unsure of proper handling procedures.

(7) Review the chemicals MSDS before ordering the product to ascertain proper procedures for handling, storage and disposal.

(8) Not work alone in a laboratory if the procedures being conducted are hazardous.

(9) Ensure that no chemicals or hazardous materials are left unattended in a non-secured location (i.e. hallway, walkway).

**5. Program Administration**

a. SOPs/JHAs shall be prepared for each laboratory operation using hazardous chemicals or equipment. The SOPs/JHAs will, at a minimum, address hazards of the job, engineering controls, personal protective equipment, accidental spills, and proper waste collection and disposal.

 b. Annual safety and health surveys shall be conducted in each laboratory.

**6. Procurement**

a. Personnel shall order the smallest quantity of chemicals necessary to complete the work. Each unit should remember the “Cradle to Grave” requirements under the Resource Conservation and Recovery Act (RCRA). ***The “actual cost” of chemicals includes the purchase and disposal of any chemicals deemed hazardous waste in accordance with 40 CFR 239 to 279.*** A bulk chemical purchase may first appear to be a great deal; however, they are usually very costly in the long run.

b. Personnel must review health and safety data on chemicals before receipt to determine special requirements for handling, storage, or disposal.

(1) MSDSs for chemicals must be made available to each worker.

(2) All chemicals must be included in the laboratories chemical inventory.

(3) The safety office will be available to assist in obtaining hard to find MSDSs.

1. Noticeable damaged containers shall not be accepted by personnel at receiving. All Personnel shall inspect containers upon receipt to ensure they are intact, not leaking and are properly labeled.

**7. Chemical Segregation and Storage**

a. Chemical Redistribution Room. The Location Safety Officer will maintain a chemical storage room that will be used to collect and redistribute chemicals, as necessary, to ensure that chemicals are not left unattended. Chemicals shall be inspected at least monthly to determine their conditions. Chemicals shall be stored according to their Hazard Class as outlined below. A reference guide may be found in Appendix G.

b. General. **All labs are capable of establishing a minimum storage scheme based on hazard classes. For the safety of all personnel and to protect the integrity of the facility, hazardous materials must be segregated.** BSCs, Hoods, ventilated cabinets or ventilated rooms should be provided when acutely toxic chemicals are stored in the laboratory. Chemical storage inside the laboratory shall be limited to those chemicals necessary to complete research requirements. Chemicals should not be stored on the bench. Open shelves should be designed with a restraining device or lip to prevent containers from slipping or tipping over. It is recommended that chemicals with in the laboratory be stored according to their compatibility groups as described below; however, at a minimum chemicals stored in labs will be segregated based on Hazard Classes. Do not store chemicals in alphabetical order, as this might place incompatible chemicals next to each other (examples include acetic acid and acetaldehyde, sodium cyanide and sulfuric acid, sodium borohydride and sodium chlorate), increasing the potential for accidental mixing of incompatible chemicals.

1. **Storage by Compatibility Groups**

The diagram entitled "Suggested Shelf Storage Pattern" (Appendix H) indicates a recommended arrangement of chemicals according to compatibility. These compatibility groups should be stored separately, especially chemicals with an NFPA 704 or HMIS reactive rating of 3 or higher, and in dedicated and labeled cabinets. Within any compatibility group or hazard class, you can arrange chemicals alphabetically to facilitate ease of retrieval. Chemicals within a given storage group may be incompatible with other chemicals in that group. Laboratory personnel shall determine intra category incompatibility and minimize incompatible storage when possible. Spill trays or other means of secondary containment should be used to reduce commingling of liquids in the event of spills or leaks and allow for easy clean-up. Trays should be large enough to contain the liquid in the largest container. The following are recommended compatibility groupings:

1. **Group A - Acids, Inorganics**

Store large bottles of acid in special acid cabinets, cabinets under lab benches, or on low shelves. Place acids in plastic trays for secondary containment in case of breakage. Segregate inorganic and oxidizing acids from organic compounds including organic acids (e.g., acetic acid) and other combustible materials. Segregate nitric acid (>40%) from other inorganic acids. Store acids separate from bases and other reducing agents. Inorganic salts, except those of heavy metals, may be stored in this group. Glacial acetic acid should be stored with flammable and combustible materials since it is combustible.

1. **Group B - Bases**

Segregate bases from acids and oxidizers on shelves near the floor. The preferred storage container for inorganic hydroxides is polyethylene instead of glass. Place containers in trays for secondary containment in the event of leakage or breaks. Flammables must be stored in a flammable cabinet.

1. **Group C - Organic chemicals**

Segregate organic compounds from inorganics. Organics and inorganics with NFPA 704 or HMIS reactive hazard rating of two (2) or less may be stored together. Chemicals with a reactive hazard rating of three (3) or four (4) are to be stored separately.

1. **Group D - Flammable and Combustible Organic Liquids**

Flammable and combustible liquid storage per room is limited to 10 gallons (37.9 liters) in open storage and use, 25 gallons (94.7 liters) in safety cans, and 60 gallons (227.3 liters) in flammable storage cabinets. Remember that only 30 gallons (113.6 liters) of Class I liquids are permitted per room, and International Fire Code restrictions might limit this even further if your lab is located on an upper floor in a new or renovated building. Store flammable and combustible materials away from sources of ignition such as heat, sparks, or open flames, and segregated from oxidizers.

1. **Group E - Inorganic Oxidizers and Salts**

Store inorganic oxidizers in a cool, dry place away from combustible materials such as zinc, alkaline metals, formic acid, and other reducing agents. Inorganic salts may also be stored in this group. Store ammonium nitrate separately.

1. **Group F - Organic Peroxides and Explosives**

Peroxides contain a double-oxygen bond (R1-O-O-R2) in their molecular structure. They are shock and heat sensitive (e.g. benzoyl peroxide), and readily decompose in storage. Store shock and heat-sensitive chemicals in a dedicated cabinet.

Some non-peroxide chemicals can readily form shock-sensitive, explosive peroxides when stored in the presence of oxygen. Examples include ethyl ether, tetrahydrofuran, and cumene. Dispose of, or use, these by their expiration date.

1. **Group G - Reactives**

Water Reactives. Store water reactives in a cool dry place protected from water sources. Alkali metals (lithium, sodium, potassium, rubidium, and cesium) should be stored under mineral oil, or in waterproof enclosures such as glove boxes. A Class D fire extinguisher should be available in case of fire. Contact EHS if one is not available in your laboratory. As an added precaution, store containers in trays or other secondary containers filled with sand.

Pyrophorics (Air Reactives). Store pyrophorics in a cool, dry place, and provide for an air-tight seal. Store white or yellow phosphorous under water in glass-stoppered bottles inside a metal can for added protection.

1. **Group H - Cyanides and Sulfides**

Cyanides and sulfides react with acids to release highly toxic gases. They must be isolated from acids and other oxidizers.

1. **Group I - Carcinogens, Highly Toxic Chemicals, and Reproductive Toxins**

A dedicated lockable storage cabinet in a "designated area" for carcinogens and highly toxic chemicals is the preferred storage method. Stock quantities of reproductive toxins are to be stored in designated storage areas. Use unbreakable, chemically resistant secondary containers. Post the storage cabinet with a sign stating “CANCER-SUSPECT AGENT”, “HIGHLY TOXIC CHEMICALS”, or “REPRODUCTIVE TOXINS”. Maintain a separate inventory of all highly acute toxics, carcinogens, and reproductive toxins.

(2) **Storage by Hazard Class**

 Store chemicals by hazard class, not the alphabet, and post storage areas to show the exact location of the chemical hazard class. The GHS Pictograms may be used for labeling. Inspect chemical storage areas at least annually for outdated or unneeded items, illegible labels, leaking containers, etc. Corroded or leaking containers shall be over packed and turned-in along with outdated or excess chemicals. To prevent leakage, odors, or reaction with air, tightly seal all containers of highly toxic, highly volatile, malodorous, carcinogenic or reactive chemicals. Make sure that caps and other closures are tight on all hazardous chemicals. A limited exception is freshly-generated mixtures such as acids and organics that may generate gas pressure sufficient to burst a tightly sealed bottle. Use commercially available vent caps or keep the lids loose until sufficient time passes to complete the reactions, and then tightly close the lids. Until all reactions are completed, the contents of the bottle are not waste, but are instead the last step of the chemical procedure.

1. **Flammables** – The number one consideration shall be the flammable characteristics of the material. If a material is flammable, it shall be stored in a flammable cabinet.
2. **Oxidizers** - Shall be stored in a location labeled a “Oxidizers”. This location shall be separate from other hazard classes. Oxidizers shall be isolated from flammables due to their tendency to contribute significantly to a fire.
3. **Corrosives** (acids & bases) – Shall be stored in a location labeled a “Corrosives”. This location shall be separate from other hazard classes.
4. **Reactives** - Shall be stored in a location labeled a “Reactives”. This location shall be separate from other hazard classes. Highly Reactives shall not be stored within 10 feet of a source of water such as a sink or an eyewash/shower station.
5. **Toxics** - Shall be stored in a location labeled a “Toxics”. This location shall be separate from other hazard classes. Consider the toxicity of the material, with particular attention paid to regulated materials. In some cases, this may mean that certain chemicals will be isolated within a storage area, for instance, a material that is an extreme poison but is also flammable, should be locked away in the flammable storage area to protect it against accidental release.

(4) Cabinets/shelves shall be labeled with Hazard Classes to facilitate proper storage. Designate a storage place for each chemical, and return it to that place after each use.

 **c. Flammable and Combustible liquids:**

(1) The quantity of all flammable and combustible liquids stored in a laboratory shall not exceed quantities specified in the RRC Waste Management Program (NFPA 45 Class D laboratory). A copy of this standard is available in the safety office for review.

(2) Flammable and combustible liquids shall be stored in their original container or container compatible with the chemical. When transferred from their original containers they shall be stored in approved safety cans when the quantity exceed one gallon. All containers must be properly marked as to its contents and hazard warnings.

(3) Flammable and combustible liquids should be stored in approved cabinets designed in accordance with NFPA 30. Cabinets and flammable storage areas shall not be located adjacent to an exit or stairwell. Cabinets shall not be vented without the approval from the safety office.

(4) The transfer of flammable and combustible liquids from bulk containers, not exceeding 5 gallons, shall be conducted in a fume hood or inside an approved storage area. The transfer of flammable and combustible liquids from bulk containers exceeding 5 gallons shall be conducted in an approved storage area (Solvent Storage Building).

(5) Flammable liquids shall not be transferred between metal containers unless the containers are electrically bonded.

(6) Refrigerators and freezers used to store flammable liquids shall be explosion–proof or “laboratory safe” in accordance with NFPA 45.

 **e. Water Reactive Chemicals:**

(1) Water reactive chemicals shall be segregated from other chemical storage and over packed in another container, provided that a hazard communication label is applied to the outer container.

(2) Water reactive chemicals shall not be stored with flammable or combustible liquids. Areas used for storage of water reactive chemicals shall be posted “CAUTION-WATER REACTIVE CHEMICAL. DO NOT USE WATER TO EXTINGUISH FIRE”.

 **f. Shock Sensitive Chemicals (includes peroxide forming):**

(1) Unless the manufactures MSDS specifies otherwise, unopened containers of shock sensitive chemicals must be turned-in after 12 months of storage in accordance with the RRC Waste Management Program. Once opened, shock sensitive chemicals shall be turned-in after 6 months of storage or sooner if specified by the manufacture. Potential peroxide forming chemicals may be extended for six months provided tests are performed to verify peroxides are not present.

(2) Shock sensitive chemicals shall be marked with the date they are received, the date they are opened, and date they are tested.

**g. Toxic Chemicals:**

(1) Toxic chemicals should be segregated from other chemicals.

(2) Toxic chemicals should be stored in a well-ventilated area. The storage of unopened containers presents no unusual hazards.

 **h. Compressed Gases:**

(1) General Requirements:

1. Gas cylinders shall be labeled or tagged to show their contents (full or empty).

(b) Gas cylinders shall be secured by the use of clamps, chains, or straps while in storage or use.

(c) When gas cylinders are not in use, hand valves shall be tightly closed and the valve protector cap in place.

(d) Compressed gas from cylinders shall be reduced through the use of a regulator specifically designed for that purpose.

(e) Reduction valves, gauges, and fittings used for oxygen shall not be used for other gases and vice a versa.

**(2) Storage Requirements:**

(a) Gas cylinders stored outdoors shall be located in a sheltered area protected from the elements. Flammable Gas cylinders shall not be stored near sources of ignition, heat, or open flames.

(b) Gas cylinders shall not be stored in laboratories. Requirements for cylinder use shall be kept to a minimum. Manifold systems should be used when feasible.

(c) Gas cylinder storage areas shall be posted with the names of the gases in storage. Areas where hydrogen or other flammable gases are stored shall be posted “DANGER FLAMMABLE GAS, NO SMOKING OR OPEN FLAMES WITHIN 50 FEET”.

(d) Gas cylinders shall be segregated by their classification. Oxidizers shall be separated from flammables by at least 20 feet. The safety office must approve exceptions to this.

(e) Inside storage areas of gas cylinders shall be adequately ventilated to prevent the build-up of gases in the event of a leak.

(f) Full and empty gas cylinders shall be stored separately. Empty gas cylinders shall be appropriately marked.

**(3) Highly Toxic Gases:**

(a) Highly toxic gases shall not be used at RRC unless approved by the RRC safety committee.

(b) Highly toxic gases used in the laboratory shall be stored in a fume hood or gas cabinet. Administrative controls, such as reducing gas mixture concentrations and cylinder size, shall be used to minimize risk. Flow limiting orifices shall be required on a case by case basis.

 **i. Distribution:**

(1) Glass containers of toxic, flammable, or corrosive chemicals shall be placed in a carrying bucket, or other unbreakable secondary container, when moved between rooms, through corridors, or outside buildings, unless they are contained in their original shipping containers. Open containers containing chemicals shall not be moved between spaces.

(2) Wheeled carts should be used to move larger quantities of chemicals which cannot be hand carried. Wheeled carts shall be designed to travel over uneven surfaces without tipping or stopping suddenly. Carts shall have a restraining device or lip to prevent containers from creeping or tipping over. Carts should have the ability to contain a chemical should it spill in transport. If the cart does not have this ability the chemical shall be placed in an unbreakable secondary container for transport between spaces.

(3) Passenger elevators shall only be used when NO personnel are on board.

(4) Compressed gas cylinders shall be moved using a suit able hand truck. The gas cylinder shall be strapped in place with the valve protector cap installed.

**8. Engineering Controls**

a. General Practice. Engineering controls including hoods, cabinets, local exhaust ventilation, and substitution of less toxic chemicals should be used to minimize exposure to all hazardous chemicals in the laboratory.

b. All laboratory operations involving the use of hazardous chemicals that could generate gas, vapors, or aerosols shall be conducted in an approved fume hood.

c. Design/Performance Criteria:

(1) Chemical Hoods:

(a) Hoods shall have an average face velocity of 80 to 120 feet per minute (FPM) with the sash in the full open position. Safe sash markings shall be installed when the face velocity requirement readings cannot be met with the sash in the full open position. Individual velocity readings should be within 20 percent of the average face velocity to ensure uniform airflow.

(b) The LSO will evaluate hood performance annually and after repair or modification to the ventilation system, following criteria established in ANSI-Z9.5 (latest edition).

(c) All hoods using toxic compounds, carcinogens, or reproductive toxins shall be equipped with an alarm that is activated by the face velocity falling below 80 FPM. They will also be equipped with an approved face velocity flow indicator. The face velocity flow indicator shall be checked by the user of the hood prior to each day’s operations to ensure face velocities do not fall below 80 FPM.

(2) Local Exhaust Ventilation:

(a) Design /performance criteria for local exhaust ventilation should be in accordance with the Industrial Ventilation Manual (latest edition).

(b) System performance shall be evaluated annually and after any repair or modification.

(3) Air Balance:

(a) Laboratories shall be maintained under negative pressure when they contain hazardous chemicals. This requirement shall be monitored annually during hood performance evaluations. Exhaust air from laboratories shall not be recirculated.

(b) Adequate conditioned make-up air shall be provided to ensure safe operation of the ventilation system.

d. Preventive maintenance. The operations and maintenance department will ensure adequate maintenance is performed in accordance with manufacturer specifications.

 e. Filtration and Vacuum Systems:

(1) Effluent from test equipment or apparatus shall be filtered or exhausted into the fume hood.

(2) House vacuums must not be used to evacuate chemicals unless provided with in-line filters for traps to prevent mechanical contamination. Portable vacuum pumps approved for use with chemicals must be vented to the fume hood.

**9. Administrative & Work Practice Controls**

a. General Requirements. Laboratory operations that could potentially present a hazard shall not be left unattended overnight without prior approval from the Chemical Hygiene Officer. Laboratory doors should be closed at all times but not locked while room is occupied.

 b. Signs and Labels:

(1) Each laboratory door leading to the main hallway shall have a posting of the RL’s and scientist responsible for the area along with their telephone numbers for both cell and work.

(2) Locations of eyewash/safety showers, first aid kits, fire extinguishers, and other safety equipment shall be clearly identified.

(3) Each laboratory shall have a posting of a picture diagram which is clearly marked for hazardous materials used or stored in that laboratory.

(4) All containers will be clearly label as to their contents. When container size allows the label shall include the hazard warnings in addition to the chemicals proper name.

(5) If labeling is not practical due to the container size, supervisors must insure other measures are in place to notify employees of the contents and their hazards, i.e., labeling a rack of test tubes.

 c. Handling Chemicals:

(1) Working quantities of hazardous chemicals outside of storage during an operation shall be as small as practical. Containers shall be closed when not in use.

 (2) Care should be taken to minimize aerosol formations during complex

 manipulations.

(3) Mouth pipetting is prohibited.

 d. Laboratory Glassware:

(1) Handling and storage procedures should be developed to minimize damage to glassware. Glassware must be inspected before each use. Damaged items should be discarded in approved broken glass containers.

(2) Glassware used for pressure or vacuum operations shall be designed specifically for that purpose. Damaged or repaired glassware should not be used for pressure or vacuum operations. Persons handling pressure or vacuum operations shall be adequately shielded.

e. Fume hoods. The following work practices shall be used to ensure adequate fume hood performance:

(1) Work with the hood sash closed as much as possible during the operations. Do not place your head inside a hood. Sash must be completely closed when not in use.

(2) Keep all apparatus and containers at least 6 inches behind the face to minimize spillage from the hood.

(3) Keep the slot in front of the hoods lower baffle free from obstructions.

(4) Storage of chemicals or hazardous waste inside the hood is not permitted and the venting of spent solvents is not allowed in any ARS facility.

(5) Minimize pedestrian traffic past the open face of the hood.

(6) Ensure there are no electrical connections in the fume hood and that cords and tubing are routed out of the work area.

(7) Separate and elevate each instrument by using blocks or racks so that air can flow easily around all apparatuses.

(8) Do not place large pieces of equipment in the hood.

(9) Do not modify fume hoods.

(10) Keep fume hoods clean and organized.

(11) Maintain a minimum of a three foot work space in front of fume hood.

(12) Do not open or close sash rapidly.

(13) DO NOT POUR HAZARDOUS CHEMICALS DOWN ANY DRAIN.

(14) Ensure fume hood is functioning properly before use. Flow rates should be between 80 to 120 Feet per minute.

 **f. Protective Clothing and Equipment:**

(1) **Eye protection**. Eye protection shall meet the requirements of ANSI Standard Z87.1 (latest edition).

(a) Eye protections suitable for the operation being conducted shall be worn in all laboratories. **Chemical goggles shall be worn during operations where splash hazards exist or where corrosives are used.**

(b) Face shields shall be used in combination with approved eye protection where addition eye/face protection is necessary against potential splash or projectiles.

(c) Visitors shall comply with the above requirements.

**(2) Gloves**. **Gloves shall be worn during all work conducted within laboratories to minimize potential skin contact with hazardous chemicals or biologicals** as specified in unit specific laboratory SOP.

(a) Selection should be based on the potential and severity of liquid contamination as well as their suitability for the operation performed. For operations with the potential for prolonged or severe liquid contamination, glove selection shall be based on the available permeation and degradation data for the specific chemical. Contact the Safety Office for guidance.

(b) Nonstandard butyl rubber gloves can be used for operations where the potential for liquid contamination is minimal. If a high degree of manual dexterity is required, thin nitrile or surgical latex gloves may be used, but only if the potential for liquid contamination is minimal.

(c) Insulated gloves shall be used to prevent contact with hot or cold surfaces. Asbestos containing gloves shall not be used.

(d) **Gloves should be changed frequently and are not to be worn away from the work area.**

**(3) Clothing:**

**(a) Lab coats or smocks shall be worn over street clothes inside all laboratories where hazardous chemicals or biological materials may be handled.** These shall be removed before exiting to non-laboratory areas. Personnel shall immediately remove and then launder or dispose of these garments once contamination has occurred. However, at a minimum Lab coats shall be laundered at least every two weeks. Lab coats may be washed at the in-house washing facilities located in PSB-12. Make sure that the usage form is filled out with the in-house facilities are used. Lab Coats may also be taken to a professional dry cleaner as needed. Dry Cleaners must be notified of any chemical hazard they may have been contaminated with. If the dry cleaner is unable to safely clean lab coats they must be provided to the safety office for disposal. In no case are lab coats to be cleaned at home.

(b) **Laboratory personnel shall wear close-toe shoes with backs while working the laboratory.** Steel-toe shoes will be worn when necessary.

(c**) Chemical protective clothing including aprons, boots or one-piece suits shall be worn when there is a high risk of chemical contamination present.** Equipment shall be inspected for cuts, tears, and degradation before each use.

(4) Respiratory Protection. Selection and use of respirators shall be in accordance with the RRC respiratory protection plan.

(5) Eyewash/Safety Showers. Design and installation of new equipment shall comply with the ANSI Z358.1 (latest edition).

(a) New construction shall have eyewash and safety showers installed in each laboratory where hazardous chemicals are handled or stored.

(b) Supervisors will ensure equipment is inspected by designated personnel to determine if it is functional. Eye washes shall be activated weekly in occupied spaces where corrosives are stored or used. Spaces that are not actively used shall have safety eyewashes and showers checked at least monthly and/or prior to beginning work in that space, whichever is more frequent. All safety showers shall be activated and inspected monthly. Inspection tags must be attached or next to the equipment and be annotated when inspections are performed.

(c) Signs must be used to post the location of each eyewash and safety shower in the laboratory.

(d) Equipment shall be accessible at all times. Personnel shall not store equipment, apparatus, or containers within the 30 inch by 48 inch restricted space below the shower.

(e) The Location Safety Office will review annual compliance inspections conducted by the operations and maintenance team and document any deficiencies and create a corrective action plan to address the deficiency.

g. Unattended operations: If an operation is approved by the unit Research Leader the LSO, along with assistance from the Chemical Hygiene Officer, will engage in the following actions, in addition to those actions deemed appropriate to ensure other safety hazards are address, must be followed: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation.

h. Maintenance and Servicing of Lab Equipment. During the maintenance and servicing of any lab equipment it is the responsibility of the laboratory supervisor to ensure all chemicals are removed from the affected work area and ensure that the equipment is free of contamination. Where this is not practical (changing fume hood filters), maintenance personnel must be informed by the laboratory supervisor of the hazards that may be present and of necessary precautions. The maintenance supervisor must ensure maintenance employees do not perform maintenance or service lab equipment until all potential hazards are adequately addressed to ensure employee safety. During the maintenance and servicing of equipment in the laboratory, hazardous chemicals will not be handled or used in the area where maintenance is being performed.

**10. Hazardous Waste Management Procedures**

**a. Procedure for Hazardous Waste Determination**

**Step 1:** Determine whether the material in question is a solid waste.

The term "solid waste" can be somewhat misleading. The word "solid" does not refer to the physical state of the waste. Solid waste can be a solid, liquid, or contained gas. Under the Resource Conservation and Recovery Act (RCRA), a solid waste is any material that you will no longer be using for its originally intended purpose or a material that must be reclaimed before reuse. In order for any material to be a hazardous waste, it must first be a solid waste.

**Step 2:** Determine whether the waste is exempted or excluded from hazardous waste regulation.

Not all RCRA solid wastes are considered hazardous wastes. The U.S. Environmental Protection Agency exempted or excluded certain wastes, such as household wastes or used oil destined for recycling, from the hazardous waste definition and regulation. Don't proceed to Step 3, which is evaluating the actual chemical or physical hazard a waste poses, until you've determined the waste is not somehow excluded from hazardous waste regulation.

Note: Even if you've determined your waste is excluded from hazardous waste regulation, you need to re-evaluate your status periodically to verify that conditions affecting the composition of your waste have not changed.

**Step 3:** Determine whether the waste actually poses a sufficient chemical or physical hazard to merit regulation. This step involves evaluating the waste in light of the regulatory definition of hazardous waste.

If you find your waste is not exempted or excluded from hazardous waste regulation, you must determine if the waste meets one or more of the hazardous waste listing descriptions found in 40 CFR Part 261 Subpart D.

**F-listed wastes**

40 CFR 261.31 lists hazardous wastes from non-specific sources (termed "F-listed wastes" after the F prefix in this hazardous waste code). An example would include F002 wastes-spent halogenated solvents (e.g., pechloroethylene, trichloroethylene, methylene chloride).

**K-listed wastes**

40 CFR 261.32 lists hazardous wastes from specific sources, such as K062 waste-spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry.

**P- and U-listed wastes**

40 CFR 261.33 lists discarded or unused commercial chemical products, off-specification products, container residues and spill residues of such products.

If the waste is not listed, you must determine if the waste meets one or more of the hazardous waste listing descriptions found in 40 CFR Part 261 Subpart D.

**Ignitability**

A waste is ignitable if it is a liquid and its flash point is less than 140° F (60° C). A waste also may be defined as ignitable if it is an oxidizer or an ignitable compressed gas as defined by the U.S. Department of Transportation Regulations in 49 CFR Part 173, or if it has the potential to ignite under standard temperature and pressure and burn persistently and vigouously once ignited. Wastes that are ignitable are classified as U.S. EPA Hazardous Waste Code D001. Examples of ignitable wastes include certain spent solvents such as mineral spirits.

**Corrosivity**

A waste is corrosive if it is aqueous and its pH is less than or equal to 2 or greater than or equal to 12.5. A waste also is corrosive if it is a liquid and it corrodes steel at a rate of more than 0.25 inches per year under conditions specified in U.S. EPA Test Method 1110. Corrosive wastes are designated as U.S. EPA Hazardous Waste Code D002. Examples of corrosive wastes include spent sulfuric acid and concentrated waste sodium hydroxide solutions that have not been neutralized.

**Reactivity**

A waste exhibits reactivity if it is unstable and explodes or produces fumes, gases, and vapors when mixed with water or under other conditions such as heat or pressure. A waste also may be defined as reactive if it is a forbidden explosive or a Class A or Class B explosive as defined in 49 CFR Part 173. Wastes that exhibit the characteristic of reactivity are classified as U.S. EPA Hazardous Waste Code D003. Examples of reactive wastes include certain cyanide or sulfide-bearing wastes.

**Toxicity**

The toxicity characteristic of a waste is determined by having a laboratory analyze an extract of the waste using the Toxicity Characteristic Leaching Procedure. The results of the analysis are compared to the regulatory thresholds of 40 constituents, primarily metals, organic compounds, and pesticides/herbicides. If the extract from the TCLP contains levels of any of the 40 constituents at or above regulatory thresholds, the waste is considered a hazardous waste. Wastes that exhibit the toxicity characteristic are classified as U.S. EPA Hazardous Waste Codes D004 through D043. Examples of toxic wastes may include wastewater treatment sludges, wastes from organic chemical manufacturing and pesticide/herbicide wastes.

**b. Conduct Waste Sampling and Analysis**

You can meet general waste analysis requirements using several methods or combinations of methods. The preferred method is to conduct sampling and analysis of the waste because this method is more accurate and defensible than other options. Procedures and equipment for obtaining and analyzing samples are described in Appendices I and II of 40 CFR Part 261. Full-scale analysis that uses methods from U.S. EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" SW-846, 3rd Edition or equivalent, may be necessary when:

* You begin a new process or change and existing one;
* You have not provided appropriate laboratory information to an off-site treatment, storage and disposal facility;
* An off-site TSDF has reason to believe the wastes you shipped were not identified accurately;
* U.S. EPA amends RCRA waste identification/classification rules and/or;
* A facility receives your waste for the first time.

A representative sample is defined as a sample of a universe or whole that can be expected to exhibit the average properties of the universe or whole.

**c. Apply Generator Knowledge of the Process or Materials that Produced the Waste**

You also can meet waste analysis requirements by applying knowledge of the waste. Generator knowledge can be used to meet all or part of the waste analysis requirements and can be defined broadly to include "process knowledge." Process knowledge may be information on the wastes obtained from existing published or documented waste analysis data or studies conducted on hazardous wastes generated by processes similar to that which generated your waste. For example, listed wastes are identified by comparing the specific process that generated your waste to those processes described in the listings rather than conducting a chemical/physical analysis of the waste. Therefore, with many listed wastes, generator knowledge is appropriate because the physical/chemical makeup of the waste is generally well-known and consistent from facility to facility.

Note: The use of existing or historical records of analysis seems attractive, as opposed to sampling and analysis, because of the potential savings associated with using such information. However, you must ensure this information reflects the current processes and materials being used and that no differences exist between the process in the documented data and your own.

If you use generator knowledge alone or in conjunction with sampling and analysis, you must maintain detailed documentation that clearly demonstrates the information is sufficient to identify the waste. Documenting both the generator knowledge and any analytical data is essential. Documentation used to support generator knowledge may include, but is not limited to:

* Material safety data sheets or similar documents,
* A thorough process description, including data on all raw materials used in the process, and or
* Other forms of detailed documentation.

Note: Concerning MSDSs, manufacturers/suppliers are only required to list constituents that comprise 1% or more of the material it addresses. This level of reporting may not be adequate to ascertain the constituent levels in the wastes to be characterized. Therefore, MSDSs should be viewed in a supporting fashion and not as the sole means of providing generator knowledge.

 **d. Empty Containers**

Empty containers that formerly contained hazardous waste can be put in the dumpster for landfill. A container is empty if all waste has been removed by the methods commonly used to empty that type of container (e.g. pouring or pumping). In addition, the container must have less than ½ inch of waste remaining, or 1.5% or less by weight of waste remaining if the container holds 110 gallons or less. Containers that held acutely hazardous waste (“P” waste) must be triple rinsed to be considered empty. All rinse water for such hazardous waste is considered hazardous if it has any of the characteristics of the hazardous waste.

**e. Mixtures**

If you mix one gallon of a hazardous waste with one gallon of a nonhazardous waste both gallons will be considered hazardous for waste disposal purposes. According to the mixture rule, nonhazardous waste that is mixed with listed hazardous waste is automatically hazardous waste. Therefore, do not mix your wastes. Dilution of characteristic hazardous waste to make it nonhazardous is considered treatment and is subject to regulatory requirements. RRC is not a hazardous waste treatment facility. Neutralization is an exception to this rule.

**f. Laboratory Hazardous Chemical Waste Including Solvents**

(1) **Drain disposal of chemical waste is restricted to the procedures found in Appendix K**.

(2) Laboratory hazardous waste that may not be drain disposed shall be stored in Satellite accumulation containers in a ***satellite accumulation area*** (SAA) within the lab where it was generated.

(3) Hazardous wastes generated in process/lab equipment. If, during the course of a laboratory experiment, hazardous wastes are removed from the process vessel and collected in a beaker or small container directly next to an experiment, such container will be considered a satellite accumulation container. Before the operator leaves the area the waste in that container shall then be placed in a larger container in the same laboratory, into which other compatible wastes from the same laboratory may be placed, as long as the larger container is at or near the point of generation, under the control of one of the operators in the laboratory who is generating such waste, and the total amount of waste in the containers does not exceed 55 gallons. The larger container referred to in the previous sentence will also be considered a satellite container. The container shall be compatible with the waste.

(4) Generators must label satellite containers of hazardous waste with the words "Hazardous Waste" or "with other words that identify the contents of the containers." ([262.34(c)(1)(ii)](http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-sec262-34.xml))

(5) When a generator accumulates more than 55 gallons of hazardous waste (or 1 quart of acute hazardous waste), the generator must ([262.34(c)(2)](http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-sec262-34.xml)):

* mark the container with the date on which 55 gallons (or 1 quart of acute hazardous waste) is exceeded, and
* remove the excess of 55 gallons (or 1 quart of acute hazardous waste) within three days or comply with the 90-day area or 180-day area regulations, as appropriate.

(6) There is no limit to the number of different wastes that can be in the same satellite area; however, you can fill only one waste container per waste stream at a time. For example, if you have three different wastes in a satellite accumulation area, you should have only three partially full containers in that area. When a container is full, it must be dated, marked and labeled according to the requirements for generator storage of hazardous waste. The container must be removed from the facility entirely or placed in a non-satellite storage area within three days of the date on the container.

(7) Containers used for satellite accumulation must be in good condition, suitable for the safe storage of hazardous waste.

(8) Waste stored in the main hazardous waste storage area, must be labeled and dated on the first day waste enters the drum. From that date, as a conditionally exempt small quantity generator (CESQG), the drum can be located onsite any number of days as long as the total hazardous waste stored does not exceed 2,200 lbs. As a small quantity generator (SQG), the waste can only be stored in the main storage area for 180 days. As a large quantity generator (LQG), the waste can only be stored in the main storage area for 90 days.

(9) Generators accumulating hazardous waste in satellite accumulation areas must comply with container standards specified in Sections 265.171-173 in Title 40 of the Code of Federal Regulations (CFR). Whether a facility is a CESQG, SQG or a LQG of hazardous waste, a hazardous waste drum or container located in a “satellite storage” area does not begin its accumulation start date until the drum is filled and moved to the main hazardous waste storage area. Drums and containers in satellite storage areas must always be closed and must be labeled as hazardous waste; however, these containers do not need to be dated until they are filled. Containers must be in good condition and be compatible with the type of waste being stored. A maximum of 55 gallons of hazardous waste or one quart of acutely hazardous waste can be stored in the satellite storage area. The 55-gallon limit applies to the total of all the non-acutely hazardous waste accumulated at a satellite accumulation area. However, there is no limit on the total number of satellite areas at the facility. Acutely hazardous wastes are P-listed and can be found in 40 CFR 261.33(e). In addition to this list, other acutely hazardous wastes include hazardous waste codes F020-F023 and F026-F027. Once a drum (or other container) in a satellite storage area is filled it must be dated. Within three days, the drum must be moved to the main hazardous waste storage area.

(10) Containers in satellite accumulation areas must be kept securely closed unless waste is being added or removed. The waste must be handled in a way that prevents or minimizes the possibility of exposure, loss of vapors, spills, fires, etc.

(11) SAA locations must not interfere with normal lab operations.

(12) SAA locations should not be located near floor drains or open flames

(13) Flammable waste must be accumulated in an approved safety can.

(14) A secondary compatible container (storage tube) should be used to ensure that a spill or leak in the primary satellite container can be contained. The secondary container shall have no other use.

**g. Solvent Waste Disposal**

Safeguarding of Waste Area: The hazardous waste drums are safeguarded in a locked shed, which is contained inside a fenced area with a gate.

Required Safety Equipment: Lab coats, gloves, safety glasses, and face shields must be worn when solvents are poured into the drums. Face shields are located on a shelf in each waste room.

Environmental Reference:

* 40 CFR parts 260-270 – Protection of Environment
* GDNR Chapter 391-3-11 Hazardous Waste Management

**Disposal is allowed during the following times:**

Monday through Thursday – 7:00 am to 11:00 & 1:00 pm to 3:00 pm

Friday – 7:00 am to 12:00

**Procedure:**

A minimum of one trained people must perform the waste disposal with at least one bystander. The bystander must remain outside of the hazardous waste storage shed with the radio in order to monitor the waste disposal and call for assistance in the event that it is needed. The trained disposal person’s name must appear on the approved list authorized by the Location Safety Officer. Both the trained disposer and the bystander must sign the log book.

Trained disposal personnel are listed in Appendix I.

(1) Prior to beginning disposal, provide the Location Safety Officer with a list of the chemicals names and quantities to be transferred to the hazardous waste storage shed.

(2) Pick up the metal-sided cart in room P-111.

(3) Pick up the shed keys and sign out the radio from the Location Safety Office along with the Hazardous Waste Building/Solvent Disposal Checklist*.* The keys and checklist book are to be returned to this office when solvent disposal is complete. Complete the required information in the “Solvent Waste Disposal Record.” The receptionist or Location Safety Officer will give you the two-way radio and instructions for using the radio. Check the radio by calling “Unit 99 – LSO” or “Unit 99 to Unit 40 (Location Safety Officer).”

(4) Load the solvent waste containers from appropriate area.

(5) Transport containers via metal-sided carts ONLY in the freight elevator to the subbasement.

(6) Exit the building by the side door in back.

(7) Proceed to the fence surrounding the waste building.

NOTE: If the gate is locked request someone (boiler plant operator or other FSE manager/foreman) to open the gate to the hazardous waste area. The gate should be unlocked during normal hours of operation.

**PROCEED SLOWLY AND WITH CAUTION.**

(8) At the Waste Solvent Building, check the radio by calling "unit 99 - LSO." The receptionist responds. Then you respond "unit 99 – entering waste storage building." If the radio is not working, DO NOT ENTER the waste building. Return to the front desk or the LSO and report the radio malfunction. *NOTE: The Location Safety Officer will notify the Facilities O&M Contract manager if no radio traffic is heard for approximately 30 minutes. The Location Safety Officer will also physically check on the personnel conducting the waste disposal if no radio traffic is heard for 30 minute.*

(9) **Turn on the exhaust fan and light switch** at the end of the building. Listen and verify the exhaust fan has come on. **If the fan is not operating DO NOT enter the building.** Use the radio to call and inform facilities O&M contractor ("unit 99 to LSO").

(10) Unlock and open the waste solvent building door #4 for solvents, and building door #5 for other waste chemicals. **Prop the door open with the door stop before entering.**

(11) Check eyewashes for proper functioning. Sign and date the tag. If the eyewash is not operating DO NOT transfer the solvent into the drum. Leave the Satellite collection cans containing the liquid waste in Room #4. Return keys and radio to the receptionist or Location Safety Officer and immediately inform the Location Safety Officer. Appropriate work orders will be created and when repairs are completed, notification will be made so that disposal can be completed and collection cans returned. DO NOT check the shower.

(12) Complete the questionnaire for dumping solvents. Complete the green logbook located on the shelf by recording the amount of solvent disposed.

(13) Make sure the drum is grounded. Open the drum-in-use with the special drum/barrel wrench. Open the small vent first to release pressure in the barrel. Then open the large opening.

(14) Make sure that you are wearing a lab coat, gloves, face shield (available on the shelf) and safety glasses before opening the drum. Next, using the special measuring stick, check the depth of solvent in the labeled drum. If there is not enough space in the open drum for the total amount of solvent you have to pour, you must measure after each container is poured into the drum. Switch to an empty drum as necessary. When a new drum is started and **before the first drop of waste goes in**, a label must be dated and placed on the drum. Again, Lab coats, gloves, face shields (available on the shelf) and safety glasses must be worn.

(15) Once the barrel is checked for available space, place the funnel box into position. Pull back the screen in the funnel box for pouring sludge or slurry waste. To keep liquid from splashing out, close the screen for pouring the larger containers.

(16) Open a waste solvent can and check the flash arrester to make sure it is held in place. If not, remove it! Otherwise it will fall into the funnel causing excessive splashing and spills. If a solvent can does not have a flash arrester or it is loose, the can should not be used again. (Contact the Location Safety Officefor a replacement can.) Slowly and carefully pour the liquid into the drum. Repeat this step for each can until finished. **DO NOT OVER FILL THE DRUMS**. When in doubt, keep checking.

(17) If a container becomes full, label it with a “Full” sign and start a new drum by putting a yellow hazardous waste sticker on it with an accumulation start date. Notify the Location Safety Office that the barrel is full. (*Empty 55 gal and 30 gallon containers are stored in room #3 of the solvent waste building.)*

(18) After each container is drained, return it to the cart.

(19) When all containers are emptied, leave the funnel box on the drum to drain. When draining is complete, remove the funnel box and close the drum’s large opening first. Then close the small vent.

(20) WAIT! Have you completed the Hazardous Waste Building/Solvent Disposal Checklist, signed, and dated it? Upon completion of the form it must be returned to the Location Safety Office for recordkeeping. Have you completed the green logbook located on the shelf in each room?

(21) Exit the building. Lock all doors, turn off the lights and exhaust fans. Notify the front desk that you are clear of the building.

(22) Close the gate and return to the building.

(23) Return the keys and the checklist book to the Location Safety Office.

(24) Return the radio. Initial the Solvent Waste Disposal Record book at the Location Safety Office.

(25) Return the empty solvent cans to the laboratory and the metal-sided cart to

P-111.

**10. Central Accumulation Area**

a. The Central Accumulation Area shall be inspected weekly by the Location Safety Officer or his appointee.

b. The maximum accumulation time limit for a CESQG or SQG is 180 days.

c. All hazardous waste shall be shipped to a Permitted Treatment, Storage, or Disposal facility (TSDF).

**11. Chemical Redistribution Room & Hazardous Waste Building Inspections**

The Chemical Redistribution Room and Hazardous Waste Building should be inspected weekly to evaluate and minimize hazards. The weekly review checklist shall be completed and records maintained in the Location Safety Office.

 **Hazardous Waste Building Inspections:**

a. Proceed to the fence surrounding the waste building.

NOTE: If the gate is locked request someone (boiler plant operator or other FSE manager/foreman) to open the gate to the hazardous waste area. The gate should be unlocked during normal hours of operation. **PROCEED SLOWLY AND WITH CAUTION.**

b. At the Waste Solvent Building, check the radio by calling "unit 99 - LSO." The receptionist responds. Then you respond "unit 99 - radio check." If the radio is not working, DO NOT ENTER the waste building. Return to the front desk or the LSO and report the radio malfunction. *NOTE: The Location Safety Officer will notify the Facilities O&M Contract manager if no radio traffic is heard for approximately 30 minutes. The Location Safety Officer will also physically check on the personnel conducting the waste disposal if no radio traffic is heard for 30 minute.*

c. **Turn on the exhaust fan and light switch** at the end of the building. Listen and verify the exhaust fan has come on. **If the fan is not operating DO NOT enter the building.** Use the radio to call and inform facilities O&M contractor ("unit 99 to LSO").

d. Unlock and open the waste solvent building door #4 for solvents, and building door #5 for other waste chemicals. **Prop the door open with the door stop before entering.**

e. Check eyewashes for proper functioning. Sign and date the tag. Check the remainder of the items on the weekly review checklist.

f. Note any deficiencies and the date that they were noted. Write up a corrective action report on any deficiencies and have them addressed as soon as possible.

g. Exit the building. Lock all doors, turn off the lights and exhaust fans.

h. Close the gate and return to the building.

i. Return the keys and the checklist book to the Location Safety Office.

j. Return the radio. File weekly review checklist in the Waste Disposal Records book in the Location Safety Office.

**12. Air Monitoring**

a. Air monitoring shall be conducted when there is a reasonable probability that employee exposure exceeds the action level for a chemical (29 CFR 1910 subpart Z).

b. If the initial determination indicates employees are exposed above the action level, or in its absence the PEL for an OSHA regulated substance, periodic monitoring shall be conducted in accordance with that particular OSHA standard.

c. Periodic air monitoring may be terminated in accordance with the requirements for that particular OSHA standard.

**13. Information and Training**

a. Personnel shall be provided with information and training to ensure they are knowledgeable of potential chemical hazards in the laboratory. The following health and safety information shall be provided:

(1) Contents of OSHA Laboratory Standard and it’s appendices.

(2) Location and availability of the Chemical Hygiene Plan.

(3) Permissible Exposure Limits (PELs) and OSHA regulated substances.

(4) Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory.

(5) Location and availability of reference material including MSDSs.

b. Personnel handling hazardous chemicals shall be trained and provided annual refresher training. Training shall include the following:

(1) Details of the Chemical Hygiene Plan.

(2) Methods and observations that may be used to detect the presence of hazardous chemicals.

(3) Physical and health hazards of chemicals used in the laboratory.

(4) Measures personnel can take to protect themselves from these hazards, including use of SOPs/JHAs engineering controls, general work practices, and personal protective equipment.

**14. Personal Hygiene**

a. Personnel shall not eat, drink, smoke, chew gum, or apply cosmetics in the laboratory. Food and beverages shall not be stored in laboratories.

b. Personnel shall wash their hands after handling hazardous chemicals. Personnel shall wash other affected areas that may have been contaminated, i.e. neck, arms, legs, or body.

c. Personnel shall restrain long hair and loose clothing to minimize the risk of chemical contamination.

**15. First Aid**

 a. Follow requirements of RRC Emergency and Disaster Action Plan.

b. Basic first aid kits containing the following items will be maintained in designated areas by the Safety Office:

(1) 1 Absorbent Compress, 4x8 inch minimum.

(2) 3 Adhesive Bandages, Large.

(3) 16 Adhesive Bandages, 1x3 inch.

(4) 5 yard Adhesive Tape.

(5) 10 Antiseptic applications, 0.5 gram each.

(6) 1 Cold Pack.

(7) 4 yard Gauze Bandage, 2 inch.

(8) 2 Sterile Pads, 2x2 inch minimum.

(9) 4 Sterile Pads, 3x3 inch minimum.

(10) 2 pair Medical Exam Gloves.

(11) 1 Triangular Bandage, 40x40x56 inch minimum.

(12) 1 Scissor.

(13) 1 Face shield for CPR use.

(14) 13 inch Elastic Bandage.

**16. Medical Surveillance**

a. Medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician.

b. A voluntary occupational medical surveillance program is offered at no cost to ARS employees that may potentially exposed to chemical, biological, physical, or other health hazards during their work at RRC.

c. Additional medical attention shall be provided to employees under the following circumstances:

(1) When an employee develops signs or symptoms associated with occupational exposure to a hazardous chemical.

(2) When air sampling reveals exposure above the action-level, or in its absence the PEL or TLV for an OSHA regulated substance, medical surveillance shall comply with the requirements of that particular standard.

d. Medical consultation shall be provided whenever an abnormal event such as a spill, leak, or explosion takes place in the laboratory. Its purpose shall be to determine whether subsequent medical examination is necessary.

e. Pregnancy Surveillance. The pregnancy surveillance program shall include the following:

(1) Female employees of childbearing age shall be informed about reproductive hazards in the laboratory. The pregnant employee and her unborn child shall not be endangered by the work assignment.

(2) Pregnant employees shall notify their supervisor as soon as the pregnancy is known. The supervisor shall notify the Location Safety Officer in writing/email of pregnant employees work assignments. The LSO will review the chemical inventory for her work location and arrange a consultation with the Occupational Medicine Consultant. If the employee requests a change in her work assignment, every reasonable effort shall be made to accommodate her request.

(3) The supervisor may request medical certification as to the nature of the limitations recommended by her physician.

**17. Chemical Spills**

a. General:

(1) Large (greater than 5 gal.) spills shall be handled in accordance with the RRC Emergency Action Plan.

(2) Personnel shall not attempt to clean-up large hazardous spills (spills greater than 4 liters of a hazardous substance). Evacuate the laboratory and notify the LSO (3137) and 911.

(3) Personnel shall use appropriate protective equipment and clothing to minimize chemical exposure during spill clean up. Specific requirements shall be documented in the labs SOP/JHA.

(4) Supervisors shall ensure supplies and equipment to handle small spills in the lab are available in a readily identifiable location.

(5) Spill trays shall be used for all complex operations where there is a reasonable probability a spill could occur.

(6) All spills shall be reported to the safety office.

b. Liquid spills:

(1) Spills should be confined using trays, absorbents, or paper towels whenever feasible.

(2) Neutralize inorganic acids with an appropriate chemical or use an absorbent mixture (i.e. soda ash). Other liquids should be absorbed with a non-reactive material such as sand, vermiculite, or other compatible absorbent material and placed in suitable containers.

(3) Flammable liquid spills. Turn off or remove all ignition or heat sources. Continuously ventilate the area. Absorb the liquid with a non-reactive material and place in a suitable container.

c. Solid spills. Low toxicity materials should be swept into a dustpan and placed in a suitable container. A wet method or HEPA vacuum should be used to clean-up toxic chemicals.

**18. Special Procedures for Handling Highly Toxic Compounds, Carcinogens and Reproductive Toxins**

a. General. In addition to the hygiene practices covered in the previous paragraphs, the following special procedures are to be used for laboratory operations involving highly toxic compounds, carcinogens, and reproductive toxins.

 b. Storage and Distribution:

(1) Storage of unopened containers presents no special hazards. Once opened, volatile chemicals shall be sealed with parafilm, tape, or over packed in an unbreakable container.

(2) Acutely toxic compressed gases shall be stored in a chemical hood or gas cabinet. Storage shall be kept to the minimum required to do the work.

 c. Engineering Controls:

(1) Laboratory Operations which involve highly toxic compounds, carcinogens, or reproductive toxins shall be planned and conducted using appropriate engineering controls. High risk operations shall be conducted inside primary containment including chemical hoods, glove boxes, or inhalation chambers. **Only** **Low Risk** operations where the potential for generation of gas, vapor, or aerosol contamination is remote may be conducted on the open bench.

(2) Effluent from test equipment or apparatus shall be filtered or scrubbed before discharge into primary containment. House vacuum shall be provided with in-line filters or traps to prevent contamination. Vacuum pumps shall be vented into a chemical hood or local ventilation system.

(3) Analytical instrumentation which generates vapor or aerosol contamination shall be vented into a hood or operated using local exhaust ventilation to capture air contaminants.

d. Administrative and Work Practice Controls:

(1) Laboratory operations involving highly toxic compounds shall be conducted in a “designated area” where access to unauthorized personnel is restricted. The area may be the entire room, an area within the room, or the primary containment. Doors leading to the designated area shall remain closed at all times. Laboratory personnel conducting such work will not work alone.

(2) Working Surfaces. Working surfaces shall be non-porous and covered with absorbent, plastic backed paper. Spill trays should be used when complex manipulations are conducted.

e. Decontamination. Contaminated equipment, apparatus, and glassware shall be decontaminated before removal from the designated area. Working surfaces shall be decontaminated prior to beginning new operations. Acetone, methanol, or water are recommended for solvent washing when chemical decontamination is not feasible.

f. Chemical spills. Wet methods or HEPA filtered vacuum shall be used to clean-up spills of highly toxic compounds, carcinogens, or reproductive toxins. Dry methods shall be prohibited. Personnel shall use appropriate protective clothing and equipment to minimize exposure.

**19. Emergencies**

 a. Follow procedures outlined in the RRC Emergency and Disaster Action Plan.

 b. Ventilation Failure:

(1) In the event of a low flow condition or complete ventilation failure, operations shall be terminated in a safe manner and personnel shall:

(a) Close the hand valve on all compressed gas cylinders.

(b) Turn off laboratory air, vacuum, and gas systems to equipment and apparatus.

(c) Close containers of volatile chemicals.

(d) Close the fume hood sash.

(e) Evacuate the laboratory room if possibility of atmospheric hazards.

(2) Personnel shall not re-enter the laboratory until ventilation has been restored for at least 30 minutes if there is a possibility of an atmospheric hazard.

(3) In cases where the operation could not be terminated and there is a reasonable probability that the laboratory atmosphere is unsafe, air monitoring may be necessary before re-entry. Contact the safety office for guidance.

**20. Housekeeping**

a. Laboratories shall be kept clean and free from obstructions. Personnel shall clean-up work areas at the end of each day’s operations. Chemical spills shall be cleaned up immediately to minimize contamination.

b. Hazardous waste shall be stored in compatible closed containers that are properly marked.

c. Equipment, apparatus, and chemical inventories shall be properly stored. Excess equipment and chemicals shall be turned-in to minimize clutter in the laboratory.

d. Floors shall be cleaned routinely to minimize resuspension of dust and toxic contaminants.

e. Stairways and halls shall not be used as storage areas. Access to exits and emergency equipment shall not be blocked.

**VIII. Biosafety Plan**

1. **Purpose**

This plan outlines appropriate practices, policies and regulatory requirements for working safely in the research laboratory with biohazardous materials at USDA ARS Russell Research Center. Where not addressed, procedures shall be in keeping with the appropriate Biosafety Level as listed in the most current edition of Biosafety in the Microbiological and Biomedical Laboratory

The purpose of this Institutional Biosafety Plan (IBP) is to provide institutional policies and procedures that support this mission. This plan is primarily drawn from the 5th Edition of Biosafety in the Microbiological and Biomedical Laboratory (BMBL; CDC/NIH, 2007). It is further supported by:

* USDA Departmental Regulations DR9630, DR4400, DM9610
* NIH Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines; NIH OBA, 2002)
* USDA/CDC Select Agent and Toxin Rules (42 CFR Part 73, 7 CFR Part 331 and 9 CFR Part 121)
* OSHA Bloodborne Pathogens Standard (29 CFR Part 1910)
* DOT Hazardous Materials Regulations (49 CFR Part 171-180)

**2. Scope**

The Institutional Biosafety Plan applies to all employees and visitors both on and off the ARS, RRC location while on duty. Other Tenants of the RRC facility must implement, at a minimum, an equivalent IBP and provide a copy of that plan to the LSO along with any updates as they occur.

**3. Responsibilities**

A. The Institutional Biosafety Committee (IBC) shall:

(1) Review and approves all rDNA research activities conducted at their ARS location, regardless of source of funds and ensures compliance with the NIH Guidelines as specified in Section III, Experiments Covered by the NIH Guidelines. This review shall include: (a) Independent assessment of the containment levels required by the NIH Guidelines for the proposed research and; (b) Assessment of the facilities, procedures, practices, and training and expertise of personnel involved in recombinant DNA research. If the Area IBC is performing the review, the facility assessment may be conducted by the location BSO or Safety staff or ASHM or their staff acting on behalf of the IBC.

(2) Review and approves all submitted registrations for research projects involving biohazards, as defined by this policy.

(3) Work with the Research Leaders/Principle Investigator, Biosafety Officer, location safety staff, during its review, to assess the appropriateness of the proposed laboratory facility, the procedures and practices, the availability of medical countermeasures or medical surveillance, and the training and expertise of the personnel involved in research. The committee may suggest or require changes in procedures, personal protective equipment, engineering controls or physical containment specifications.

(4) Work with the investigators and their personnel in conjunction with the BSO, and location safety staff to adopt emergency plans covering spills or contamination from all containment laboratories.

(5) Notify the Principal Investigator/Research Leader/ Lead Researcher that submitted the registration of the results of the IBC’s review and approval/disapproval and/or any conditions of approval.

(6) Track experiments through the project registration document and annual updates to assure that once an experimental procedure within the project has been approved, no substantial change is made unless a formal request (amended registration document) with appropriate justification is submitted to the IBC and approved. A major change would include a change in laboratory space, addition of new pathogens or toxin (e.g. different genus and species or pathogens that were previously approved), scope of work change such as going from bench scale to large scale processes, addition of vector systems or major change in transgene insert, etc. Minor changes such as the addition or deletion of staff to the registration can be made through a written notification to the IBC chair or secretary.

(7) Maintain files documenting membership, annual reports, IBC meeting minutes and information related to the review of research project registrations for at least 5 years. The submission of these documents through ARS line management should be performed as outlined in the reports section of this document.

(8) Conduct a review of project activity associated with an approved registration at irregular intervals, dictated by complaint of nonconformance to the stipulations in an approved experiment or upon receipt of a request from the RL/PI for approval to make a major change/modification to an approved project or experiments. All major changes must be approved by the IBC prior to proceeding with the work. Investigations of complaints are addressed in (paragraph below). File maintenance and transmission of results of review are as stipulated in (paragraph above and reports section of this ARS policy).

(9) Promptly investigate all complaints concerning nonconformance with stipulations of an approved activity, or failure to comply with provisions of the NIH Guidelines and ARS policies concerning use of rDNA or biohazards. If warranted, after investigation of complaint(s), recommend to appropriate ARS line management such as the (Area Director, Location Coordinator, Research Leader) a course of corrective action appropriate for the infraction. Corrective actions may include: removal of an employee from the IBC approved registration, rescinding IBC approval for the research project, referral to ARS Labor and Employee Relations Branch, Personnel Division (LERB) when ARS employees are involved or Contracting and Assistance Division (CAD) when cooperator employees are involved to determine whether formal investigation concerning possible disciplinary action is warranted.

(10) Communicate all noncompliance issues and adverse events to the Area IBC, line management and Agency Biosafety Officer.

(11) In addition to its project review function, the IBC provides an open forum to discuss biological safety concerns and assist in the resolution of any biological safety issues brought before the committee.

(12) Upon public inquiry requesting the proceedings (i.e. minutes) of ARS IBC meetings forward the request, requestor information and the requested IBC proceedings through the Area IBC, AD, and Agency Biosafety Office to the Agency Information Office for review. The minutes will not contain confidential information.

B. The Location Safety Officer shall:

(1) Serve as the Location Biosafety Officer (BSO) and manage all biosafety issues under the guidance of the IBC.

(2) At a minimum conduct annual inspections/risk assessment of each RRC location utilizing biohazards or rDNA to ensure that research is accomplished following NIH guidelines. Locations having BSL-3 laboratories or utilizing CFR listed agents may need to be inspected more frequently.

(3) In addition to the annual inspection, the BSO or IBC member as a pre-requisite for IBC approval will inspect facilities proposing new work or submitting a renewal registration for an existing research project (5 year registration renewal cycle) with biohazards to ensure that adequate facilities, engineering controls and procedures are in place for the work proposed in the registration document. The BSO will then present those findings to the IBC.

The website: (https://arsnet.usda.gov/sites/ARS/Biosafety/Training%20Materials/Forms/AllItems.aspx) provides biosafety inspection checklists as a self-inspection tool for use by laboratories and location staff assigned biosafety program responsibilities.

 (4) Assist with arrangement of any necessary training.

C. The Research Leaders or Principle Investigators shall:

(1) Assure full compliance with ARS policies and the NIH Guidelinesin the conduct of research using recombinant DNA and/or biohazards.

(2) Be directly responsible for all aspects of biosafety specific to their registered research program.

(3) Obtains and maintains the applicable APHIS permits for work with pathogens or conducting field tests using recombinant plants or microorganisms.

(4) Shall not commence or modify a research project involving biohazard(s) or rDNA that requires an IBC approval (see Sections III-A, III-B, III-C, III-D, and III-E, Experiments Covered by the NIH Guidelines) until that research or the proposed modification thereof has been reviewed and approved by the IBC and has met all other requirements of the NIH Guidelines;

(5) Research activities involving biohazards and rDNA materials shall:

1. Follow all applicable laws, regulations, policies, procedures, and guidelines governing the acquisition, storage, use and disposal of biohazards or rDNA materials in research;
2. Prior to engaging in research activities involving biohazards or rDNA, ensure all staff listed on the registration document are appropriately trained on the applicable regulations, standard operating procedures, emergency procedures, security and safety procedures as required by ARS IBC policy, applicable regulations and guidelines (9 CFR 121, NIH Guidelines, 29 CFR 1910.1030, etc.); ensure that necessary training is appropriately documented.
3. Ensure employees are proficient in performing laboratory operations according to the laboratory’s standard operational procedures.
4. Supervise the safety performance of laboratory staff to ensure that the appropriate safety practices and good microbiological technique are employed. Correct work errors that may result in putting the employee or others into unsafe situations or the release of rDNA or biohazards to the environment.
5. Receive and participate in adequate in-service training concerning biosafety and laboratory safety procedures and;
6. Abide by and carry out the decisions of the ARS IBCs.
7. Report all concerns, complaints and adverse events regarding the acquisition, use, storage or disposal of biohazards and rDNA to the IBC Chair, BSO and appropriate ARS line management.
8. Ensure compliance with all surveillance, data reporting, and adverse event reporting requirements set forth in the NIH Guidelines.

**4.** **Laboratory Access, Signage and Labeling**

Access to the lab is limited or restricted at the discretion of the lab supervisor when work with cultures or specimens are in progress. Doors are lockable, kept closed and locked when personnel are not present.

Anyone entering areas where biohazardous materials are used must be aware of the potential hazards. Therefore, standardized laboratory door signage has been developed and will be used to provide warning of the presence of a human biohazard, along with other hazards. This signage must be posted at the entrance of the lab. The lab signage must also indicate the organisms and biosafety level, any special requirements for entry (vaccinations, PPE, etc.), and the PIs name and contact information. Appropriate signage should also be posted at entrances to each storage room where biohazardous materials are stored.

**5. General**

 The scientist or laboratory technician is the first line of defense against exposure to hazardous agents. Protection depends on the conscientious and proficient use of good microbiological practices and the correct use of safety equipment. Training, experience, knowledge of the agent and procedure hazards, good habits, caution, attentiveness, and concern for the health of coworkers are prerequisites for a laboratory staff in order to reduce the inherent risks that attend work with hazardous agents. Laboratory directors or principal investigators should train and retrain new staff to the point where aseptic techniques and safety precautions become second nature. They should also ensure that the necessary safety equipment is available and operating properly.

**A. Laboratory Practices and Techniques**

Laboratory acquired infections (LAI) may be infrequent or even rare, but risks are always there and they should be constantly considered to keep personnel in check. Single, known exposure incidents are not typically found in historically documented LAIs. Therefore, it is imperative that good microbiological practices and technique are used, not only for product protection but for personal protection as well.

In order for infection or disease to occur, there must be an adequate number of organisms to cause disease (known as the infectious dose) and an appropriate route of transmission to the body. Knowing how infectious organisms are transmitted and what their infectious dose is can help in evaluating risk and avoiding infection. Information like this must be gathered prior to commencement of work. Good starting points for safety information about human pathogens are infectious agent MSDSs and the agent information section of the 5th edition of the BMBL.

Infectious agents are transmitted through one or more of these routes of exposure:

* Parenteral inoculation (sharps injuries and bites from animals or arthropod vectors)
* Inhalation of aerosols (microscopic particles dispersed or suspended in air; ­<5 μm in diameter)
* Ingestion
* Mucous membrane exposure (eyes, mouth, nose)

**(1) Handling of Sharps and broken glassware**

All sharp items shall be handled in such a way as to avoid cuts and sticks to researchers and to anyone handling the items downstream, such as janitorial staff or people at a landfill, who may come into contact with sharps and broken glass. Items may be considered a sharp if it has potential to cut. For example, plastics or metal objects that have been broken leave a sharp jagged edge. Dispose of these as broken glass.

Laboratories doing research on biohazards have an additional complication. An employee suffering a cut could potentially be inoculated with a pathogen and develop a laboratory acquired infection (LAI). For this reason, all sharps used are required to be decontamination and autoclaving is the only approved method at RRC for decontaminating sharps and broken glass.

***Standard Operating Practices***

1. All sharps must be collected in an approved hard plastic red sharps container for waste disposal.
2. An appropriate sharps container must be kept close to the point of use to avoid walking around with contaminated sharps.
3. Care must be taken not to overfill sharps containers. They are considered full when they are ¾ full. Never allow syringes, needles or other contents to stick out of the sharps container.
4. All broken glass goes into an approved cardboard container with liner.
5. Wearing lab coat, gloves and safety glasses, securely close the container according to the design of the container. Make sure nothing can fall out.
6. When containers are full, they are autoclaved for 1 hour, dry cycle, in an open autoclave bag contained within an autoclavable plastic bin. Put indicator tape on the container.
7. After containers have cooled, remove all biohazard signs or use a Sharpie to cross them out. Leave the indicator tape on the box and confirm it changed color. The concept is to show that the containers no longer contain biohazards.
8. Place the container in a black plastic bag and tie shut.
9. Place the container in a plastic bin to contain any drips and put on a cart.
10. Wheel the container down to the BIG BLUE compactor at the loading dock.
11. Throw the containers wrapped in black plastic into the compactor.

**(2) Blending, Grinding, Sonicating, Lyophilizing, and Freezing**

The greatest risk when using any of these devices is the creation of aerosols. When possible, blenders, grinders, sonicators, lyophilizers, etc. should be operated within a certified BSC when a biohazardous agent is present. Shields or covers must be used whenever possible to minimize aerosols and splatters.

1. For work with biohazardous agents, safety blenders should be used. Safety blenders are designed to prevent leakage from the bottom of the blender jar and to withstand autoclaving. They also provide a cooling jacket to avoid biological inactivation.
2. Avoid using glass blender jars. If a glass jar must be used, it must be covered with a polypropylene jar to contain the glass in case of breakage.
3. A towel moistened with disinfectant must be placed over the top of the blender while operating. This practice can be adapted to grinders and sonicators as well.
4. Aerosols must be allowed to settle for 10 minutes before opening the blender jar or grinder.
5. Lyophilizer vacuum pump exhaust must be filtered through HEPA filters or vented into BSC.

f) Polypropylene tubes should be used in place of glass ampules for storing biohazardous material in liquid nitrogen. Ampoules can explode, causing eye injuries and exposure to the biohazardous material.

**(3) Open Flames**

When sterilizing inoculating loops in an open flame, aerosols, which may contain viable microorganisms, can be created. Open flames are also an obvious fire hazard. A shielded electric incinerator or hot bead sterilizer is recommended instead of an open flame. Disposable plastic loops and needles are excellent alternatives as well.

Open flames should not be used within a biosafety cabinet because they disrupt the laminar airflow, in addition to being a fire hazard.

**(4) Pipetting**

The general risk associated with pipetting a biohazardous material is the potential creation of an aerosol and/or splash. Micropipettors can also create aerosols. To reduce risks associated with pipetting, the following practices are recommended:

1. ***Mouth pipetting is strictly prohibited***; mechanical pipetting aids must be used instead.
2. All human biohazards should be pipetted within a certified BSC when possible.
3. Cotton-plugged, disposable pipettes should be used. Cotton-plugged micropipette tips are also available.
4. Biohazardous materials must never be forcibly discharged from pipettes. “To deliver” (TD) pipettes should be used instead of pipettes requiring blowout.
5. To avoid splashing, biohazardous material should be dispensed from a pipette or micropipettor by allowing it to run down the receiving container wall.
6. Place used pipettes and micropipette tips horizontally in a liquid disinfectant pan inside the BSC. Disinfectant should be changed regularly and should completely cover pipettes. Allow adequate disinfection time before disposal of pipettes.
7. Pasteur pipettes should be disposed of in a puncture-resistant container.

**(5) Surface Decontamination**

 Decontamination renders an area, device, item, or material safer to handle, that is, reasonably free from a risk of disease transmission. The primary objective of a decontamination procedure is to reduce the level of microbial contamination such that the risk of the transmission of infection is eliminated. To reduce risks associated with surface contamination, the following practices are recommended:

a) Prior to beginning work, spray work area with a fresh liquid disinfectant. (10% bleach [0.5% sodium hypochlorite] for porous surfaces and 1% bleach [0.05% sodium hypochlorite] for cleaned, hard, and smooth surfaces).

b) Following work, again spray work area with a liquid disinfectant. (10% bleach [0.5% sodium hypochlorite] for porous surfaces and 1% bleach [0.05% sodium hypochlorite] for cleaned, hard, and smooth surfaces).

**(6) Reusable PPE & Equipment Decontamination**

Disinfect all reusable PPE/Equipment with a compatible disinfectant. Use a brush to remove any debris from the device and then disinfect the item again. Cage washing and decontamination equipment should be readily available.

**(7) Spill Response**

When accidents occur that involve the release of biohazardous agents, the PI should be notified as soon as possible. Trained lab staff working with these agents will be responsible for mitigation. The Office of Biosafety is available for assistance and should be contacted as soon as possible (following incident reporting protocols).

 Spills of biohazardous materials must be first contained, decontaminated and further cleaned up by staff properly trained and equipped to work with infectious materials. Each lab using biohazardous materials must have appropriate equipment and supplies on hand for managing spills and accidents involving biohazardous materials. Permanent equipment should include a safety shower, eyewash, a hand-washing sink, and disinfection and clean-up supplies. Spill protocols should be posted in areas where agents are handled and a biohazard spill kit should be readily available.

Examples of biohazard spill kit supplies:

* Nitrile or other appropriate disposable gloves
* Waterproof overboots
* Lab coats, disposable gowns, disposable Tyvek-like suits
* Goggles, safety glasses, or disposable face shield
* Disposable shoe covers (booties)
* Absorbent material - paper towels, absorbent pads
* Appropriate disinfectant (should be freshly prepared with available materials on hand)
* Tools to aid in collecting material - tongs, forceps, dustpan
* Biohazard bags and sharps waste containers
* Warning sign to post for restricted entry

**Managing a Biohazardous Spill INSIDE a Biosafety Cabinet (BSC)**

1. Keep the BSC running.
2. Immediately cover with absorbent material.
3. Soak absorbent material with freshly prepared disinfectant. Work from the outside of the absorbent material to the center. Allow for appropriate contact time.
4. Remove gloves and other contaminated clothing, according to standard procedures. Place in biohazard bag(s) for autoclaving.
5. Wash hands and arms thoroughly. Don a new pair of gloves and additional PPE as needed.
6. After appropriate contact time, collect disinfected materials placed on the spill area in a biohazard bag. If tubes or solid materials are involved, utilize tools such as tongs to pick up those materials. Broken glass and sharps should be placed in a sharps container rather than in a biohazard bag.
7. Wipe up spill area with disinfectant soaked paper towels.
8. Wipe down walls, work surfaces, and equipment in BSC with disinfectant.
9. If leaked through the BSC grille
	1. wipe down all items within the cabinet and remove,
	2. ensure drain valve is closed
	3. flood tray top, drain pans, and catch basins with disinfectant
	4. allow to stand for the appropriate contact time
	5. lift out tray and remove exhaust grille work
	6. clean top and bottom surfaces with sponge/cloth soaked in decontaminating solution
	7. replace grille tray and grille work
	8. if applicable, drain decontaminating solution from cabinet base into a collection vessel containing additional decontaminating solution.

A flexible tube should be attached to the drain valve and be of sufficient length to allow the open end to be submerged in the disinfectant within the collection vehicle. The drain pan should be flushed with water and drain tube removed.

* 1. remove gloves and other contaminated clothing, according to standard procedures. Place in biohazard bag for autoclaving.
1. Place all contaminated materials within a biohazard bag. Autoclave all contaminated material.
2. Follow incident reporting protocols for notifying lab supervisor (PI) and the Biosafety Officer.
3. For BSL2 labs, work may not resume until the PI or lab supervisor agrees that the cleanup is complete. For BSL3 or select agent labs, work may not resume until PI and BSO/RO have determined the clean up was appropriate.
4. Record spill cleanup on the Laboratory Decontamination Log sheet.

**Managing a Biohazardous Spill OUTSIDE of a Biological Safety Cabinet (BSC)**

1. Quickly place absorbent pads on the spilled area and carefully saturate the area with liquid disinfectant.
2. Remove PPE and potentially contaminated clothing, place in biohazard bag and wash any apparently contaminated body parts with soap and water before leaving the laboratory.
3. Post warning signs and/or a sentry to keep anyone from entering the spill area. Do not allow anyone entry to the area unless cleared to do so by the PI or BSO. Leave the area as necessary and following standard exit protocols.
4. Report the incident to the lab supervisor, PI or Biosafety Officer as needed.
5. Allow 20 minutes for any potential aerosols to settle and appropriate contact time for liquid disinfectant to work.
6. Once any potential aerosol has settled, don appropriate PPE for entry (double gloves are recommended).
7. Further soak absorbent material with freshly prepared disinfectant. Work from outside the absorbent material to the center being careful to minimize splashing or potential formation of aerosols. Allow for appropriate contact time.
8. Collect disinfected materials placed on the spill area in a biohazard bag. Utilize tools such as tongs to pick up those materials. Broken glass and sharps should be placed in a sharps container.
9. Wipe up the general area surrounding the spill with disinfectant soaked paper towels – including walls, work surfaces, and equipment.
10. Remove gloves and other contaminated clothing, according to standard procedures. Place in biohazard bag for autoclaving. Place all contaminated PPE in biohazard bag and autoclave with all contaminated material.

k) Record spill cleanup on the Laboratory Decontamination Log sheet.

**(8) Transport of Biohazardous Materials**

Any biohazardous materials transported between laboratories or buildings at RRC must be contained as it would be within the laboratory to prevent a release to the environment. Secondary and tertiary containers should be utilized and labeled with the biohazard symbol and the identity of the material inside.

1. All PPE required to handle samples in lab are required for sample transport between spaces. At a minimum wear laboratory coat/gown, safety glasses, and gloves.
2. Be familiar with the location and use of the biohazard spill kit.
3. Dispose of used gloves, wash hands, and put on new gloves prior to transporting samples.
4. The freight elevator (4) shall be used with NO additional personnel are on board.
5. Place materials in primary containers that are securely closed.
6. Mark the primary container with biohazard indicator tape.
7. Place materials, liquids or solids, in a **secondary container** **impervious to leaks**. For example, a tightly sealed full autoclave bag can be put into a plastic bin for transport.
8. Place bins on a cart and wheel materials between rooms.
9. Do not leave biohazardous materials unattended in hallways.
10. Disinfect cart surfaces and handles following transport.

**(9) Disposal and Disinfection of Biohazardous Materials and Animal Carcasses**

All Biohazardous waste decontamination, management, and quality controls at the RRC facility shall be in keeping with USDA Departmental Regulation 9630-001. Biohazardous materials used in research laboratories at RRC fall under the State of Georgia Biomedical Waste Rules ([391-3-4-.15](http://rules.sos.state.ga.us/docs/391/3/4/15.pdf)).

**a. Biomedical waste means:**

* pathological waste;
* biological waste;
* sharps;
* chemotherapy waste;
* specimen containers and sample bags;
* towels, absorbent surface liners, or underpads;
* contaminated, discarded equipment that was in contact with infectious agents,
* contaminated animal carcasses, body parts, bedding or wastes from infected animals
* cultures and stocks of infectious agents and associated biologicals from medical, pathological, research and industrial laboratories;
* waste from production of biologicals;
* discarded live and attenuated vaccines; or
* culture dishes and devices used to transfer, inoculate and mix cultures.
* Animal carcasses should be separated from other waste and stored in isolated cold storage for later incineration.

**b. Storage, containment and transport of biomedical waste**

Storage and containment of biomedical waste will be in a manner and location that protects materials from animals, rain and wind, does not provide a breeding place or a food source for insects and rodents, and minimizes exposure to the public.

Biomedical waste, except for sharps, must be placed in containers which are impervious to moisture and have sufficient strength to preclude ripping, tearing, or bursting under normal conditions of use. Containers will be securely closed so as to prevent leakage or expulsion of contents during storage, handling, or transport. All containers used for contaminated biological waste will be red or orange or clearly identified with the universal biohazard symbol or clearly marked with the word “Biohazard”.

Biomedical waste placed in storage for handing or transport must be placed in secondary containers as well, either disposable or reusable pails, cartons, boxes, drums, dumpsters, or portable bins. These secondary containers may be of any color and shall be conspicuously labeled with the universal biohazard symbol and the word “Biohazard” on the sides so as to be readily visible from any lateral direction when the container is upright.

**c. Disposal of biohazardous waste**

All cultures, stocks, and other potentially infectious materials should be properly decontaminated by autoclaving. When treated in this way in accordance within the State of Georgia biomedical waste regulations, the waste shall no longer be considered biomedical waste and may be combined and handled as regular solid waste. After containers have cooled, remove all biohazard signs or use a Sharpie to cross them out. Leave the indicator tape on the box and confirm it changed color. The concept is to show that the containers no longer contain biohazards. Place the container in a black plastic bag and tie shut. Place the container in a plastic bin to contain any drips and put on a cart. Wheel the container down to the BIG BLUE compactor at the loading dock. Throw the containers wrapped in black plastic into the compactor.

1. **Biohazardous Waste Incident Reporting**

All USDA scientists and research personnel are responsible for reporting any biohazardous waste incidents, regardless of severity, to their supervisor or designee and to the Location Biosafety Officer. The Location Biosafety Officer shall conduct an investigation and report findings to the appropriate line management and/or the Responsible Official for select agents and toxins.

1. **Mutihazardous Waste**

Waste with multiple type hazards including two or more of the following: radioactive, biohazardous agent(s), or hazardous chemical(s). If the multihazardous waste contains a biohazardous agent(s), inactivation of the biohazard(s) is usually the first step in the disposal process. After inactivation of the biohazard the waste will be treated as radioactive or as a hazardous waste as appropriate.

**(10) Autoclaving**

The most effective method of physical decontamination is steam sterilization (autoclaving).

Minimum Elements Required for Effective Autoclave Use.

Autoclaves must be properly used to effectively sterilize their contents. Autoclave use for microbiological media preparation requires various time and temperature settings for sterilization; therefore, individual trials should be done to determine the proper loading and time settings to determine adequate sterilization.

When autoclaving biohazardous waste, take into account the volume of waste and the ability of steam to penetrate the load. Vials of biological indicators can be placed inside of a load to determine if lab specific settings are appropriate. Minimum autoclave cycle time for a light load of biohazardous waste is 30 minutes at 121°C, 15psi. The following parameters contribute to autoclave effectiveness:

* *Temperature*: unless specifically instructed by media manufacturers’ directions, autoclave chamber temperature should be at least 121°C (250°F). Prions require higher autoclave temperatures but alternate disposal methods for prions should be considered in the risk assessment.
* *Time*: cycle time will vary according to the contents of the autoclave. If media is to be prepared, the manufacturers’ instructions should be followed. An adequate autoclave time for biohazardous waste is a minimum of 30 minutes, measured after the temperature of the material being sterilized reaches 121°C and 15 psi pressure. The tighter the autoclave is packed, the longer it will take to reach 121°C in the center of the load.
* *Steam Contact*: steam saturation of the load is essential for effective decontamination. Air pockets or insufficient steam supply will prevent adequate saturation. To ensure adequate steam contact, leave autoclave bags partially open during autoclaving to allow steam to penetrate into the bag. The addition of a small amount of water inside the bag before autoclaving will help ensure heat transfer to the items being decontaminated (do not add water if it will cause biohazardous materials to splash out of the bag).
* *Containers*: use leak-proof autoclavable containers only. Always consider substitutes for glassware when selecting containers. Plastics such as polypropylene, polypropylene copolymer or fluoropolymer products are capable of being autoclaved repeatedly. Place non-borosilicate glass bottles in a tray of water to help prevent heat shock. Place plastic bags inside a secondary container in the autoclave in case liquids leak out. Autoclavable plastic or stainless steel containers are appropriate secondary containers. Make sure plastic bags and pans are autoclavable to avoid melting.

**(11) Biological Toxin Inactivation**

Refer to the following tables for complete inactivation of different toxins:

30 Minute Exposure Time to Sodium Hypochlorite (NaOCl) With or Without Sodium Hydroxide (NaOH)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Toxins** | **2.5% NaOCl****+0.25 N NaOH** | **2.5% NaOCl** | **1.0% NaOCl** | **0.1% NaOCl** |
| **T-2 Mycotoxin** | YES | NO | NO | NO |
| **Brevetoxin** | YES | YES | NO | NO |
| **Microtoxin** | YES | YES | YES | NO |
| **Tetrodotoxin** | YES | YES | YES | NO |
| **Saxitoxin** | YES | YES | YES | YES |
| **Palytoxin** | YES | YES | YES | YES |
| **Ricin** | YES | YES | YES | YES |
| **Botulinum** | YES | YES | YES | YES |
| **Staphylococcal Enterotoxins** | YES (?) | YES (?) | YES (?) | YES (?) |

**Autoclaving or 10 Minute Exposure to Dry Heat**

|  |  |
| --- | --- |
|  | **Dry Heat** |
| **Toxins** | **Autoclave** | **200 C** | **500 C** | **1000 C** | **1500 C** |
| **T-2 Mycotoxin** | NO | NO | NO | NO | YES |
| **Brevetoxin** | NO | NO | NO | NO | YES |
| **Microtoxin** | NO | NO | YES | YES | YES |
| **Tetrodotoxin** | NO | NO | YES | YES | YES |
| **Saxitoxin** | NO | NO | YES | YES | YES |
| **Palytoxin** | NO | NO | YES | YES | YES |
| **Ricin** | YES | YES | YES | YES | YES |
| **Botulinum** | YES | YES | YES | YES | YES |
| **Staphylococcal** | YES (?) | YES (?) | YES (?) | YES (?) | YES (?) |

Reference*: Robert W. Wannemacher, Ph.D., Assistant Chief, Toxicology Division, US Army Medical Research Institute of Infectious Disease*

* For T-2 mycotoxin and brevetoxin, it is recommended that, for complete inactivation, all liquid samples, accidental spills, and non-burnable waste be soaked in 2.5% sodium hypochlorite with 0.25N sodium hydroxide for 4 hours. It is further recommended that cages and bedding from animals exposed to T-2 mycotoxin or brevetoxin be exposed to 2.5% sodium hypochlorite and 0.25N sodium hydroxide for 4 hours.
* Exposure for 30 minutes to 1.0% sodium hypochlorite is an effective procedure for laboratory (working solutions, equipment, animal cages, working area and spills) for inactivation of saxitoxin, tetrodotoxin, microcystin, palytoxin, ricin, botulinum toxin or staphylococcal enterotoxins (SEB).
* All burnable waste from toxins should be incinerated at temperatures in excess of 1500°F.
* Autoclaving can be used with protein toxins (Ricin, Botulinum toxin and SEB) but should not be used with any of the low molecular weight toxins.
* Tap water with normal chlorination is not a useful medium for inactivation of any of these toxins.
* Stability at high and low pHs varies with the toxin used and is not a universal procedure for inactivation of toxin waste.
* If the skin is accidentally exposed to toxins, it is recommended that it be washed immediately with soap and water.

**(12) PPE Removal Procedures**

PPE shall be removed in a manner that minimizes the spread of biohazards and allergens.

1. First, remove gown / lab coat and place in trash or collection bin
2. Next, remove gloves
3. Remove hair, face/mouth protection, and eye protection.
4. Wash hands

**(13) Animal Laboratory Disinfection Procedures**

1. Put on required PPE. At a minimum a lab coat or gown, gloves, and safety glasses shall be warn.
2. Make sure all windows are sealed.
3. Mop area with disinfectant.
4. Pour disinfectant down floor drain traps following cleaning to flush drains.

**(14) Laboratory Animal Handling**

Laboratory animals shall only be handled in approved locations and by individuals trained to do work with the specific animals. All topics not listed here shall be in keeping with the Vertebrate Animal Biosafety Level Criteria beginning on page 84.

1. All employees working with study animals should to undergo a yearly physical by the center health services unit.
2. All employees working with study animals should have a current tetanus inoculation.
3. All employees shall wear lab coats or other protective apparel along with protective disposable gloves when working with study animals.
4. All animal bites, scratches that break the skin surface, or other injuries should be reported to the location safety office and the health services unit as soon as possible.
5. Work with animals can produce dusts that can irritate the respiratory system for this reason protective dust masks are highly encouraged.
6. Safety glasses, face shields, dust masks, lab coats, shoe covers, gloves, and disposable coveralls are encouraged during the cleaning and disinfecting of animal areas; however, at a minimum a lab coat or gown, gloves, and safety glasses shall be warn.
7. Moribund animals should be euthanized and the carcass treated as required by the study protocol.
8. All abnormalities should be reported to the Animal Quarters Supervisor and the Principal Investigator. If those abnormalities can potentially affect the safety of the personnel at RRC the Location Safety Officer must be notified immediately.

**(15) Transport of Laboratory Animals**

Any animals transported between laboratories or buildings at RRC must be contained in a secure cage and have a cloth or paper drape wrapped around the cage. All PPE required to handle animals in lab is also required for animal transport between spaces. At a minimum wear laboratory coat/gown, safety glasses, and gloves.

**B. Bloodborne Pathogen Exposure Control Plan**

The Occupational Safety and Health Administration’s (OSHA) Bloodborne Pathogens Standard, 29 CFR 1910.1030, requires that each employer having an employee(s) with occupational exposure as defined by paragraph (b) of section 1910.1030 establish a written Exposure Control Plan and to eliminate or minimize employee occupational exposure to blood, certain other body fluids, or other potentially infectious materials as defined below:

* 1. Blood means human blood, human blood components, and products made from human blood.
	2. Bodily fluids means semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
	3. Other potentially infectious materials means any unfixed tissue or organ (other than intact skin) from a human (living or dead), and human immunodeficiency virus (HIV)-containing cell or tissue cultures, organ cultures, and HIV- or hepatitis B virus (HBV)-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

See SOP Section XIII for details.

**C.** **Laboratory Biosafety Level Criteria**

The essential elements of the three biosafety levels at RRC for activities involving infectious microorganisms and laboratory animals are designated in ascending order, by degree of protection provided to personnel, the environment, and the community. Standard microbiological practices are common to all laboratories. Special microbiological practices enhance worker safety, environmental protection, and address the risk of handling agents requiring increasing levels of containment.

**Biosafety Level 1**

Biosafety Level 1 is suitable for work involving well-characterized agents not known to consistently cause disease in immunocompetent adult humans, and present minimal potential hazard to laboratory personnel and the environment. BSL-1 laboratories are not necessarily separated from the general traffic patterns in the building. Work is typically conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is not required, but may be used as determined by appropriate risk assessment. Laboratory personnel must have specific training in the procedures conducted in the laboratory and must be supervised by a scientist with training in microbiology or a related science.

The following standard practices, safety equipment, and facility requirements apply to BSL-1 laboratories at RRC.

***A. Standard Operating Practices***

1. The laboratory supervisor must enforce the institutional policies that control access to the laboratory.

2. Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory.

3. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose.

4. Mouth pipetting is prohibited; mechanical pipetting devices must be used.

5. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be followed. Whenever practical, laboratory supervisors should adopt improved engineering and work practice controls that reduce risk of sharps injuries. Precautions, including those listed below, must always be taken with sharp items.

These include:

a. Careful management of needles and other sharps are of primary importance. Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

b. Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.

c. Non-disposable sharps must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.

d. Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.

6. Perform all procedures to minimize the creation of splashes and/or aerosols.

7. Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.

8. Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. Depending on where the decontamination will be performed, the following methods should be used prior to transport.

a. Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.

b. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.

9. A sign incorporating the universal biohazard symbol must be posted at the entrance to the laboratory when infectious agents are present. The sign may include the name of the agent(s) in use, and the name and phone number of the laboratory supervisor or other responsible personnel. Agent information should be posted in accordance with the institutional policy.

10. An effective integrated pest management program is required.

11. The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur. Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of childbearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance.

***B. Special Practices***

None required.

***C. Safety Equipment (Primary Barriers and Personal Protective Equipment)***

1. Special containment devices or equipment, such as BSCs, are not generally required.

2. Protective laboratory coats, gowns, or uniforms are recommended to prevent contamination of personal clothing.

3. Wear protective eyewear when conducting procedures that have the potential to create splashes of microorganisms or other hazardous materials. Persons who wear contact lenses in laboratories should also wear eye protection.

4. Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Alternatives to latex gloves should be available. Wash hands prior to leaving the laboratory. In addition, BSL-1 workers should:

a. Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary.

b. Remove gloves and wash hands when work with hazardous materials has been completed and before leaving the laboratory.

c. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated laboratory waste. Hand washing protocols must be rigorously followed.

***D. Laboratory (Secondary Barriers)***

1. Laboratories should have doors for access control.

2. Laboratories must have a sink for hand washing.

3. The laboratory should be designed so that it can be easily cleaned. Carpets and rugs in laboratories are not appropriate.

4. Laboratory furniture must be capable of supporting anticipated loads and uses. Spaces between benches, cabinets, and equipment should be accessible for cleaning.

a. Bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.

b. Chairs used in laboratory work must be covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.

5. Laboratories windows that open to the exterior should be fitted with screens.

**Biosafety Level 2**

Biosafety Level 2 builds upon BSL-1. BSL-2 is suitable for work involving agents that pose moderate hazards to personnel and the environment. It differs from BSL-1 in that: 1) laboratory personnel have specific training in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures; 2) access to the laboratory is restricted when work is being conducted; and 3) all procedures in which infectious aerosols or splashes may be created are conducted in BSCs or other physical containment equipment.

The following standard and special practices, safety equipment, and facility requirements apply to BSL-2.

***A. Standard Operating Practices***

1. The laboratory supervisor must enforce the institutional policies that control access to the laboratory.

2. Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory.

3. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose.

4. Mouth pipetting is prohibited; mechanical pipetting devices must be used.

5. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented. Whenever practical, laboratory supervisors should adopt improved engineering and work practice controls that reduce risk of sharps injuries. Precautions, including those listed below, must always be taken with sharp items. These include:

a. Careful management of needles and other sharps are of primary importance. Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

b. Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.

c. Non-disposable sharps must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.

d. Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.

6. Perform all procedures to minimize the creation of splashes and/or aerosols.

7. Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.

8. Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. Depending on where the decontamination will be performed, the following methods should be used prior to transport:

a. Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.

b. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.

9. A sign incorporating the universal biohazard symbol must be posted at the entrance to the laboratory when infectious agents are present. Posted information must include: the laboratory’s biosafety level, the Laboratory supervisor’s name (or other responsible personnel), telephone number, and required procedures for entering and exiting the laboratory. Agent information should be posted in accordance with the institutional policy.

10. An effective integrated pest management program is required.

11. The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur. Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of childbearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance.

***B. Special Practices***

1. All persons entering the laboratory must be advised of the potential hazards and meet specific entry/exit requirements.

2. Laboratory personnel must be provided medical surveillance, as appropriate, and offered available immunizations for agents handled or potentially present in the laboratory.

3. Consider the need for collection and storage of serum samples from at-risk personnel.

4. A laboratory-specific biosafety manual must be prepared and adopted as policy. The biosafety manual must be available and accessible.

5. The laboratory supervisor must ensure that laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-2 agents.

6. Potentially infectious materials must be placed in a durable, leak proof container during collection, handling, processing, storage, or transport within a facility.

7. Laboratory equipment should be routinely decontaminated, as well as, after spills, splashes, or other potential contamination.

a. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material NOT by contracted custodial employees.

b. Equipment must be decontaminated before repair, maintenance, or removal from the laboratory.

8. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in this laboratory biosafety plan. All such incidents must be reported to the laboratory supervisor. Medical evaluation, surveillance, and treatment should be provided and appropriate records maintained.

9. Animal and plants not associated with the work being performed must not be permitted in the laboratory.

10. All procedures involving the manipulation of infectious materials that may generate an aerosol should be conducted within a BSC or other physical containment devices.

***C. Safety Equipment (Primary Barriers and Personal Protective Equipment)***

1. Properly maintained BSCs, other appropriate personal protective equipment, or other physical containment devices must be used whenever:

a. Procedures with a potential for creating infectious aerosols or splashes are conducted. These may include pipetting, centrifuging, grinding, blending, shaking, mixing, sonicating, opening containers of infectious materials, inoculating animals intranasally, and harvesting infected tissues from animals or eggs.

b. High concentrations or large volumes of infectious agents are used. Such materials may be centrifuged in the open laboratory using sealed rotor heads or centrifuge safety cups.

2. Protective laboratory coats, gowns, smocks, or uniforms designated for laboratory use must be worn while working with hazardous materials. Remove protective clothing before leaving for non-laboratory areas, e.g., cafeteria, library, and administrative offices). Dispose of protective clothing appropriately, or deposit it for laundering by the institution. It is recommended that laboratory clothing not be taken home.

3. Eye and face protection (goggles, mask, face shield or other splatter guard) is used for anticipated splashes or sprays of infectious or other hazardous materials when the microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. Persons who wear contact lenses in laboratories should also wear eye protection.

4. Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Alternatives to latex gloves should be available. Gloves must not be worn outside the laboratory. In addition, BSL-2 laboratory workers should:

a. Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary.

b. Remove gloves and wash hands when work with hazardous materials has been completed and before leaving the laboratory.

c. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated laboratory waste. Hand washing protocols must be rigorously followed.

5. Eye, face and respiratory protection should be used in rooms containing infected animals as determined by the risk assessment.

***D. Laboratory (Secondary Barriers)***

1. Laboratory doors should be self-closing and have locks in accordance with the institutional policies.

2. Laboratories must have a sink for hand washing. The sink may be manually, hands-free, or automatically operated. It should be located near the exit door.

3. The laboratory should be designed so that it can be easily cleaned and decontaminated. Carpets and rugs in laboratories are not permitted.

4. Laboratory furniture must be capable of supporting anticipated loads and uses. Spaces between benches, cabinets, and equipment should be accessible for cleaning.

a. Bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.

b. Chairs used in laboratory work must be covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.

5. Laboratory windows that open to the exterior are not recommended. However, if a laboratory does have windows that open to the exterior, they must be fitted with screens.

6. BSCs must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSCs should be located away from doors, windows that can be opened, heavily traveled laboratory areas, and other possible airflow disruptions.

7. Vacuum lines should be protected with liquid disinfectant traps.

8. An eyewash station must be readily available.

9. There are no specific requirements for ventilation systems. However, planning of new facilities should consider mechanical ventilation systems that provide an inward flow of air without recirculation to spaces outside of the laboratory.

10. HEPA filtered exhaust air from a Class II BSC can be safely recirculation back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer’s recommendations. BSCs can also be connected to the laboratory exhaust system by either a thimble (canopy) connection or directly exhausted to the outside through a hard connection. Provisions to assure proper safety cabinet performance and air system operation must be verified.

11. A method for decontaminating all laboratory wastes should be available in the facility (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method).

**Biosafety Level 3**

Biosafety Level 3 is applicable to clinical, diagnostic, teaching, research, or production facilities where work is performed with indigenous or exotic agents that may cause serious or potentially lethal disease through the inhalation route of exposure. Laboratory personnel must receive specific training in handling pathogenic and potentially lethal agents, and must be supervised by scientists competent in handling infectious agents and associated procedures.

All procedures involving the manipulation of infectious materials must be conducted within BSCs or other physical containment devices. A BSL-3 laboratory has special engineering and design features.

The following standard and special safety practices, equipment, and facility requirements apply to BSL-3.

***A. Standard Operating Practices***

1. The laboratory supervisor must enforce the institutional policies that control access to the laboratory.

2. Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory.

3. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose.

4. Mouth pipetting is prohibited; mechanical pipetting devices must be used.

5. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented. Whenever practical, laboratory supervisors should adopt improved engineering and work practice controls that reduce risk of sharps injuries.

Precautions, including those listed below, must always be taken with sharp items. These include:

a. Careful management of needles and other sharps are of primary importance. Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

b. Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.

c. Non-disposable sharps must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.

d. Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.

6. Perform all procedures to minimize the creation of splashes and/or aerosols.

7. Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.

8. Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. A method for decontaminating all laboratory wastes should be available in the facility, preferably within the laboratory (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method). Depending on where the decontamination will be performed, the following methods should be used prior to transport:

a. Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.

b. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.

9. A sign incorporating the universal biohazard symbol must be posted at the entrance to the laboratory when infectious agents are present. Posted information must include the laboratory’s biosafety level, the supervisor’s name (or other responsible personnel), telephone number, and required procedures for entering and exiting the laboratory. Agent information should be posted in accordance with the institutional policy.

10. An effective integrated pest management program is required.

11. The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur. Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of childbearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance.

***B. Special Practices***

1. All persons entering the laboratory must be advised of the potential hazards and meet specific entry/exit requirements.

2. Laboratory personnel must be provided medical surveillance and offered appropriate immunizations for agents handled or potentially present in the laboratory.

3. Each institution should consider the need for collection and storage of serum samples from at-risk personnel.

4. A laboratory-specific biosafety manual must be prepared and adopted as policy. The biosafety manual must be available and accessible.

5. The laboratory supervisor must ensure that laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-3 agents.

6. Potentially infectious materials must be placed in a durable, leak proof container during collection, handling, processing, storage, or transport within a facility.

7. Laboratory equipment should be routinely decontaminated, as well as, after spills, splashes, or other potential contamination.

a. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.

b. Equipment must be decontaminated before repair, maintenance, or removal from the laboratory.

8. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the laboratory biosafety manual. All such incidents must be reported to the laboratory supervisor. Medical evaluation, surveillance, and treatment should be provided and appropriate records maintained.

9. Animals and plants not associated with the work being performed must not be permitted in the laboratory.

10. All procedures involving the manipulation of infectious materials must be conducted within a BSC, or other physical containment devices. No work with open vessels is conducted on the bench. When a procedure cannot be performed within a BSC, a combination of personal protective equipment and other containment devices, such as a centrifuge safety cup or sealed rotor must be used.

***C. Safety Equipment (Primary Barriers and Personal Protective Equipment)***

1. All procedures involving the manipulation of infectious materials must be conducted within a BSC (preferably Class II or Class III), or other physical containment devices.

2. Workers in the laboratory where protective laboratory clothing with a solid-front, such as tie-back or wrap-around gowns, scrub suits, or coveralls. Protective clothing is not worn outside of the laboratory. Reusable clothing is decontaminated before being laundered. Clothing is changed when contaminated.

3. Eye and face protection (goggles, mask, face shield or other splash guard) is used for anticipated splashes or sprays of infectious or other hazardous materials. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. Persons who wear contact lenses in laboratories must also wear eye protection.

4. Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Alternatives to latex gloves should be available. Gloves must not be worn outside the laboratory. In addition, BSL-3 laboratory workers:

a. Changes gloves when contaminated, glove integrity is compromised, or when otherwise necessary. Wear two pairs of gloves when appropriate.

b. Remove gloves and wash hands when work with hazardous materials has been completed and before leaving the laboratory.

c. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated laboratory waste. Hand washing protocols must be rigorously followed.

5. Eye, face, and respiratory protection must be used in rooms containing infected animals.

***D. Laboratory (Secondary Barriers)***

1. Laboratory doors must be self-closing and have locks in accordance with the institutional policies. The laboratory must be separated from areas that are open to unrestricted traffic flow within the building. Laboratory access is restricted. Access to the laboratory is through two self-closing doors. A clothing change room (anteroom) may be included in the passageway between the two self-closing doors.

2. Laboratories must have a sink for hand washing. The sink must be hands-free or automatically operated. It should be located near the exit door. If the laboratory is segregated into different laboratories, a sink must also be available for hand washing in each zone. Additional sinks may be required as determined by the risk assessment.

3. The laboratory must be designed so that it can be easily cleaned and decontaminated. Carpets and rugs are not permitted. Seams, floors, walls, and ceiling surfaces should be sealed. Spaces around doors and ventilation openings should be capable of being sealed to facilitate space decontamination.

a. Floors must be slip resistant, impervious to liquids, and resistant to chemicals. Consideration should be given to the installation of seamless, sealed, resilient or poured floors, with integral cove bases.

b. Walls should be constructed to produce a sealed smooth finish that can be easily cleaned and decontaminated.

c. Ceilings should be constructed, sealed, and finished in the same general manner as walls.

Decontamination of the entire laboratory should be considered when there has been gross contamination of the space, significant changes in laboratory usage, for major renovations, or maintenance shut downs. Selection of the appropriate materials and methods used to decontaminate the laboratory must be based on the risk assessment.

4. Laboratory furniture must be capable of supporting anticipated loads and uses. Spaces between benches, cabinets, and equipment must be accessible for cleaning.

a. Bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.

b. Chairs used in laboratory work must be covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.

5. All windows in the laboratory must be sealed.

6. BSCs must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSCs should be located away from doors, heavily traveled laboratory areas, and other possible airflow disruptions.

7. Vacuum lines must be protected with HEPA filters, or their equivalent. Filters must be replaced as needed. Liquid disinfectant traps may be required.

8. An eyewash station must be readily available in the laboratory.

9. A ducted air ventilation system is required. This system must provide sustained directional airflow by drawing air into the laboratory from “clean” areas toward “potentially contaminated” areas. The laboratory shall be designed such that under failure conditions the airflow will not be reversed.

a. Laboratory personnel must be able to verify directional airflow. A visual monitoring device, which confirms directional airflow, must be provided at the laboratory entry. Audible alarms should be considered to notify personnel of air flow disruption.

b. The laboratory exhaust air must not re-circulate to any other area of the building.

c. The laboratory building exhaust air should be dispersed away from occupied areas and from building air intake locations or the exhaust air must be HEPA filtered.

 HEPA filter housings should have gas-tight isolation dampers, decontamination ports, and/or bag-in/bag-out (with appropriate decontamination procedures) capability. The HEPA filter housing should allow for leak testing of each filter and assembly. The filters and the housing should be certified at least annually.

10. HEPA filtered exhaust air from a Class II BSC can be safely re-circulated into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer’s recommendations. BSCs can also be connected to the laboratory exhaust system by either a thimble (canopy) connection or directly exhausted to the outside through a hard connection. Provisions to assure proper safety cabinet performance and air system operation must be verified. BSCs should be certified at least annually to assure correct performance. Class III BSCs must be directly (hard) connected up through the second exhaust HEPA filter of the cabinet. Supply air must be provided in such a manner that prevents positive pressurization of the cabinet.

11. A method for decontaminating all laboratory wastes should be available in the facility, preferably within the laboratory (e.g., autoclave, chemical disinfection, or other validated decontamination method).

12. Equipment that may produce infectious aerosols must be contained in primary barrier devices that exhaust air through HEPA filtration or other equivalent technology before being discharged into the laboratory. These HEPA filters should be tested and/or replaced at least annually.

13. Facility design consideration should be given to means of decontaminating large pieces of equipment before removal from the laboratory.

14. Enhanced environmental and personal protection may be required by the agent summary statement, risk assessment, or applicable local, state, or federal regulations. These laboratory enhancements may include, for example, one or more of the following: an anteroom for clean storage of equipment and supplies with dress-in, shower-out capabilities; gas tight dampers to facilitate laboratory isolation; final HEPA filtration of the laboratory exhaust air; laboratory effluent decontamination; and advanced access control devices, such as biometrics.

15. The BSL-3 facility design, operational parameters, and procedures must be verified and documented prior to operation. Facilities must be re-verified and documented at least annually.

**C. Vertebrate Animal Biosafety Level Criteria**

The following standard practices, safety equipment, and facility requirements apply to all RRC indoor animal research facilities. No animals shall be housed for any duration at any time outside designated animal research facilities within RRC. At present, RRC animal research facilities shall not exceed ABSL-2.

**Animal Biosafety Level 1**

Animal Biosafety Level 1 is suitable for work in animals involving well-characterized agents that are not known to cause disease in immunocompetent adult humans, and present minimal potential hazard to personnel and the environment.

ABSL-1 facilities should be separated from the general traffic patterns of the building and restricted as appropriate. Special containment equipment or facility design may be required as determined by appropriate risk assessment. Personnel must have specific training in animal facility procedures and must be supervised by an individual with adequate knowledge of potential hazards and experimental animal procedures.

The following standard practices, safety equipment, and facility requirements apply to ABSL-1.

***A. Standard Microbiological Practices***

1. The animal facility director establishes and enforces policies, procedures, and protocols for institutional policies and emergencies.

Each institute must assure that worker safety and health concerns are addressed as part of the animal protocol review.

Prior to beginning a study animal protocols must also be reviewed and approved by the Institutional Animal Care and Use Committee (IACUC) and the Institutional Biosafety Committee.

2. A safety manual specific to the animal facility is prepared or adopted in consultation with the animal facility director and appropriate safety professionals. The safety manual must be available and accessible. Personnel are advised of potential hazards and are required to read and follow instructions on practices and procedures.

3. The supervisor must ensure that animal care, laboratory and support personnel receive appropriate training regarding their duties, animal husbandry procedures, potential hazards, manipulations of infectious agents, necessary precautions to prevent exposures, and hazard/exposure evaluation procedures (physical hazards, splashes, aerosolization, etc.). Personnel must receive annual updates and additional training when procedures or policies change. Records are maintained for all hazard evaluations, employee training sessions and staff attendance.

4. An appropriate medical surveillance program is in place, as determined by risk assessment. The need for an animal allergy prevention program should be considered.

Facility supervisors should ensure that medical staff is informed of potential occupational hazards within the animal facility, to include those associated with research, animal husbandry duties, animal care and manipulations.

Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all personnel and particularly women of childbearing age should be provided information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance.

Personnel using respirators must be enrolled in an appropriately constituted respiratory protection program.

5. A sign incorporating safety information must be posted at the entrance to the areas where infectious materials and/or animals are housed or are manipulated. The sign must include the animal biosafety level, general occupational health requirements, personal protective equipment requirements, the supervisor’s name (or other responsible personnel), telephone number, and required procedures for entering and exiting the animal areas. Identification of specific infectious agents is recommended when more than one agent is being used within an animal room.

Security-sensitive agent information should be posted in accordance with the institutional policy.

Advance consideration should be given to emergency and disaster recovery plans, as a contingency for man-made or natural disasters.

6. Access to the animal room is limited. Only those persons required for program or support purposes are authorized to enter the facility.

All persons including facility personnel, service workers, and visitors are advised of the potential hazards (natural or research pathogens, allergens, etc.) and are instructed on the appropriate safeguards.

7. Protective laboratory coats, gowns, or uniforms are recommended to prevent contamination of personal clothing.

Gloves are worn to prevent skin contact with contaminated, infectious and hazardous materials, and when handling animals.

Gloves and personal protective equipment should be removed in a manner that minimizes transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or are manipulated.

Persons must wash their hands after removing gloves, and before leaving the areas where infectious materials and/or animals are housed or are manipulated.

Eye and face and respiratory protection should be used in rooms containing infected animals, as dictated by the risk assessment.

8. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside of the laboratory in cabinets or refrigerators designed and used for this purpose.

9. All procedures are carefully performed to minimize the creation of aerosols or splatters of infectious materials and waste.

10. Mouth pipetting is prohibited. Mechanical pipetting devices must be used.

11. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented.

When applicable, laboratory supervisors should adopt improved engineering and work practice controls that reduce the risk of sharps injuries. Precautions, including those listed below, must always be taken with sharp items. These include:

a. Use of needles and syringes or other sharp instruments in the animal facility is limited to situations where there is no alternative for such procedures as parenteral injection, blood collection, or aspiration of fluids from laboratory animals and diaphragm bottles.

b. Disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used disposable needles must be carefully placed in puncture-resistant containers used for sharps disposal. Sharps containers should be located as close to the work site as possible.

c. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving.

d. Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.

e. Equipment containing sharp edges and corners should be avoided.

12. Equipment and work surfaces are routinely decontaminated with an appropriate disinfectant after work with an infectious agent, and after any spills, splashes, or other overt contamination.

13. Animals and plants not associated with the work being performed must not be permitted in the areas where infectious materials and/ or animals are housed or are manipulated.

14. An effective integrated pest management program is required.

15. All wastes from the animal room (including animal tissues, carcasses, and bedding) are transported from the animal room in leak-proof, covered containers for appropriate disposal in compliance with applicable institutional, local and state requirements.

Decontaminate all potentially infectious materials before disposal using an effective method.

***B. Special Practices***

None required.

***C. Safety Equipment (Primary Barriers and Personal Protective Equipment)***

1. A risk assessment should determine the appropriate type of personal protective equipment to be utilized.

2. Special containment devices or equipment may not be required as determined by appropriate risk assessment.

3. Protective laboratory coats, gowns, or uniforms may be required to prevent contamination of personal clothing.

Protective outer clothing is not worn outside areas where infectious materials and/or animals are housed or manipulated. Gowns and uniforms are not worn outside the facility.

4. Protective eyewear is worn when conducting procedures that have the potential to create splashes of microorganisms or other hazardous materials. Persons who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations or airborne particulates.

Persons having contact with NHPs must assess risk of mucous membrane exposure and wear protective equipment (e.g., masks, goggles, face shields, etc.) as appropriate for the task to be performed.

5. Gloves are worn to protect hands from exposure to hazardous materials.

A risk assessment should be performed to identify the appropriate glove for the task and alternatives to latex gloves should be available.

Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary.

Gloves must not be worn outside the animal rooms.

Gloves and personal protective equipment should be removed in a manner that prevents transfer of infectious materials.

Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated waste.

6. Persons must wash their hands after handling animals and before leaving the areas where infectious materials and/or animals are housed or are manipulated. Hand washing should occur after the removal of gloves.

***D. Laboratory Facilities (Secondary Barriers)***

1. The animal facility is separated from areas that are open to unrestricted personnel traffic within the building. External facility doors are self-closing and self-locking.

Access to the animal facility is restricted. Doors to areas where infectious materials and/or animals are housed, open inward, are self-closing, are kept closed when experimental animals are present, and should never be propped open. Doors to cubicles inside an animal room may open outward or slide horizontally or vertically.

2. The animal facility must have a sink for hand washing. Sink traps are filled with water, and/or appropriate liquid to prevent the migration of vermin and gases.

3. The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors and ceilings) are water resistant. Floors must be slip resistant, impervious to liquids, and resistant to chemicals.

It is recommended that penetrations in floors, walls and ceiling surfaces be sealed, including openings around ducts, doors and doorframes, to facilitate pest control and proper cleaning.

4. Cabinets and bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals. Spaces between benches, cabinets, and equipment should be accessible for cleaning.

Chairs used in animal area must be covered with a non-porous material that can be easily cleaned and decontaminated. Furniture must be capable of supporting anticipated loads and uses. Sharp edges and corners should be avoided.

5. External windows are not recommended; if present windows must be resistant to breakage. Where possible, windows should be sealed. If the animal facility has windows that open, they are fitted with fly screens. The presence of windows may impact facility security and therefore should be assessed by security personnel.

6. Ventilation should be provided in accordance with the *Guide for Care and Use of Laboratory Animals*. No recirculation of exhaust air may occur. It is recommended that animal rooms have inward directional airflow.

Ventilation system design should consider the heat and high moisture load produced during the cleaning of animal rooms and the cage wash process.

7. Internal facility appurtenances, such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surface areas to facilitate cleaning and minimize the accumulation of debris or fomites.

8. If floor drains are provided, the traps are filled with water, and/or appropriate disinfectant to prevent the migration of vermin and gases.

9. Cages are washed manually or preferably in a mechanical cage washer. The mechanical cage washer should have a final rinse temperature of at least 180°F. If manual cage washing is utilized, ensure that appropriate disinfectants are selected.

10. Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

11. Emergency eyewash and shower are readily available; location is determined by risk assessment.

**Animal Biosafety Level 2**

Animal Biosafety Level 2 builds upon the practices, procedures, containment equipment, and facility requirements of ABSL-1. ABSL-2 is suitable for work involving laboratory animals infected with agents associated with human disease and pose moderate hazards to personnel and the environment. It also addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure.

ABSL-2 requires that: 1) access to the animal facility is restricted; 2) personnel must have specific training in animal facility procedures, the handling of infected animals and the manipulation of pathogenic agents; 3) personnel must be supervised by individuals with adequate knowledge of potential hazards, microbiological agents, animal manipulations and husbandry procedures; and 4) BSCs or other physical containment equipment is used when procedures involve the manipulation of infectious materials, or where aerosols or splashes may be created.

Appropriate personal protective equipment must be utilized to reduce exposure to infectious agents, animals, and contaminated equipment. Implementation of employee occupational health programs should be considered.

The following standard and special practices, safety equipment, and facility requirements apply to ABSL-2:

***A. Standard Microbiological Practices***

1. The animal facility director establishes and enforces policies, procedures, and protocols for institutional policies and emergencies.

Each organization must assure that worker safety and health concerns are addressed as part of the animal protocol review.

Prior to beginning a study, animal protocols must also be reviewed and approved by the IACUC and the Institutional Biosafety Committee.

2. A safety manual specific to the animal facility is prepared or adopted in consultation with the animal facility director and appropriate safety professionals.

The safety manual must be available and accessible. Personnel are advised of potential hazards, and are required to read and follow instructions on practices and procedures.

Consideration should be given to specific biohazards unique to the animal species and protocol in use.

3. The supervisor must ensure that animal care, laboratory, and support personnel receive appropriate training regarding their duties, animal husbandry procedure, potential hazards, manipulations of infectious agents, necessary precautions to prevent hazard or exposures, and hazard/exposure evaluation procedures (physical hazards, splashes, aerosolization, etc.). Personnel must receive annual updates or additional training when procedures or policies change. Records are maintained for all hazard evaluations, employee training sessions and staff attendance.

4. An appropriate medical surveillance program is in place, as determined by risk assessment. The need for an animal allergy prevention program should be considered.

Facility supervisors should ensure that medical staff is informed of potential occupational hazards within the animal facility, to include those associated with research, animal husbandry duties, animal care and manipulations.

Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all personnel and particularly women of childbearing age should be provided information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance.

Personnel using respirators must be enrolled in an appropriately constituted respiratory protection program.

5. A sign incorporating the universal biohazard symbol must be posted at the entrance to areas where infectious materials and/ or animals are housed or are manipulated when infectious agents are present. The sign must include the animal biosafety level, general occupational health requirements, personal protective equipment requirements, the supervisor’s name (or names of other responsible personnel), telephone number, and required procedures for entering and exiting the animal areas. Identification of all infectious agents is necessary when more than one agent is being used within an animal room.

Security-sensitive agent information and occupational health requirements should be posted in accordance with the institutional policy.

Advance consideration should be given to emergency and disaster recovery plans, as a contingency for man-made or natural disasters.

6. Access to the animal room is limited. Only those persons required for program or support purposes are authorized to enter the animal facility and the areas where infectious materials and/or animals are housed or manipulated.

All persons including facility personnel, service workers, and visitors are advised of the potential hazards (physical, naturally occurring, or research pathogens, allergens, etc.) and are instructed on the appropriate safeguards.

7. Protective laboratory coats, gowns, or uniforms are recommended to prevent contamination of personal clothing.

Gloves are worn to prevent skin contact with contaminated, infectious and hazardous materials and when handling animals.

Gloves and personal protective equipment should be removed in a manner that prevents transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or are manipulated.

Persons must wash their hands after removing gloves, and before leaving the areas where infectious materials and/or animals are housed or are manipulated.

Eye, face and respiratory protection should be used in rooms containing infected animals, as dictated by the risk assessment.

8. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside of the laboratory in cabinets or refrigerators designated and used for this purpose.

9. All procedures are carefully performed to minimize the creation of aerosols or splatters of infectious materials and waste.

10. Mouth pipetting is prohibited. Mechanical pipetting devices must be used.

11. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented. When applicable, laboratory supervisors should adopt improved engineering and work practice controls that reduce the risk of sharps injuries. Precautions must always be taken with sharp items. These include:

a. The use of needles and syringes or other sharp instruments in the animal facility is limited to situations where there is no alternative such as parenteral injection, blood collection, or aspiration of fluids from laboratory animals and diaphragm bottles.

b. Disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used, disposable needles must be carefully placed in puncture-resistant containers used for sharps disposal. Sharps containers should be located as close to the work site as possible.

c. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving.

d. Broken glassware must not be handled directly; it should be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.

e. Use of equipment with sharp edges and corners should be avoided.

12. Equipment and work surfaces are routinely decontaminated with an appropriate disinfectant after work with an infectious agent, and after any spills, splashes, or other overt contamination.

13. Animals and plants not associated with the work being performed must not be permitted in the areas where infectious materials and/ or animals are housed or manipulated.

14. An effective integrated pest management program is required.

15. All wastes from the animal room (including animal tissues, carcasses, and bedding) are transported from the animal room in leak-proof containers for appropriate disposal in compliance with applicable institutional, local and state requirements.

Decontaminate all potentially infectious materials before disposal using an effective method.

***B. Special Practices***

1. Animal care staff, laboratory and routine support personnel must be provided a medical surveillance program as dictated by the risk assessment and administered appropriate immunizations for agents handled or potentially present, before entry into animal rooms.

When appropriate, a base line serum sample should be stored**.**

2. Procedures involving a high potential for generating aerosols should be conducted within a biosafety cabinet or other physical containment device. When a procedure cannot be performed within a biosafety cabinet, a combination of personal protective equipment and other containment devices must be used.

Restraint devices and practices that reduce the risk of exposure during animal manipulations (e.g., physical restraint devices, chemical restraint medications) should be used whenever possible.

3. Decontamination by an appropriate method (e.g. autoclave, chemical disinfection, or other approved decontamination methods) is necessary for all potentially infectious materials and animal waste before movement outside the areas where infectious materials and/or animals are housed or are manipulated. This includes potentially infectious animal tissues, carcasses, contaminated bedding, unused feed, sharps, and other refuse.

A method for decontaminating routine husbandry equipment, sensitive electronic and medical equipment should be identified and implemented.

Materials to be decontaminated outside of the immediate areas where infectious materials and/or animals are housed or are manipulated must be placed in a durable, leak proof, covered container and secured for transport. The outer surface of the container is disinfected prior to moving materials. The transport container must have a universal biohazard label.

Develop and implement an appropriate waste disposal program in compliance with applicable institutional, local and state requirements. Autoclaving of content prior to incineration is recommended.

4. Equipment, cages, and racks should be handled in a manner that minimizes contamination of other areas.

 Equipment must be decontaminated before repair, maintenance, or removal from the areas where infectious materials and/or animals are housed or are manipulated.

5. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.

6. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the safety manual. All such incidents must be reported to the animal facility supervisor or personnel designated by the institution. Medical evaluation, surveillance, and treatment should be provided as appropriate and records maintained.

***C. Safety Equipment (Primary Barriers and Personal Protective Equipment)***

1. Properly maintained BSCs, personal protective equipment (e.g., gloves, lab coats, face shields, respirators, etc.) and/or other physical containment devices or equipment, are used whenever conducting procedures with a potential for creating aerosols, splashes, or other potential exposures to hazardous materials. These include necropsy of infected animals, harvesting of tissues or fluids from infected animals or eggs, and intranasal inoculation of animals.

When indicated by risk assessment, animals are housed in primary biosafety containment equipment appropriate for the animal species, such as solid wall and bottom cages covered with filter bonnets for rodents or other equivalent primary containment systems for larger animal cages.

2. A risk assessment should determine the appropriate type of personal protective equipment to be utilized.

Scrub suits and uniforms are removed before leaving the animal facility. Reusable clothing is appropriately contained and decontaminated before being laundered. Laboratory and protective clothing should never be taken home.

Gowns, uniforms, laboratory coats and personal protective equipment are worn while in the areas where infectious materials and/or animals are housed or manipulated and removed prior to exiting. Disposable personal protective equipment and other contaminated waste are appropriately contained and decontaminated prior to disposal.

3. Eye and face protection (mask, goggles, face shield or other splatter guard) are used for manipulations or activities that may result in splashes or sprays from infectious or other hazardous materials and when the animal or microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. Persons who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations or airborne particulates.

Persons having contact with NHPs should assess risk of mucous membrane exposure and wear protective equipment (e.g., masks, goggles, face shields) appropriate for the task to be performed. Respiratory protection is worn based upon risk assessment.

4. Gloves are worn to protect hands from exposure to hazardous materials. A risk assessment should be performed to identify the appropriate glove for the task and alternatives to latex gloves should be available.

Gloves are changed when contaminated, glove integrity is compromised, or when otherwise necessary.

Gloves must not be worn outside the animal rooms.

Gloves and personal protective equipment should be removed in a manner that prevents transfer of infectious materials.

Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated waste.

Persons must wash their hands after handling animals and before leaving the areas where infectious materials and/or animals are housed or are manipulated. Hand washing should occur after the removal of gloves.

***D. Laboratory Facilities (Secondary Barriers)***

1. The animal facility is separated from areas that are open to unrestricted personnel traffic within the building. External facility doors are self-closing and self-locking.

Doors to areas where infectious materials and/or animals are housed, open inward, are self-closing, are kept closed when experimental animals are present, and should never be propped open. Doors to cubicles inside an animal room may open outward or slide horizontally or vertically.

2. A hand-washing sink is located at the exit of the areas where infectious materials and/or animals are housed or are manipulated. Additional sinks for hand washing should be located in other appropriate locations within the facility.

If the animal facility has segregated areas where infectious materials and/or animals are housed or manipulated, a sink must also be available for hand washing at the exit from each segregated area.

Sink traps are filled with water, and/or appropriate disinfectant to prevent the migration of vermin and gases.

3. The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors and ceilings) are water resistant.

Penetrations in floors, walls and ceiling surfaces are sealed, including openings around ducts, doors and doorframes, to facilitate pest control and proper cleaning.

Floors must be slip-resistant, impervious to liquids, and resistant to chemicals.

4. Cabinets and bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals. Spaces between benches, cabinets, and equipment should be accessible for cleaning.

Furniture should be minimized. Chairs used in animal area must be covered with a non-porous material that can be easily cleaned and decontaminated. Furniture must be capable of supporting anticipated loads and uses. Sharp edges and corners should be avoided.

5. External windows are not recommended; if present, windows must be sealed and resistant to breakage. The presence of windows may impact facility security and therefore should be assessed by security personnel.

6. Ventilation should be provided in accordance with the *Guide for Care and Use of Laboratory Animals*.1 The direction of airflow into the animal facility is inward; animal rooms maintain inward directional airflow compared to adjoining hallways. A ducted exhaust air ventilation system is provided. Exhaust air is discharged to the outside without being recirculated to other rooms.

Ventilation system design should consider the heat and high moisture load produced during the cleaning of animal rooms and the cage wash process.

7. Internal facility appurtenances, such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surface areas, to facilitate cleaning and minimize the accumulation of debris or fomites.

8. Floor drains must be maintained and filled with water, and/or appropriate disinfectant to prevent the migration of vermin and gases.

9. Cages should be autoclaved or otherwise decontaminated prior to washing. Mechanical cage washer should have a final rinse temperature of at least 180°F. The cage wash area should be designed to accommodate the use of high-pressure spray systems, humidity, strong chemical disinfectants and 180°F water temperatures during the cage/equipment cleaning process.

10. Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

11. If BSCs are present, they must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSCs should be located away from doors, heavily traveled laboratory areas, and other possible airflow disruptions. HEPA filtered exhaust air from a Class II BSC can be safely re-circulated back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer’s recommendations. BSCs can also be connected to the laboratory exhaust system by either a thimble (canopy) connection or directly to the outside through an independent, hard connection. Provisions to assure proper safety cabinet performance and air system operation must be verified. BSCs should be recertified at least once a year to ensure correct performance.

All BSCs should be used according to manufacturer’s specifications to protect the worker and avoid creating a hazardous environment from volatile chemicals and gases.

12. If vacuum service (i.e., central or local) is provided, each service connection should be fitted with liquid disinfectant traps and an in-line HEPA filter placed as near as practicable to each use point or service cock. Filters are installed to permit in-place decontamination and replacement.

13. An autoclave should be present in the animal facility to facilitate decontamination of infectious materials and waste.

14. Emergency eyewash and shower are readily available; location is determined by risk assessment.

**IX. Written Hazard Communication Program**

**1. Purpose**

This program prescribes policies, procedures and standards to ensure the dangers associated with hazardous chemicals used for other then laboratory settings, are explained and understood by all affected RRC employees.

**2. Responsibilities**

a. The Location Safety Officer will:

(1) Manage and coordinate the locations Hazard Communication Program.

(2) Assist all affected supervisors with information to implement this program.

(3) Conduct Hazard Communication Training on an as annual basis or as needed.

(4) Monitor compliance with this program during work-place inspections.

(5) Provide assistance to supervisors in obtaining material safety data sheets (MSDS) and maintain a copy of MSDS used at RRC.

(6) Coordinate appropriate medical surveillance of personnel exposed to hazardous chemicals.

b. Supervisors will:

(1) Ensure implementation and enforcement of this program.

(2) Maintain a hazardous chemical inventory list for their work area, update annually or as necessary do to change. Supervisors will ensure that an updated copy is provided to the location safety office by March 15th of each year (See Appendix E for format).

(3) Maintain MSDS’s for all laboratory hazardous materials within the lab area.

(4) Inform personnel of the location of the MSDS’s for the work area, inventory list, this regulation, and other related written documents.

(5) Ensure employees perform in-house labeling of hazardous chemicals when required.

(6) Respond to complaints from employees regarding the HazardCommunication Program.

(7) Survey work areas daily to assure compliance with this regulation and to ensure that all biosafety procedures are being followed.

(8) Ensure personnel complete training as required by this program. Chemical Hygiene Plan training can satisfy requirements for this training provided the same information is presented.

c. Personnel working with hazardous materials/chemicals not covered by the location’s Chemical Hygiene Plan or Biosafety plan will.

(1) Attend required Hazard Communication Training.

(2) Follow directives set by this regulation and applicable SOP’s

(3) Ensure all containers filled with hazardous chemicals that are not for immediate use are labeled IAW this program.

(4) Not eat, smoke, chew gum or tobacco products, drink or apply cosmetics while handling hazardous materials/chemicals.

(5) Wash hands prior to eating, drinking, smoking, chewing gum or tobacco products or applying cosmetics after being exposed to hazardous materials/chemicals.

(6) Report any discrepancies, exposures, or abnormal conditions associated with hazardous materials/chemicals in your work area to your supervisor.

(7) Report for any job related medical surveillance examinations.

d. Operations and Maintenance Officer will ensure.

(1) Contractors are made aware of this and the lab safety programs and comply with applicable requirements.

(2) Contractors are made aware of hazardous chemicals they may be exposed to at the RRC location and are provided access to appropriate MSDS’s

(3) Contractors who may be exposed to hazardous chemicals have and implement a Written Hazard Communication Program which meets or exceeds requirements of 29CFR1910.1200.

(4) Non Contractor personnel who may be potentially exposed to hazardous chemicals as a result of contractor operations are fully informed of the hazards, protective measures and provided access to MSDS’s of these hazardous chemicals.

**3. General**

a. The Location Safety Officer will serve as the overall Hazard Communication Program Coordinator. He will ensure the program is reviewed and updated as necessary in coordination with the RRC safety committee.

b. Under this program all employees not covered by the laboratory biosafety program will be informed of: The contents of OSHA’s hazard communication standard, the hazardous properties of chemicals with which they work with, safe handling procedures, and measures to take to protect themselves from these chemicals. In addition, all personnel will be informed of the hazards associated with non-routine tasks.

c. Non-hazardous or non-toxic chemical substitutes shall be used to the maximum extent possible.

d. **Use of hazardous materials shall be limited to the maximum extent possible.**

e. Hazardous material storage in work areas shall be **limited to those chemicals necessary to complete job requirements.** Central storage locations should be used when they are available. Hazardous materials shall be stored according to their compatibility categories.

f. Containers of hazardous materials shall be visually inspected at least semi-annually, by the user of the material, to determine their condition. Corroded or leaking containers shall be over packed and turned-in along with outdated and excess chemicals to the location safety office.

**4. Hazardous Chemical Inventory**

a. Supervisors will maintain an inventory of all hazardous chemicals used in each laboratory/location and update the inventory any time a new chemical is introduced or no longer in the work area. This list must include any cleaning or lubricating chemicals maintained within the space. A copy of this list will be maintained in an area designated by the supervisor that is accessible during all work hours. The chemical name listed on the MSDS must match the name listed on the chemical inventory and product label.

b. The chemical inventory must contain the products trade name, chemical name, manufacturer’s name, address and telephone number and stock number if available.

c. Copies of current inventories will be provided to the location safety office.

**5. Material Safety Data Sheets (MSDS’s)**

a. Supervisors will maintain MSDS’s for all hazardous materials used or stored. The MSDS’s must be a fully completed OSHA Form 174 or equivalent. MSDS’s will be readily available in binders/folders or by computer terminals so that all personnel working in the lab/location have knowledge of and access to them during their work shift. MSDS’s will be maintained in a manner easily identifiable using the hazardous material inventory.

b. Supervisors are responsible for acquiring and updating MSDS’s. MSDS’s are required to be obtained prior to purchase of a hazardous material. This includes but is not limited to such items as compressed gases, welding rods, fuels solvents, cleaners, paints, toners, etc.

c. MSDSs can be obtained from the manufacturer or chemical supplier. If unable to obtain a MSDS contact the location safety office.

**6. Labels and Other Forms of Warning**

a. Supervisors will ensure that all hazardous chemicals are properly labeled and are written in English. A manufacture’s label in most cases is adequate. All chemical containers must be labeled, tagged or marked with the following information.

 (1) Identity of the hazardous chemical(s) contained therein and,

(2) Appropriate hazard warnings, or alternatively, words. Pictures, symbols or combination there of, which provide at least general information regarding the hazards of the chemicals. Supervisors will refer to the corresponding MSDS to determine and verify label information.

b. No warning information, whether provided by the manufacture or locally produced, will be removed or defaced from a container of hazardous chemicals.

c. All containers will be properly labeled until thoroughly decontaminated or until disposed of properly.

d. Exceptions:

(1) If stationary containers are within a work area, signs, placards or other written forms of warning can be posted in a work area which conveys the same hazard information required for labels.

(2) If personnel transfer chemicals from a labeled container to a portable container that is intended only for that individuals use during his shift, then no label is required on the portable container.

(3) Pipes containing hazardous chemicals are not required to be labeled but their contents must be described during hazardous communication training.

(4) Labeling requirement do not apply to the following substances which are regulated by labeling requirements of other federal agencies: pesticides, food, drugs, cosmetics, alcoholic beverages, hazardous waste.

**7. Training**

a. A Hazardous Communication course will be coordinated by the location safety officer and section supervisor on an as needed basis and to new employees. This training can also be incorporated in CHP training provided all training requirements of this program are covered.

b. Supervisors must ensure all personnel are provided with specific information and training on all hazardous chemicals in their work areas at the time of their initial job assignment and whenever a new hazard or chemical is introduced into their work area.

c. Training must cover review of this written program and information on the hazardous chemicals personnel may be exposed to in their workplace with regards to:

(1) Chemical and physical properties of hazardous materials and methods that can be used to detect their presence or release.

(2) Physical hazards of chemicals (e.g., potential for fire, explosion, etc)

(3) Health hazards, including signs and symptoms of exposure, associated with exposure to chemicals in the workplace and any medical condition known to be aggravated by the exposure to these chemicals.

(4) Procedures to protect against hazards (e.g., BSCs, personal protective equipment required, proper use, and maintenance; work practices or methods to assure proper use and handling of chemicals; and procedures for emergency response)

(5) Work procedures to follow to assure protection when cleaning hazardous chemical spills and leaks.

(6) Where MSDS’s are located, and how employees may obtain additional hazardous information.

d. The safety office will maintain documentation of training for the duration of civilian employment and retain the records for 30 years thereafter.

**8. Non-Routine Tasks**

Supervisors must conduct special training sessions to inform personnel of hazardous chemicals they may be exposed to and the proper precautions to take to reduce or avoid exposure. Non-routine task include confined space work.

**9. Contractor Employees**

a. The COR will advise outside contractors in person of any chemical hazards that may be encountered in the normal course of their work at RRC, the local labeling system, protective measures and safe handling procedures listed on the product’s MSDS’s for which they may be exposed to. The contractor will be informed of the location and availability of these MSDS’s.

b. Each contractor bringing chemicals on the RRC location, must make available on-site a chemical inventory, MSDS’s and a written hazardous communication program in compliance with current OSHA regulations. In addition, he must provide appropriate hazard information on these chemicals to include hazard communication labels used and the precautionary measures to be taken in working with these chemicals.

**10. Information**

All employees, or their designated representatives, can obtain further information on this written program, the hazard communication standard, applicable MSDS, and chemical information list at the safety office.

**X. Lockout Tagout**

**1. Purpose**

This section prescribes, policies, procedures and standards to ensure isolation of equipment from all potential hazardous energy before personnel conduct any service or maintenance function where the unexpected energization, start-up or release of stored energy, could cause injury.

**2. Responsibilities.**

a. The Safety Officer will:

(1) Assist all sections in developing and implementing energy control procedures as resource’s permit.

(2) Approve or conduct lockout/tagout training.

(3) Maintain documentation of periodic inspections of energy control procedures.

b. Contracting Officer Representatives (COR) will ensure:

(1) Contractors who service and/or conduct maintenance on equipment where the unexpected energization, start-up or release of stored energy, could cause injury, are aware of this regulation.

(2) Applicable contractors have a lockout/tagout program in compliance with 29 CFR 1910.147 and 29 CFR 1910.333

c. The Operations & Maintenance Director and section leaders will:

(1) Develop and implement applicable energy control procedures prior to maintenance and /or servicing of machinery and equipment requiring lockout/tagout by this regulation.

(2) Review and approve specific energy control procedures with applicable personnel.

(3) Identify and maintain documentation of personnel authorized to implement energy control procedures.

(4) Conduct and document periodic inspections as specified by this regulation.

(5) Ensure only trained personnel conduct lockout/tagout.

(6) Ensure personnel understand and comply with this regulation and applicable energy control procedures.

(7) Investigate and properly report accidents involving lockout/tagout operations to the Safety Office.

(8) Provide protective materials and hardware to applicable personnel for isolating, securing or blocking of machines or equipment from energy sources.

(9) Maintain documentation of applicable energy control procedures.

d. Employees will:

(1) Comply with this regulation and applicable energy control procedures.

(2) Notify supervisor of any problems concerning this regulation or specific energy control procedures, which could affect personnel safety.

**3. General Information.**

a. The Occupational Safety and Health Administration has promulgated two standards that require lockout/tagout of machinery and equipment. They are:

(1) Control of Hazardous Energy (Lockout/Tagout) - 29CFR 1910.147.

(2) Lockout/Tagout Electrical Safe Work Practice Standard 29 CFR 1910.333

b. The following simple lockout procedure is provided to assist the operations and maintenance department in developing their procedures so they meet the requirements of this standard. When the energy isolating devices are not lockable, tagout may be used, provided the employer complies with the provisions of the standard which require additional training and more rigorous periodic inspections. When tagout is used and the energy isolating devices are lockable, the employer must provide full employee protection (see paragraph(c)(3)) and additional training and more rigorous periodic inspections are required. For more complex systems, more comprehensive procedures may need to be developed, documented, and utilized.

 c. Minimum Lockout Procedure for RRC:

 Purpose: This procedure establishes the minimum requirements for the lockout or energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

 Compliance with this Program: All RRC employees and contracted employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees and contracted employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance, shall not attempt to start, energize, or use that machine or equipment.

 **Sequence of Lockout:**

1. Notify all affected employees that servicing of maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the serving or maintenance. List *individual names*, *job titles of affected employees* and *how notification occurred*.
2. The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy. Identify *type(s)* and *magnitude(s) of energy*, *its hazards* and *the methods to control the energy*.
3. If the machine or equipment is operating, shut it down by normal stopping procedures (depress the stop button, open switch, close valve, etc.). Identify *type(s)* and *location(s) of machine or equipment operating controls*.
4. De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s). Identify *type(s)* and *location(s)* *of energy isolating device(s) with assigned individual lock(s)*.
5. Lock out the energy isolating device(s) with assigned individual lock(s).
6. Store or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc. Identify *method of verifying the isolation of the equipment.*
7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

CAUTION: Return operating control(s) to neutral or “off” position after verifying the isolation of the equipment. Identify the method of verifying the isolation of the equipment.

1. The machine or equipment is now locked out.

d. An energy source is any source of electrical, mechanical, pneumatic, chemical, thermal, stored (i.e. spring compression) or other similar source.

e. Restoring Equipment to Service:

1. Check the machine or equipment and the immediate area around the machine or equipment to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine or equipment. Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.
5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

f. This regulation does not apply to the following conditions:

(1) Work on cord and plug connected electrical equipment for which exposure to the hazards of unexpected energization or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(2) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines. Provided that it can be demonstrated that: (a) continuity of service is essential; (b) shutdown of the system is impractical; and (c) documented procedures are followed, and special equipment is used that will provide proven effective protection for employees.

(3) Energized electrical parts where it is demonstrated that de-energizing introduces additional or increased hazards (i.e. interruption of emergency alarms) or is infeasible due to equipment design or operational limitations (i.e. testing that has to be performed on energized circuits). This is provided that other safety related work practices are used to protect employees from hazards and are suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts. In addition, requirements of 29 CFR 1910.333 must be met for work performed on exposed energized live parts or in the vicinity of any hazard they may present.

**4. Procedure involving more than one person.**

In the preceding steps, if more than one employee is involved with the maintenance or servicing of equipment or machinery at the same time, each employee will place his own assigned lockout & tagout device on each energy-isolating device. When an energy isolating device cannot accept multiple locks & tags, a multiple lockout/tagout device (hasp) will be used. If a multiple lockout device is not practical, a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box which allows the use of multiple locks to secure it. Each employee will then use his own assigned lock & tag to secure the box. As each person no longer needs to maintain his lockout protection, that person will remove his lock & tag from the multiple lockout device. The senior individual involved in conducting the lockout/tagout will have overall responsibility for the lockout/tagout operation and coordination of efforts.

**5. Removal of lockout/tagout devices by other than the employee who applied it.**

Lockout/tagout devices will be removed from each energy-isolating device by the employee, who applied it, EXCEPT:

Lockout/tagout devices may be removed by the employee’s immediate supervisor if the authorized employee who applied it is not available and:

a. It is verified that the authorized employee who applied the device is not at the location;

b. All reasonable efforts were made to contact the authorized employee to inform him that his lockout/tagout device has been removed and;

c. The authorized employee has this knowledge before he resumes work.

**6. Informing outside contractors.**

The Contracting Officer Representatives (COR)for the contractor will inform him of the elements of this program and obtain information regarding their lockout/tagout program. This information will be conveyed to affected government employees in an understandable manner. The COR will ensure the coordination of work procedures between the contractor and government employees.

**7. Personnel changes.**

In the case of personnel changes, a change over period will be established so that the authorized employees may exchange their locks/tags. Authorized personnel and their supervisor assuming control of lockout or equipment will be fully briefed in the scope and stage of the work by those who are being relieved.

**8. Periodic inspections.**

Periodically (at least annually) the effectiveness of a department’s lockout/tagout program will be evaluated by the Safety Officer. Any deviations or inadequacies will be documented and corrected. Documentation of annual evaluations will be performed by the Safety Officer by 01 February of each year. The date of the inspection/evaluation must be documented on the annual inspection report, see Appendix J. The original will be maintained by the Safety Officer until superseded by the next annual inspection.

**9. Training.**

a. Any employee who could be exposed to hazardous energy sources will be instructed by his supervisor in the safety significance of lockout/tagout procedures. Employees required to implement energy control procedures will satisfactorily complete RRC’s lockout/tagout training program. This is in addition to specific training provided by the supervisor that is commensurate with employee responsibilities.

b. Lockout/tagout training will be completed by personnel prior to being assigned work to service machinery or equipment.

c. An outline of RRC’s lockout/tagout training program will be maintained by the Safety Office.

d. Supervisors will ensure employees are retrained whenever there is a change in job assignment, a change in machines, or equipment in a process that presents a new hazard or a change to lockout tagout procedures. Retraining will also be given whenever the annual inspection identifies a deficiency in the employee’s procedures. Retraining will reestablish employee proficiency and introduce new or revised control methods and procedures as necessary.

**10. Electrical test verification of de-energized circuits.**

Supervisory personnel will test and verify that the circuit elements and electrical parts of equipment that employees will be exposed too are de-energized for all lockout/tagout procedures. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage back feed even though specific parts of the circuit have been de-energized and presumed to be safe. If the circuit to be tested is more than 600 volts, nominal, the test equipment will be checked for proper operation immediately before and after the test.

**11. Accidents involving lockout/tagout.**

The Safety Officer will fully investigate all lockout/tagout accidents. If the accident involved the control of hazardous energy with a single lockout source, a specific procedure will be written for its control before work is continued. If the accident involved a specific procedure for a piece of equipment, the lockout, tagout specific procedure will be evaluated and modified (if needed) prior to authorizing work to continue.

**12. Lock and tag specifications for use in lockout/tagout operations.**

a. Lockout Devices:

(1) Lockout devices used for lockout/tagout will be red in color.

(2) Lockout devices will be substantial to prevent removal without excessive force, such as with the use of bolt cutters.

(3) Each lockout device installed by an employee will have a tagout device, as specified below, attached to it to identify the individual applying the lockout device.

(4) Lockout devices must be capable of withstanding the environment which they will be exposed to.

(5) Only one key will be issued an employee per lockout device. Any additional keys must be destroyed.

b. Tagout Devices:

(1) Tagout devices must be attached directly to lockout devices when possible, If this is not possible it must be secured by a nylon self locking tie which will required cutting to remove.

(2) Tagout devices must be constructed and printed to withstand the environment which they will be exposed to so as not to become illegible.

(3) All tagout devices must read on one side “Danger do not operate, may only be removed by \_\_\_\_\_\_\_\_\_\_” (tag will have space for employee to print name section and date). The opposite side must read “DANGER - this energy source is locked out, unauthorized removal of this lock/tag may result in immediate discharge.” DANGER marking must be white letters on red oval with a black square.

(4) Tagout devices must be filled out in include the full name of the individual applying the tagout device, his unit and the date it is applied.

**13. Exceptions to documented energy control procedures.**

Specific energy control procedures are not required to be documented for a particular machine or equipment, when all of the following elements exist:

a. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees;

b. The machine or equipment has a single energy source which can be readily identified and isolated;

c. The isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment;

d. The machine or equipment is isolated from that energy source and locked out during servicing or maintenance;

e. A single lockout device will achieve a locked out condition.

f. The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance;

g. The servicing or maintenance does not create hazards for other personnel; and

 h. In utilizing this exception, there has been on accidents involving the unexpected activation or re energization of the machine or equipment during servicing.

**XI. HEARING CONSERVATION PROGRAM**

**1. Purpose**

To institute an occupational hearing conservation program to prevent any temporary or permanent noise induced hearing loss to employees, and to comply with Federal OSHA Standard 29 CFR 1910.95.

**2. Monitoring**

a. The Location Safety Office or contracted consultant will monitor and identify workplace noise levels using a calibrated sound level meter on an annual basis, or whenever there is a change in production processes, equipment, or controls. Monitoring is performed to determine which employees in which sections are exposed to excessive noise and fall under the hearing conservation program. Whenever employee noise exposures equals or exceeds an eight-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent, the affected employee will be subject to the hearing conservation program.

b. Supervisors will notify the LSO of upcoming equipment purchases or modifications which may affect sound levels. When the equipment purchase or modification is nearing its final decision phase, the Safety Office is to be notified.

c. Controlling noise at the source utilizing engineering controls must be considered first before any other tactics are implemented.

d. Warning signs will be posted in conspicuous locations near the high noise level areas to ensure that personnel know where hearing protection is required when machinery is in operation.

**3. Audiometric Testing Program**

a. Audiometric testing will be provided at no cost to every RRC employee in the hearing conservation program. This testing will be done at the pre-placement physical if possible, on a regular annual basis, and upon termination.

b. Audiometric testing will be performed by a licensed/certified audiologist, technician, or any other qualified individual.

c. The Safety Office will inform employees prior to their scheduled testing. Employees must have 14 hours of non-exposure to workplace noise, prior to the actual testing. Protective hearing equipment may be substituted for the necessary waiting period.

d. If an employee’s audiogram suggests that a standard threshold shift has occurred, the employee will be notified. The occurrence will be recorded on the OSHA 300 log if the standard threshold shift is due to a workplace exposure.

e. Audiometric testing will be conducted on an annual basis.

f. A list of employees participating in the hearing conservation program, which includes the mandatory audiometric testing, will be maintained by the Safety Office.

**4. Hearing Protection**

a. The employee’s immediate supervisor will order and provide adequate hearing protection for employees. All employees subject to work in those areas must be provided with appropriate hearing protection devices from among the following types listed in the table below.

b. Employees are required to wear hearing protection that is provided, and at no time must an employee tamper with, or modify any hearing protection equipment. Damaged or defective equipment must be discarded and replaced.

c. Supervisors are required to enforce the hearing conservation policy in their area of responsibility.

d. The standard required that a variety of hearing protection devices be available to persons who are required to wear them. The types of protective devices available include:

|  |  |  |
| --- | --- | --- |
| **Type of Hearing Protection** | **Advantages** | **Disadvantages** |
| Ear Muffs | One size fits most adults.Can easily be seen at a distance.Can be put on, adjusted, etc. while wearing gloves.Can be warming to the ears in cold weather | Usually have a lower noise reduction rating than ear plugs, but still provide effective protection.They are bulky and cannot fit in pockets or stored in tool kits.May interfere with and not sit properly when glasses, hearing aids, etc. Because of their size, may not be suitable for the work quarters.Excessive heat and sweat accumulation may make uncomfortable to wear in hot locations.Are more difficult to clean than ear plugs. |
| Ear plugs(pre-formed and expandable) | Have highest noise reduction rating and are very effective in protecting your hearing when worn properly.Do not interfere with work in close quarters.Are easily carried and stored when not in use.Compatible with glasses or any other type of head gear without affecting performance.Can be easily cleaned. | Fitting can be complicated. Ear canals vary in diameter and the left and right ear canals are not necessarily similar in size, shape, or position.Can be easily left in other work clothes or fall out of pocket and become lost.Cannot be seen at a distance which makes it difficult to evaluate if person is wearing them.Gloves must be removed and hands washed prior to putting in ear plugs. |

**5. Training and Information**

a. The Location Safety Office will ensure that each employee in the hearing conservation program receives training during the first week of employment.

b. Retraining will be conducted on an annual basis. Information provided in the retraining program will be consistent with changes in work processes and /or protective equipment.

**6. Record keeping**

a. The Safety Officer will maintain accurate records for all noise level surveys and employee exposure.

b. Employee’s baseline/annual audiograms and any other records will be retained at the agencies testing facility for the duration of employment plus 30 years after termination.

c. Records will be provided to employees, former employees , or designated representative thereof, upon written request to the Safety Office.

**XII. Respiratory Protection Plan**

**1. Purpose.**

The purpose of this plan is to serve as guidance for the RRC in our evaluation of the need for respiratory protection at our location.

**2. Scope and Application.**

At present, biological safety cabinets (BSC) are located within laboratories. These BSC are designed to reduce exposures to laboratory personnel to within occupational exposure limits when functioning properly and when used correctly. For any work outside of the BSCs that may involve the creation of aerosols N95 particulate filter respirators are encouraged, but not required. Use of the N95 particulate filter respirator shall be considered “Best practice” for bench work involving pathogens; however, such voluntary use requires that each individual receive the OSHA mandated information described in 1910.134 App D.

Engineering controls such as ventilation and substitution of less toxic materials are the first line of defense. These controls along with administrative controls such as proper technique should offer adequate protection to our personnel. In the event that engineering and administrative controls are found to be inadequate, work in the given location/lab will immediately halt while new controls measures are put into place. New control measures will focus on new engineering and administrative controls; however, if adequate protection cannot be achieved through these measures a respiratory program will be instituted.

**3. Responsibilities**.

a. The Safety Officer is responsible for overseeing the respiratory protection plan and for conducting the required evaluations/inspections at RRC. The Location Safety Officer will annually or as needed, evaluate/inspect RRC facility locations with regard to proper use of BSCs and proper technique thereby ensuring that exposures remain under the PEL/TLV limits.

Duties include:

(1) Identifying work areas, processes or tasks that may require workers to wear respirators, and evaluating those potential exposures.

 (2) Evaluating the program.

(3) Updating the written plan as necessary to reflect workplace changes that affect respirator use.

(4) Provide new employee laboratory safety orientation and annually training opportunities to all personnel.

b. Supervisors are responsible for ensuring the respiratory protection plan is implemented in their particular areas. In addition to being knowledgeable about the plan requirements for their own protection, supervisors must also ensure that the plan is understood and followed by the employees under their charge.

Supervisor duties include:

(1) Ensuring that employees under their supervision (including new hires and students) have received appropriate training in the proper use of BSCs and proper lab techniques that incorporate safety into all aspects of their duties.

 (2) Ensuring the availability of dust masks and N95 particulate respirators for voluntary use.

 (3) Being aware of tasks that may require the use of respiratory protection.

 (4) Enforcing the proper use of BSCs and affective lab techniques.

(5) Continually monitoring work areas and operations to identify changes in respiratory hazards.

(6) Coordinating with the Safety Office on how to address respiratory hazards or other concerns regarding the program.

c. Each employee has the responsibility to evaluate the risks involved in their work and determine if they should voluntarily wear an N95 particulate filtering respirator during their work.

Employees must also:

(1) Properly use the BSCs and thereby limit their potential exposures to respiratory hazards.

(2) Use proper lab techniques that incorporate safety into all aspects of their duties.

(3) Inform their supervisor or the Safety Office of any respiratory hazards that they feel are not adequately addressed in the workplace and of any other concerns that they have regarding the plan.

(4) Notify their supervisor or the Safety Office of any other problems associated with using their BSC or voluntary N95 particulate filter.

d. Hazard Evaluation Update. The Safety Officer is responsible to revise and update the hazard evaluation as needed. If an employee feels that respiratory protection is needed during a particular activity, she/he will notify the Safety Officer of the potential hazard. The Safety Officer will assess the hazard and then communicate the results of that assessment back to the affected employees. If it is determined that respiratory protection is necessary, work will halt in the given location until proper controls can be put into place.

e. NIOSH Certification. All N95 particulate filters must be certified by the National Institute for Occupational Safety and Health (NIOSH) and shall be used in accordance with the terms of that certification. All filters must be labeled with the appropriate NIOSH approval label. The label must not be removed or defaced while it is in use.

**XIII. BLOODBORNE PATHOGEN EXPOSURE CONTROL PLAN**

* 1. **POLICY**

The Richard B. Russell Research Center (RRC)is committed to providing a safe and healthful work environment for our entire staff. In pursuit of this endeavor, the following exposure control plan (ECP) is provided to eliminate or minimize occupational exposure to bloodborne pathogens in accordance with OSHA standard 29 CFR 1910.1030, "Occupational Exposure to Bloodborne Pathogens."

The ECP is a key document to assist RRC in implementing and ensuring compliance with the

standard, thereby protecting our employees. This ECP includes:

\* Determination of employee exposure

\* Implementation of various methods of exposure control, including:

Universal precautions

Engineering and work practice controls

Personal protective equipment

Housekeeping

\* Hepatitis B vaccination

\* Post-exposure evaluation and follow-up

\* Communication of hazards to employees and training

\* Recordkeeping

\* Procedures for evaluating circumstances surrounding an exposure incident

The methods of implementation of these elements of the standard are discussed in the subsequent

pages of this ECP.

**2. PROGRAM ADMINISTRATION**

\* The RRC Location Coordinator is responsible for the implementation of the ECP. The Safety and Occupational Health Specialist will maintain, review, and update the ECP at least annually, and whenever necessary to include new or modified tasks and procedures.

Contact location/phone number: 706-546-3137.

\* **Those employees who are determined to have occupational exposure to blood or other**

**potentially infectious materials (OPIM) must comply with the procedures and work**

**practices outlined in this ECP.**

\* Each Unit/Agency conducting bloodborne pathogen related work will maintain and provide all necessary personal protective equipment (PPE), engineering controls (e.g., sharps containers), labels, and red bags as required by the standard. The supervising scientist(s) involved with such research work will ensure that adequate supplies of the aforementioned equipment are available in the appropriate sizes.

Supervising Scientist(s) currently conducting research that falls under this plan:

Ronald T. Riley, TMRU Room 364, Contact Number: 706-546-3377

\* The above listed scientist(s) will be responsible for ensuring that all medical actions required are performed and that appropriate employee health and OSHA records are maintained.

\* The above listed scientist(s) will be responsible for training, documentation of training, and making the written ECP available to employees, OSHA, and NIOSH representatives.

**3.** **EMPLOYEE EXPOSURE DETERMINATION**

The following is a list of all employees at our facility which are likely to have occupational exposure:

NAME, JOB TITLE DEPARTMENT & LOCATION OF WORK WITH RRC

Ronald T. Riley, Principal Investigator, Rm. 342 & 364

 Jency L. Showker, Technician Biochemistry, Rm. 342 & 364

 Trevor Mitchell, Physical Science Technician, Rm. 342 & 364

The following is a list of job classifications in which **some** employees at our establishment have occupational exposure. Included is a list of tasks and procedures, or groups of closely related tasks and procedures, in which occupational exposure may occur for these individuals:

JOB TITLE DEPARTMENT/LOCATION TASK/PROCEDURE

*(Example: Housekeeper Environmental Services Handling Regulated Waste)*

*Part-time, temporary, contract and per diem employees are covered by the standard. How the*

*provisions of the standard will be met for these employees should be described in the ECP*.

No other employees at this time have been found to have potential occupational exposure.

* 1. **METHODS OF IMPLEMENTATION AND CONTROL**

Universal Precautions

All employees will utilize universal precautions.

Exposure Control Plan

Employees covered by the bloodborne pathogens standard receive an explanation of this

ECP during their initial training session. It will also be reviewed in their annual refresher training. All employees have an opportunity to review this plan at any time during their work shifts by contacting Ron Riley, the PI or Michael Hiles, the Safety and Occupational Health Specialist for RRC. If requested, we will provide an employee with a copy of the ECP free of charge and within 15 days of the request.

The Safety and Occupational Health Specialist for RRC along with the related PI(s) are responsible for reviewing and updating the ECP annually or more frequently if necessary to reflect any new or modified tasks and procedures which affect occupational exposure and to reflect new or revised employee positions with occupational exposure.

**Engineering Controls and Work Practices**

Engineering controls and work practice controls will be used to prevent or minimize exposure to bloodborne pathogens. The specific engineering controls and work practice controls used are listed below:

\*Washed solvent-free, individually-labelled C18-solid phase extraction cartridges containing adsorbed long-chain amino alcohols extracted from urine will sealed with paraflim, wrapped in aluminum foil, and attached to absorbant paper prior to being mailed to RRC.

\* The blood samples will be approximately 15µl of human dried blood on labeled FTATM Elute MicroCards. The absorbant paper in the cards is impregnated with chemicals that denature proteins and are anti-viral and anti-bacterial. Prior to arriving at RRC the blood samples will be thoroughly dried at room temperature before the cards are closed. Once the blood spot is thoroughly dry the outer flap will be closed and the blood cards will be double bagged in non-breathable ZiplockTM bags containing desiccant for storage and shipment. At RRC a 6mm core (representing 15µl of blood) will be removed from each card and extracted with 1:1 acetonitrile/water and 5% formic acid. Once the analysis by liquid chromatography-electro spray ionization-mass spectrometry (LCMS) is deemed complete (all necessary data analyzed and quantitated) the FTA elute cards will be incinerated.

Sharps disposal containers are inspected and maintained or replaced by Ron Riley whenever necessary to prevent overfilling; however, no sharps will be generated by this study.

This facility identifies the need for changes in engineering control and work practices through reviews of close calls, mishaps, and incident investigations, OSHA records, employee interviews, and/or committee activities.

We evaluate new procedures or new products regularly by discussions about best practices within the agency, literature reviews, supplier info, and/or new products considered.

Both front line workers and management officials are involved in this process through the SHEM committee. In addition, the safety and occupational health specialist maintains an open door policy and encourages individuals with ideas to contribute to the safety culture development within RRC.

Ron Riley, the PI with the assistance of Michael Hiles, the Safety and Occupational Health Specialist will ensure effective implementation of these recommendations.

**Personal Protective Equipment (PPE)**

PPE is provided to our employees at no cost to them. Training is provided by laboratory supervisors in the use of the appropriate PPE for the tasks or procedures employees will perform.

The types of PPE available to employees are as follows:

Lab coats, gloves, eye protection*,* and filter masks

PPE is located within each lab and resupplies through the supply room in the sub-basement. The lab supervisors are responsible for ensuring that it is available.

All employees using PPE must observe the following precautions:

\* Wash hands immediately or as soon as feasible after removal of gloves or other

PPE.

\* Remove PPE after it becomes contaminated, and before leaving the work area.

\* Used disposable PPE may be disposed of in waste can if it does not present a biosafety hazard. If it presents a biohazard the disposable PPE will first be decontaminated using an autoclave before being disposed of in the trash.

\* Wear appropriate gloves when it can be reasonably anticipated that there may be hand contact with blood or OPIM, and when handling or touching contaminated items or surfaces; replace gloves if torn, punctured, contaminated, or if their ability to function as a barrier is compromised.

\* Utility gloves may be decontaminated for reuse if their integrity is not compromised; discard utility gloves if they show signs of cracking, peeling, tearing, puncturing, or deterioration.

\* Never wash or decontaminate disposable gloves for reuse.

\* Wear appropriate face and eye protection when splashes, sprays, spatters, or droplets of blood or OPIM pose a hazard to the eye, nose, or mouth.

\* Remove immediately or as soon as feasible any garment contaminated by blood or

OPIM, in such a way as to avoid contact with the outer surface.

The procedure for handling used PPE is as follows: Any disposable PPE used during this study will be discarded into biohazard bags and autoclaved prior to trash disposal. All reusable PPE will be decontaminated using a 10% bleach solution or other approved solution. All decontamination of reusable PPE will take place within either lab 364 or lab 342.

**Housekeeping**

Regulated wasteis placed in containers which are closable, constructed to contain all contents and prevent leakage, appropriately labeled or color-coded (see Labels), and closed prior to removal to prevent spillage or protrusion of contents during handling.

The procedure for handling sharps disposal containerscan be found in the RRC SOP Section 8: Biosafety Plan.

The procedure for handling other regulated wasteis found in the RRC SOP Section 8: Biosafety Plan.

Contaminated sharpsare discarded immediately or as soon as possible in containers that are closable, puncture-resistant, leakproof on sides and bottoms, and labeled or colorcoded appropriately. Sharps disposal containers are available within each lab space.

Bins and pails(e.g., wash or emesis basins) are cleaned and decontaminated as soon as feasible after visible contamination.

Broken glasswarewhich may be contaminated is picked up using mechanical means, such as a brush and dust pan and then autoclaved.

Laundry

No laundry contaminated with blood will be generated by this study. No liquid urine or liquid blood will be will be used in this study

* 1. **HEPATITIS B VACCINATION**

Ron Riley, with the help of the FOH Health Unit located at RRC will provide

training to employees under his supervision on hepatitis B vaccinations, addressing the safety, benefits, efficacy, methods of administration, and availability.

The hepatitis B vaccination series is available at no cost after training and within 10 days

of initial assignment to employees identified in the exposure determination section of this

plan. Vaccination is encouraged unless: 1) documentation exists that the employee has

previously received the series, 2) antibody testing reveals that the employee is immune, or

3) medical evaluation shows that vaccination is contraindicated.

However, if an employee chooses to decline vaccination, the employee must sign a

declination form. Employees who decline may request and obtain the vaccination at a

later date at no cost. Documentation of refusal of the vaccination is kept in the Location Support Office in the employee’s record.

Following the medical evaluation, a copy of the health care professional's Written

Opinion will be obtained and provided to the employee. It will be limited to whether the

employee requires the hepatitis vaccine, and whether the vaccine was administered.

* 1. **POST-EXPOSURE EVALUATION AND FOLLOW-UP**

Because no liquid blood will be collected or stored it is highly unlikely that there could be an exposure incident. Nonetheless, in the unlikely event of an exposure incident, the incident shall be reported, investigated, and documented. When an employee incurs an exposure incident, it shall be reported immediately to their supervisor. Following a report of an exposure incident, the exposed employee shall go their personal Healthcare professional and provide/obtain the following:

* 1. Documentation of the route(s) of exposure
	2. A description of the circumstances under which the exposure occurred
	3. The identification and documentation of the source individual (The identification is not required if the employer can establish that identification is impossible or prohibited by state or local law.)
	4. The collection and testing of the source individual's blood for HBV and HIV serological status
	5. Post-exposure treatment for the employee, when medically indicated in accordance with the U.S. Public Health Service
	6. Counseling
	7. Evaluation of any reported illness

The Healthcare professional evaluating an employee will be provided with the following information:

1. A copy of this plan.
2. A copy of the OSHA Bloodborne Pathogen regulations (29 CFR 1910.1030)
3. Documentation of the route(s) of exposure.
4. A description of the circumstances under which the exposure occurred.
5. Results of the source individual's blood testing, if available.
6. All medical records applicable to treatment of the employee, including vaccination status.

The employee will receive a copy of the evaluating healthcare professional's written opinion upon completion of the evaluation.

The healthcare professional's written opinion for Hepatitis B vaccination should be limited to the following: (1) whether the employee needs Hepatitis B vaccination; (2) whether the employee has received such a vaccination. The healthcare professional's written opinion for post-exposure evaluation and follow-up is limited to the following information:

1. That the employee was informed of the results of the evaluation.
2. That the employee was informed about any medical conditions resulting from exposure to blood or other infectious materials that require further evaluation or treatment.

All other findings or diagnoses will remain confidential and will not be in a written report.

All medical evaluations shall be made by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional. All laboratory tests must be conducted by an accredited laboratory at no cost to the employee. All medical records will be kept in accordance with 29 CFR 1910.1020.

* 1. **ADMINISTRATION OF POST-EXPOSURE EVALUATION AND FOLLOW-UP**

Ron Riley with the help of Michael Hiles, the Safety and Occupational Health Specialist for RRC will ensure that health care professional(s) responsible for employee's hepatitis B vaccination and post-exposure evaluation and follow-up are given a copy of OSHA's bloodborne pathogens standard.

Ron Riley, Principal Investigator, will ensure that the health care professional evaluating an employee after an exposure incident receives the following:

\* a description of the employee's job duties relevant to the exposure incident

\* route(s) of exposure

\* circumstances of exposure

\* if possible, results of the source individual's blood test

\* relevant employee medical records, including vaccination status

* 1. **PROCEDURES FOR EVALUATING THE CIRCUMSTANCES SURROUNDING AN**

**EXPOSURE INCIDENT**

Ron Riley, the PI and Michael Hiles, the Safety and Occupational Health Specialist will review the circumstances of all exposure incidents to determine:

\* engineering controls in use at the time

\* work practices followed

\* a description of the device being used (including type and brand)

\* protective equipment or clothing that was used at the time of the exposure incident

 (*gloves, eye shields, etc.)*

\* location of the incident (*O.R., E.R., patient room, etc.)*

\* procedure being performed when the incident occurred

\* employee’s training

If it is determined that revisions need to be made, Ron Riley, the PI and Michael Hiles, the Safety and Occupational Health Specialist will ensure that appropriate changes are made to this

ECP. *(Changes may include an evaluation of safer devices, adding employees to the*

*exposure determination list, etc.)*

* 1. **EMPLOYEE TRAINING**

Ron Riley, Jency Showker and Trevor Mitchell will complete the Bloodborne Pathogens training program at least annually for as long as this study continues.

The training program includes at least the following elements:

1. An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents.
2. A general explanation of the epidemiology and symptoms of bloodborne diseases.
3. An explanation of the modes of transmission of bloodborne pathogens.
4. An explanation of the employer's exposure control plan and the means by which the employee can obtain a copy of the written plan.
5. An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood or other potentially infectious materials.
6. An explanation of the use and limitations of methods that will prevent or reduce exposure, including appropriate engineering controls, work practices, and personal protective equipment.
7. Information on the types, proper use, location, removal, handling, decontamination, and disposal of personal protective equipment.
8. An explanation of the basis for selection of personal protective equipment.
	1. **RECORDKEEPING**

***Training Records***

Training records are completed for each employee upon completion of training. These

documents will be kept for at least **three years** by the PI and a copy will be provided to the Location Safety Office.

The training records include:

\* the dates of the training sessions

\* the contents or a summary of the training sessions

\* the names and qualifications of persons conducting the training

\* the names and job titles of all persons attending the training sessions

Employee training records are provided upon request to the employee or the employee's authorized representative within 15 working days. Such requests should be addressed to the Principle Investigator.

***Medical Records***

Medical records relating to the Occupational Medical Surveillance Program (OMSP) are maintained for each employee within the program with occupational exposure in accordance with 29 CFR 1910.1020, "Access to Employee Exposure and Medical Records."

The Location Support Officeis responsible for maintenance of the required medical records.

These **confidential** records are kept in the Location Support Office for at least the **duration of employment plus 30** **years**.

Employee OMSP medical records are provided upon request of the employee or to anyone having written consent of the employee within 15 working days. Such requests should be sent to

Location Support Office.

***OSHA Recordkeeping***

An exposure incident is evaluated to determine if the case meets OSHA’s Recordkeeping

Requirements (29 CFR 1904). This determination and the recording activities are done by

The Location Safety & Occupational Health Specialist

***Sharps Injury Log***

In addition to the 1904 Recordkeeping Requirements, all percutaneous injuries from

contaminated sharps are also recorded in the Sharps Injury Log. All incidences must

include at least:

- the date of the injury

- the type and brand of the device involved

- the department or work area where the incident occurred

-an explanation of how the incident occurred.

This log is reviewed at least annually as part of the annual evaluation of the program and is maintained for at least five years following the end of the calendar year that they cover. If a copy is requested by anyone, it must have any personal identifiers removed from the report.

**APPENDIX**

TABLE OF FORMS

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**Appendix A**

|  |
| --- |
| NOTICE OFUNSAFE OR UNHEALTHFULWORKING CONDITION(DO NOT REMOVE NOTICE UNTIL CONDITION IS ABATED) |
| 1. LOCATION: | 3. DATE OF INSPECTION: |
| 2. OFFICIAL IN CHARGE OF LOCATION: | 4. STANDARD VIOLATED: |
| 5. LOCATION OF VIOLATION IN SPACE: |
| 6. DESCRIPTION OF UNSAFE OR UNHEALTHFUL CONDITION: |
| 7. RECOMMENDED ABATEMENT PROCEDURES a. Interim b. Final: Abatement should be completed by |
| 8. ADDITIONAL INFORMATION CONCERNING THIS VIOLATION CAN BE OBTAINED FROM Location Safety Officer: TELEPHONE NO.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |

**Appendix B**

|  |  |  |
| --- | --- | --- |
| **RRC SAFETY AND HEALTH COMMITTEE**Instructions:1. Post a copy in a prominent place for employees information by October 15 each year.
2. Send a copy to the AOD or Regional Safety and Health Office.
3. Send a copy to SHMP, A3D, 6505 Belcrest Road, Hyattsville, Maryland 20782.
4. Provide updated copies as changes in appointment or membership occur.
 | Date: | U.S. Department of Agriculture Agricultural Research ServiceRussell Research Center950 College Station Rd.Athens, GA 30605 |
| NO. OF PERMANENTFULL TIME EMPLOYEESAT LOCATION:  |
| COMMITTEE MEMBERS/REPRESENTATIVE |
| PRINT NAME | PHONE | JOB SERIES AND TITLE | WORK LOCATION WITHIN RRC |
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**Appendix C**

**RRC EMPLOYEE REPORT OF**

**ALLEGED UNSAFE OR UNHEALTHFUL WORKING CONDITIONS**

The undersigned (*check one)*

  Employee  Student Other (*Specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

believes that a job safety or health hazard exists at the following location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Does this hazard (s) immediately threaten serious physical harm?  Yes  No

If “yes” immediately contact your supervisor or Location Safety Officer.

Name of Research Leader or Supervisor in charge of area. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Telephone \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Briefly describe the hazards that appear to exist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Have you reported this hazard to your supervisor? Yes No

If yes, what if any actions have been taken? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Describe any recommendations you have to eliminate the hazard? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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My name may be revealed to the official in charge.  Yes  No

Name(print): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Telephone Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Appendix D**

**RRC JOB HAZARD ANALYSIS (JHA)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Date: |  | New JHA |  or |  | Revised JHA Revision Date: | JHA # |
| Job Classification: | Typical Task Location: | Page: of |
| Task Overview: |  |
| Task Elements: | *
*
*
*
 |
| Required PPE: |  |
| Tools & Equipment: |  |
|  |
| **OCCUPATIONAL HEALTH CONCERNS / POTENTIAL HAZARDS** |
| **Chemical Agents** | **Physical Agents** | **Biological Agents** |
|  |  |  |
|  |
| **Activity / Sequence of Job Steps** | **Potential Hazards / Injury Sources** | **Controls** |
|  |  |  |
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**Appendix E**

**Lab Chemical Inventory Instruction Sheet**

**1st column** - **Chemical** - Typed in initial letter cap only. The chemical name that you list must be the same as the chemical name that is listed on the container label. If it was synthesized on site put an asterid at the end of the chemical name.

**2nd column** - **Cas #** - List the product cas number as listed on the container label. If a cas number is not listed type NA.

**3rd column - Supplier** - Typed in initial letter cap only. Type in the name of the manufacturer that is listed on the chemical label and MSDS. If the manufacturer is unknown type NA.

**4th column - Quantity** - Typed in lower case only. List the total amount of weight or volume of the chemical. If it is a solid chemical it should be listed in weight. If it is a liquid chemical it should be listed in volume. Ex. One bottle weighs 2ml and one bottle weighs 3ml = 5ml should be listed. The weight should be listed with no spaces separating the number from the volume or weight.

**5th column - Location** - Typed in initial letter cap only. Only list the building number and room number. As in the following example: Rm 326.

**6th column - Physical State** - Typed in initial cap only. List the physical state of the chemical. List either Liquid, Solid, or Gas.

**7th column - Hazards** - Typed in initial cap only. List all hazard(s) that the chemical falls under, refer to the chemical(s) MSDS. Attached is a Hazard Category Comparison for Reporting EPA hazard categories. You can list more than one category for a chemical.

**Use the following Hazard Classifications only:**

* Flammable
* Health Hazard
* Corrosion
* Explosive
* Oxidizer
* Acute Toxicity
* Irritant
* Gas Cylinder

**8th column - Scientific Lab** - Typed in initial cap only. List the name of the scientists lab that is responsible for the chemical. Ex. Tumlinson, Becnel, Brenner....

**9th column - MSDS** - Typed in initial cap only.

Type “Yes” if you have the MSDS **(YOU SHOULD HAVE IT!!!)** and “No” if you do not have the MSDS because it is locally synthesized.

**Appendix F**

**Current New Employee Initial Safety Training Requirements**

**Laboratory Personnel:**

* Practicing Safe Science (General Laboratory Procedures/housekeeping/PPE)
* Hazard Communication
* Hazardous Waste
* Bloodborne Pathogens
* Emergency Procedures

**Office Personnel:**

* Hazard Communication
* Bloodborne Pathogens
* Emergency Procedures

**Appendix G**

|  |
| --- |
| **Minimum Chemical Storage Requirements for ARS RRC Laboratories*** Chemicals should be stored according to hazard class (ex. flammables, oxidizers, health hazards/toxins, corrosives, etc.). The GHS pictograms may be used for easy labeling of chemical storage locations.
* Store chemicals away from direct sunlight or localized heat.
* All chemical containers should be properly labeled, dated upon receipt, and dated upon opening.
* Store hazardous chemicals below shoulder height of the shortest person working in the lab.
* Shelves should be painted or covered with chemical-resistant paint or chemical-resistant coating.
* Shelves should be secure and strong enough to hold chemicals being stored on them. Do not overload shelves.
* Personnel should be aware of the hazards associated with all hazardous materials.
* Separate solids from liquids.
 |
| Below are examples of chemical groups that can be used to categorize storage. Use these groups as examples when separating chemicals for compatibility. Please note: reactive chemicals must be more closely analyzed since they have a greater potential for violent reactions. Contact Location Safety Officer if you have any questions concerning chemical storage.  |
| **Acids*** Make sure that all acids are stored by compatibility (ex. separate inorganics from organics).
* Store concentrated acids on lower shelves in chemical-resistant trays or in a corrosives cabinet. This will temporarily contain spills or leaks and protect shelving from residue.
* Separate acids from incompatible materials such as bases, active metals (ex. sodium, magnesium, potassium) and from chemicals which can generate toxic gases when combined (ex. sodium cyanide and iron sulfide).

**Bases*** Store bases away from acids.
* Store concentrated bases on lower shelves in chemical-resistant trays or in a corrosives cabinet. This will temporarily contain spills or leaks and protect shelving from residue.

**Flammables*** Approved flammable storage cabinets should be used for flammable liquid storage.
* You may store 20 gallons of flammable liquids per 100 sq.ft. in a properly fire separated lab. The maximum allowable quantity for flammable liquid storage in any size lab is not to exceed 50 gallons.
* Use only explosion-proof or intrinsically safe refrigerators and freezers for storing flammable liquids.

**Peroxide-Forming Chemicals*** Peroxide-forming chemicals should be stored in airtight containers in a dark, cool, and dry place.
* Unstable chemicals such as peroxide-formers must always be labeled with date received, date opened, and disposal/expiration date.
* Peroxide-forming chemicals should be properly disposed of before the date of expected peroxide formation (typically 6-12 months after opening).
* Suspicion of peroxide contamination should be immediately investigated. Contact Laboratory Safety for procedures.

**Water-Reactive Chemicals*** Water reactive chemicals should be stored in a cool, dry place.
* Do not store water reactive chemicals under sinks or near water baths.
* Class D fire extinguishers for the specific water reactive chemical being stored should be made available.

**Oxidizers*** Make sure that all oxidizers are stored by compatibility.
* Store oxidizers away from flammables, combustibles, and reducing agents.

**Toxins*** Toxic compounds should be stored according to the nature of the chemical, with appropriate security employed when necessary.
* A "Poison Control Network" telephone number should be posted in the laboratory where toxins are stored. (9-1-800-222-1222 throughout Georgia)
 |
| Color coded labeling systems that may be found in your lab:

|  |  |
| --- | --- |
| **Hazard** | **Color Code** |
| Flammables | Red |
| Health Hazards/Toxins | Blue |
| Reactives/Oxidizers | Yellow |
| Contact Hazards | White |
| General Storage | Gray, Green, Orange |

***Please Note:*** Chemicals with labels that are colored and striped may react with other chemicals in the same hazard class. See MSDS for more information. Chemical containers which are not color coded should have hazard information on the label. Read the label carefully and store accordingly.  |

**Appendix H**

***Suggested Shelf Storage Pattern***

A suggested arrangement of compatible chemical families on shelves in a chemical storage room, suggested by the Flinn Chemical Catalog/Reference Manual, is depicted below.

* First sort chemicals into organic and inorganic classes.
* Next, separate into the following compatible families.

|  |  |
| --- | --- |
| **Inorganics** | **Organics** |
| 1. Metals, Hydrides | 1. Acids, Anhydrides, Peracids |
| 2. Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates | 2. Alcohols, Amides, Amines, Glycols, Imides, Imines |
| 3. Amides, Azides\*, Nitrates\* (except Ammonium nitrate), Nitrites\*, Nitric acid | 3. Aldehydes, Esters, Hydrocarbons |
| 4. Carbon, Carbonates, Hydroxides, Oxides, Silicates | 4. Ethers\*, Ethylene oxide, Halogenated hydrocarbons, Ketenes, Ketones |
| 5. Carbides, Nitrides, Phosphides, Selenides, Sulfides | 5. Epoxy compounds, Isocyanates |
| 6. Chlorates, Chlorites, Hydrogen Peroxide\*, Hypochlorites, Perchlorates\*, Perchloric acid\*, Peroxides | 6. Azides\*, Hydroperoxides, Peroxides |
| 7. Arsenates, Cyanates, Cyanides | 7. Nitriles, Polysulfides, Sulfides, Sulfoxides |
| 8. Borates, Chromates, Manganates, Permanganates | 8. Cresols, Phenols |
| 9. Acids (except Nitric acid) |  |
| 10. Arsenic, Phosphorous\*, Phosphorous Pentoxide\*, Sulfur |  |

\*Chemicals deserving special attention because of their potential instability.

**Appendix I**

**ARS RRC Authorized Waste Solvent Disposal Personnel**

**If not on this list, do not issue key or radio, send them to the Location Safety Officer. If FSIS send to Gina McLeroy.**

Manju Amin

Nasreen Bano

Nicole Bartenfeld

Candace Betts

Doug Cosby

John Gamble

Johnna Garrish

Cheryl Gresham

Samantha Hawkins

Dorothy Hinton

Laura Lee-Rutherford

Brian Oakly

Bruce Seal

Robin Woodroof

Crickett Wray

Hung Yueh Yeh

Michael Hiles

***Emergency Contact Numbers:***

Michael Hiles 3137; Cell: 706-296-5221

Gina McLeroy 2321

Samantha Hawkins 3454

**Appendix J**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lockout/Tagout Periodic Inspection** **Checklist and Certification*****USDA ARS Russell Research Center***

|  |
| --- |
| **General Inspection** |
| Name of Authorized Employee Being Audited: |
| Department: | Date: |
| Audited By: | Title: |
| Name/Identification of Machine, Process, or Equipment: |
| Location of Machine, Process, or Equipment: |
| **Preparing For Shutdown Audit Items (Circle One)** |
| The employee has been trained in the Facilities General Lockout/Tagout procedures. | YES | NO |
| The employee was able to identify all “stored” and “kinetic” energy sources for this piece of equipment. | YES | NO |
| **Shutting Down The Equipment Audit Items** |
| The employees shut down the piece of equipment using normal stopping procedures (e.g., putting a switch in the “off” position or pressing a button). | YES | NO |
| **Isolating The Equipment Audit Items** |
| The piece of equipment was isolated from every energy source feeding into it (e.g., close valves, throw main disconnects, throw circuit breakers). | YES | NO |
| **Applying Lockout/Tagout Device Audit Items** |
| Appropriate locks, tags, and lockout devices were available and utilized. | YES | NO |
| **Controlling Stored Energy Audit Items** |
| All potential residual hazardous energy was relieved, disconnected, or restrained (e.g., trapped pressure relieved, pipe flanges blanked, elevated equipment blocked or supported). | YES | NO |
| **Verifying Isolation of Audit Items**  |
| The equipment was tested to ensure the right system was locked out and to ensure that the equipment could not be operated. | YES | NO |
| **Removing Locks and Tags Audit Items** |
| All equipment components are intact and capable of operating properly. | YES | NO |
| All lockout/tagout devices are only removed by the employee who applied them and affected employees have been notified that locks and tags have been removed and the equipment is ready for use. | YES | NO |
| **Problems** |
| List any problems identified during the lockout/tagout audit: |
| List corrective action steps to rectify these aforementioned problems: |
| Auditor’s Signature: | Date: |

 |

**Appendix K**

**DRAIN DISPOSAL PROCEDURES**

**Prohibited Discharge Standards for Athens-Clarke County**

**\*\*No user shall introduce or cause to be introduced into the Publicly Owned Treatment Works(POTW)any pollutant or wastewater which causes pass through or interference. These general prohibitions apply to all users of the POTW whether or not they are subject to categorical pretreatment standards or any other National, State or local pretreatment standards or requirement. Furthermore, no user may contribute the following substances to the POTW:**

1. **Pollutants which create a fire or explosive hazard** in the municipal wastewater collection and POTW, including, but not limited to wastestreams with a closed-cup flashpoint of less than 140 degrees fahrenheit (60 degrees centigrade) using the test methods specified in 40 CFR 261.21.

2. Any wastewater having a **pH less than 5.5 or more than 10.0**, or otherwise causing corrosive structural damage to the POTW or equipment, or endangering Athens-Clarke County Personnel.

3. **Solid or viscous substances in amounts which will cause obstruction of the flow in the POTW resulting in interference**, but in no case solids greater than one and one-half inches in any dimension.

4. **Any wastewater containing pollutants**, including oxygen demanding pollutants (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration **which**, either singly or by interaction with other pollutants, **will cause interference with either the POTW; or any wastewater treatment or sludge process, or which will constitute a hazard to humans or animals.**

 **\*\* Athens-Clarke County defines a Pollutant as any dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, medical wastes, chemical wastes, industrial wastes, biological materials, radioactive materials, heat, wrecked or discharged equipment, rock, sand, cellar dirt, agricultural and industrial wastes, and the characteristics of the wastewater (i.e., pH, temperature, TSS, turbidity, color, BOD, Chemical Oxygen Demand (COD), toxicity, odor.**

5. Any wastewater having a temperature greater than 150 degrees fahrenheit, or which will inhibit biological activity in the treatment plant resulting in interference, but in no case wastewater which causes the temperature at the introduction into the treatment plant to exceed 104 degrees fahrenheit.

6. **Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin, in excess of 100 mg/l**.

7. **Any pollutants which result in the presence of toxic gases, vapors or fumes** within the POTW in a quantity that may cause acute worker health and safety problems.

8. Any trucked or hauled pollutants, except at discharge points designated by Athens-Clarke County in accordance with Section 5-1-3 (e).

9. **Any noxious or malodorous liquids, gases, solids, or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance, a hazard to life, or to prevent entry into the sewers for maintenance and repair**.

10. **Any wastewater which imparts color which cannot be removed by the treatment process**, such as, but not limited to, dye wastes and vegetable tanning solutions, which consequently imparts color to the treatment plant's effluent thereby violating Athens-Clarke County's NPDES permit. Color (in combination with turbidity) shall not cause the treatment plant effluent to reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonably established norm for aquatic life.

11. Any wastewater containing any radioactive wastes or isotopes except as specifically approved by the Public Utilities Director in compliance with applicable State or Federal regulations.

12. Storm water, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, noncontact cooling water, and unpolluted industrial wastewater, unless specifically authorized by the Public Utilities Director.

13. Any sludges, screenings, or other residues from the pretreatment of industrial wastes.

14. Any medical wastes, except as specifically authorized by the Public Utilities Director in a wastewater discharge permit.

15. **Any wastewater causing the treatment plant's effluent to fail a toxicity test**.

16. **Any wastes containing detergents, surface active agents, or other substances which may cause excessive foaming** in the POTW.

17. **Any discharge of fats, oils, or greases of animal or vegetable origin is limited to 200 mg/l.**

**The following is a flow chart designed to help you make laboratory disposal decisions:**

**Is the material**

**potentially harmful**

**to people,**

**equipment or the**

**environment?**

**Maybe** **No**

(You don’t really know?)

 **Manage as Dispose in drain or trash**

 **Hazardous waste. (refer to drain & trash**

 **Disposal restrictions)**

 **Is the waste a biological**

 **waste, used fluorescent lamp,**

 **used battery, used oil, No Managed as a**

**or oil filter, or hazardous waste.**

**radioactive material?**

 **Yes**

 **Refer to the specific**

**procedures for these wastes**