NASA Ames Research Center
Ames Environmental Procedural Requirements

Chapter 3 - Hazardous Materials Management

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3.1 Applicability

This instruction is applicable to all civil servant and contractor employees and tenant personnel at Ames Research Center (Ames), NASA Research Park Partners, and Crows Landing Flight Facility.

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3.2 Purpose

This chapter prescribes the roles and responsibilities for the environmental management of hazardous materials.

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3.3 Policy

It is the policy of Ames Research Center to:

1. Comply with all pertinent statutory and regulatory requirements and Executive Orders related to hazardous materials management. Ames recognizes and will comply with applicable Federal, state, and local regulations.
2. Consult about the best techniques and methods to manage hazardous materials, as appropriate, with Federal, state, and local agencies, including:
    - U.S. Environmental Protection Agency (EPA)
    - Occupational Safety and Health Administration (OSHA)
    - California Office of Emergency Services
    - Santa Clara County Department of Environmental and Hazardous Materials Compliance Division (Country)
    - Stanislaus County Environmental Health Department
3. Promote employee awareness of hazardous materials management through training and active information dissemination.
4. Inform the surrounding communities of the inventory of hazardous materials utilized and stored at Ames.

    Note: Related occupational safety policies regarding hazardous materials management are contained in the Ames Safety Manual, APR 1700.1, Chapter 13, Chemical Hygiene Program and Chapter 24, Chemical Hazard Communication Plan.

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3.4 Authority

All relevant Federal, state, and local laws and regulations related to hazardous materials management, including but not limited to:

1. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. 9601 et seq.), including the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 11001 et. seq.)
2. Executive Order 12088, amended by Executive Order 12580, Federal Compliance with Pollution Control Standards
3. Executive Order 13101 of 14 September 1998, promotion of Federal Government's use of recycled products and environmental preferable products and services
4. State and local laws and regulations related to hazardous material management:
    - California Code of Regulations, Title 19, Office of Emergency Services
    - California Code of Regulations, Title 23, Water
    - California Code of Regulations, Title 26, Toxics
    - California Health and Safety Code, Chapter 6.95
    - Santa Clara County Hazardous Material Storage Ordinance
    - Santa Clara County Toxic Gas Ordinance
5. NASA Policy Directive 8500.1, NASA Environmental Management
6. Environmental Excellence for the Twenty-First Century, NASA Strategy Document

7. Ames Policy Directive 8800.4, Ames Environmental Programs
8. Uniform Fire Code and National Fire Protection Association Standards

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3.5 Responsibilities

3.5.1 Ames Hazardous Materials Users

1. Conduct operations, including required inspections and maintenance of inspection logs of use and storage areas, applicable monitoring records, and proper labeling, in compliance with all applicable regulations, requirements, and permit conditions.
2. Maintain and make available required records, as requested by the Environmental Services Office, Code QE (Environmental Office).
3. Maintain current file of material safety data sheets (MSDS).
4. Maintain an accurate Hazardous Materials Inventory Statement (HMIS), including above- and underground tanks and all compressed gases.
5. Update hazardous materials inventory when new chemicals are obtained and when storage areas are no longer used.
6. Input updated HMIS via Code QE website at least once per year by December 15, or earlier if requested or necessary (i.e., inventory changes or storage is relocated).
7. Participate and provide input in order to complete plans and reports on time.
8. Provide access and point of contact for inspections, assessments, and audits by the Environmental Office and regulatory agencies.
9. Implement corrective actions, if required.
10. Attend training, as required.
11. Maintain training records and provide copies to the Environmental Office of any applicable non-Ames training.
12. Inform the Environmental Office of changes in operations that affect storage and use of hazardous materials, 45 days prior to changes.
13. Maintain storage areas clean of debris and free of rainwater. Designate storage areas of either hazardous materials or hazardous wastes with posted emergency procedure signs and provide designated spill kits.
14. Report releases to Environmental Office and maintain spill log.
15. Close hazardous materials storage areas or equipment no longer in use in coordination with the Environmental Office.

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3.5.2 Resident Agencies and NASA Partners Hazardous Materials Users

1. Conduct operations, including required inspections of use and storage areas and proper labeling, in compliance with all applicable regulations, requirements, and permit conditions.
2. Maintain and make available required records, as requested by the Environmental Office.

3. Maintain a current file of MSDS.
4. Maintain an accurate HMIS, including above- and underground tanks and all compressed gases.
5. Submit the HMIS to the appropriate regulatory agency.
6. Update hazardous materials inventory when new chemicals are obtained and when storage areas are no longer used.
7. Participate and provide input to NASA Environmental Office in order to complete plans and reports on time.
8. Provide access and point of contact for inspections, assessments, and audits by the Environmental Office and regulatory agencies.
9. Implement corrective actions, if required.
10. Attend training, as required and maintain training records.
11. Inform the Environmental Office of changes in operations that affect storage and use of hazardous materials.
12. Maintain storage areas clean of debris and free of rainwater. Designate storage areas of either hazardous materials or hazardous wastes with posted emergency procedure signs and provide designated spill kits.
13. Prepare and submit the Building Emergency Action Plans (BEAPs) and Closure Plans to the county and the Environmental Office.
14. Maintain permits, pay fees, and maintain records for a three-year period.
15. Close hazardous materials storage areas or equipment no longer in use. Provide closure plan to the County at least 30 days prior to closure.
16. Report all releases to the Environmental Office.

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3.5.3 Environmental Services Office, Code QE (Environmental Office)

1. Identify laws and regulations to which Ames must adhere.
2. Develop Ames policy to implement the identified laws and regulations.
3. Provide oversight and direction.
4. Provide training, as required.
5. Provide consultation, services, and support, including internal self-inspections.
6. Prepare and submit the Hazardous Material BEAPs and Closure Plans to the County for Ames Hazardous Materials Users.
7. Collect and complete the chemical inventories and submit the HMIS to the appropriate regulatory agency for Ames Hazardous Materials Users.
8. Report all releases to the appropriate regulatory agency.
9. Maintain permits, pay fees, and maintain records for a three-year period for Ames Hazardous Materials Users.
10. Conduct closure for hazardous materials storage areas or equipment no longer in use for Ames Hazardous Materials Users.
11. Conduct inspections of hazardous materials storage areas with County inspector and serve as liaison to the County.
12. Submit design drawings to the county for new and re-modeled hazardous materials storage facilities, pay plan review fee, and coordinate on-site inspection wit County and NASA users.
13. Maintain BEAP web site for hazardous material BEAPs.

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3.5.4 Safety Office, Code QH

1. Prepare and distribute non-hazardous materials BEAPs.
2. Inform Code QE of any new hazardous materials buildings.
3. Maintain non-hazardous materials BEAP website.

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3.5.5 Line Management and Contracting Officers Technical Representatives

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3.6 Definitions

3.6.1 Acute

A sudden event, condition, or exposure; e.g., skin burns caused by a corrosive material or death caused by inhalation of a poisonous gas.

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3.6.2 Acutely Hazardous Material

A substance that is listed on the Environmental Protection Agency (EPA) List of Extremely Hazardous Substances, 40 CFR, Part 355, Appendix A, or Santa Clara County Acutely Hazardous Materials List.

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3.6.3 Bioaccumulative

A substance that accumulates and concentrates in ecosystems or organisms higher in the food chain.

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3.6.4 Hazardous Material Building Emergency Action Plan (BEAP)

A plan required for facilities storing, handling, or dispensing hazardous materials that describes the chemicals stored and used, their locations, building hazards, escape routes, and emergency spill response procedures.

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3.6.5 Carcinogenic

A substance that causes cancer and is listed as a known or suspected carcinogen by the EPA, International Agency for Research on Cancer, Occupational Safety and Health Administration, National Toxicology Program, or Proposition 65.

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3.6.6 Chronic

A long-term event, condition, or exposure; e.g., cancer or liver damage caused by long-term exposure to low levels of contaminants.

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3.6.7 Compatibility

The chemical characteristics of a material that determine other materials with which it may or may not be safely combined.

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3.6.8 Corrosive

Any aqueous material with a pH of less than or equal to 2.0, or greater than or equal to 12.5, or that corrodes SAE steel at a rate of 0.25 inches per year at 130^{o}F. Any nonaqueous material that, when mixed with an equivalent weight of water, produces a solution with a pH less than or equal to 2.0, or greater than or equal to 12.5, and that corrodes SAE steel at a rate of 0.25 inches per year at 130^{o}F.

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3.6.9 Extremely Hazardous Material

A substance or combination of substances that, if human exposure should occur, will likely result in death, disabling personal injury, or serious illness caused by the substance or combination of substances because of its quantity, concentration, or chemical characteristics. A list of these substances can be found in 40 CFR, Part 355, Appendix A, and is included as Appendix A to this chapter. This list of chemicals had been adopted by both the state and the county as their list of acutely hazardous or extremely hazardous materials.

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3.6.10 Hazardous Material

As defined in Section 25501 of Chapter 6.95 of the California Health and Safety Code, any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that a handler believes would be injurious to the health and safety of persons or harmful to the environment.

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3.6.11 Hazardous Materials Inventory Statement (HMIS)

An annual report filed with Santa Clara County that delineates the type and quantity of hazardous material including wastes stored or handled at a particular site.

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3.6.12 Ignitable

A liquid with a flashpoint of less than 60^{o}C (140^{o}F); a nonliquid capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes, and, when ignited, burns vigorously and persistently; any oxidizer; and any ignitable compressed gas.

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3.6.13 Material Safety Data Sheet (MSDS)

Documentation prepared by the manufacturer or distributor of a hazardous material that describes the product and its use; identifies and describes hazardous ingredients; describes the material's physical and chemical characteristics; explains any special hazards (such as fire, explosion, polymerization), health hazards, the reactivity of the product, precautions for safe handling and use, and any necessary control measures to minimize exposure.

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3.6.14 Organics

Typically refers to a carbon-containing compound, for example, solvents and petroleum hydrocarbons.

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3.6.15 Oxidizers

Material that promotes combustion of other materials, for example, organic peroxides and perchlorates.

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3.6.16 Reactive

Any material that is normally unstable and readily undergoes violent change without detonation; reacts violently with water, forms potentially explosive mixtures with water, or generates toxic gases, vapors, or fumes when mixed with water; is capable of detonation or explosion if subjected to an initiator or heat; or contains cyanide or sulfide, which generates toxic gases when exposed to pH conditions above 2.0 and below 12.5.

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3.6.17 Secondary Containment

An impermeable, chemically compatible container (e.g., bermed pad, tray, or overpack drum) that contains spills and leaks from primary containers and meets the volume requirements of Section 3.9.1.

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3.6.18 Segregation

The separation of chemically incompatible materials by physical barriers or distance.

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3.6.19 Teratogenic

Capable of causing defects in fetuses.

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3.6.20 Threshold Planning Quantity

The quantity for an extremely hazardous substance as defined in 40 CFR, Part 355, Appendix A (included as Appendix A to this chapter).

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3.6.21 Toxic Gas Ordinance

The Santa Clara County Toxic Gas Ordinance No. NS-517.44 regulates gases that have an established Level of Concern (LOC). A Level of Concern is the maximum concentration of a substance in air that will not cause serious health effects in the majority of the population when exposed to the substance for a relatively short period of time. The LOC is equal to 0.1 of the Immediately Dangerous to Life and Health (IDLH) level (for substances with an established IDLH).

The Ordinance also regulates any material that is shipped in a compressed gas cylinder; that becomes or acts as a gas upon release at normal temperature and pressure (70° F and 760 mm Hg); or that is used or handled as a gas. Refer to Chapter 23, Toxic Gas Management, for more information.

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3.7 Affected Operations

Any operation or individual using, handling, or storing hazardous materials. Examples of affected operations include photo processing, solvent cleaning, construction projects, vehicle and equipment maintenance, coating application, and laboratory research.

A hazardous material may be liquid, solid, or gaseous. Examples of some hazardous materials include flammable solids, oils, paints, and solvents. Hazardous materials become hazardous waste when they become obsolete or outdated, are left over as waste after use in a process or on a project, and have no further use. Refer to Chapter 2.0, Pollution Prevention Program Requirements, for pollution prevention program requirements and Chapter 4.0, Hazardous Waste Management, for detailed definitions of hazardous waste and descriptions of hazardous waste management requirements.

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3.8 General Requirements

Hazardous materials must be managed according to the types of hazards they present. General requirements for hazardous materials follow:

1. Liquid hazardous materials must be secondarily contained to prevent leakage or spills.
2. All compressed gases must be secured with at least a single (preferably two non-combustible strap(s). All gas cylinders not in use must be stored with the valve cover in place. Store gas cylinders according to their chemical compatibility.
3. All hazardous materials must be segregated according to hazard class to prevent inadvertent mixing of incompatible materials.
4. Hazardous materials shall not be stored in locations where they may be exposed to conditions (heat, light, air, water, etc.) that are incompatible with the material.
5. To prevent hazardous materials from accidentally reaching the sanitary sewer, hazardous materials should not be stored above sinks, next to sinks or floor drains, or in fume hoods with open sinks (unless secondarily contained).
6. All hazardous materials containers, lockers, and cabinets, and piping must be labeled.
7. Appropriate spill cleanup materials and personal protective equipment must be available in areas of hazardous materials storage and labeled or designated as a spill kit.
8. Hazardous materials storage areas and operations must be inspected weekly and deficiencies corrected in a timely manner. Inspections shall be recorded by using a form similar to that found in Appendix B that includes all items applicable to the particular hazardous materials storage area.
9. A MSDS must be available for each hazardous material listed in the operation's hazardous materials inventory. Materials must be handled as described on the MSDS. For additional information on MSDS, refer to the Ames Health and Safety Manual APR 1700.1, Chapter 24, Chemical Hazard CommunicationPlan.
10. Each hazardous material used, or present, at any time during the year must be included in the operation's HMIS, which must be kept current.
11. Releases must be cleaned up immediately by trained personnel, and all releases must be documented on a spill log.
12. Hazardous materials must not be stored near storm drains.
13. Hazardous materials must not be stored on unpaved surfaces.
14. All containers storing hazardous materials must be compatible with the material stored and must be free of defects.
15. All storage areas must be free of debris and rainwater.
16. All storage areas must be labeled and secured.
17. Appropriate fire extinguishing equipment must be available and properly maintained.

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3.9 Specific Requirements

3.9.1 Secondary Containment

1. Except for containers in use, all liquid hazardous materials must be secondarily contained.
2. 2 Secondary containment must be kept dry and free of debris and defects.
3. Secondary containment must be chemically compatible with the material(s) in storage.
4. Secondary containment must be able to contain the following:
    - 110 percent of a single container's volume.
    - 10 percent of the aggregate volume of multiple containers or 150 percent of the largest container, whichever is greater.
    - Additionally, the secondary containment must be able to contain a 20-minute fire sprinkler release, if open to such a system a system.
    - Additionally, if the storage system is open to rainfall, then the secondary containment must be able to accommodate the volume of a 24-hour rainfall, as determined by 100-year storm.
5. If the secondary containment obscures the identification of the containers inside, the containment itself must be labeled to describe its contents and their hazards.

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3.9.2 Segregation

1. All hazardous materials must be segregated according to hazard class and compatibility to prevent hazardous reactions that result from inadvertent or accidental mixing of chemically incompatible materials. Segregation is the separation of materials through isolation or physical barriers. Appendix C presents a chemical compatibility matrix and procedures for use of the matrix.
2. Examples of hazard classes that should be stored separately include corrosive acids, corrosive bases, oxidizers (peroxides), poisons, explosives, flammables, and reactives.
3. Incompatibility may occur between chemicals (sodium metal and water, chlorine and ammonia) or between chemicals and their containers (sulfuric acid and a metal container).
4. Hazardous materials and hazardous waste must be stored in a separate secondary containment.

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3.9.3 Labeling

1. All hazardous materials containers, cabinets, and associated piping must be labeled with contents, at 20-foot intervals, including day-use or bench-top containers, must have their contents identified. Labels must indicate the name of the material spelled out in English and any hazards associated with it (e.g., "ACETONE" or "FLAMMABLE"). The chemical formula alone is not sufficient.

2. Labels should meet the following hazard communication requirements (see Ames Health and Safety Manual APG 1700.1, Chapter 24, Chemical Hazard Communication Plan):
    - Identification of contents in container.
    - Identification of health and safety hazards.
3. Labels for many common materials are available from the Environmental Office support service contractor. Custom labels can be special ordered, when necessary. Individuals may label their own containers as long as the labels meet requirements, are durable and legible, and letters are large enough to be visible from a distance of approximately six feet, except for small containers (less than five gallons).
4. Blank National Fire Protection Association (NFPA) system labels are available from Ames Stores Stock for laboratory chemicals.
5. Uniform marking guidelines for hazardous materials and hazardous waste have been developed by the Santa Clara County Manufacturing Group and have been adopted by Santa Clara County. These guidelines are included as Appendix D.

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3.9.4 Spill Cleanup, Fire Protection, and Personal Protective Equipment

1. Wherever hazardous materials are used or stored, appropriate spill response equipment and fire protection equipment must be available. For example, a laboratory using acids should have an acid compatible spill kit, with acid-resistant gloves and a fire extinguisher for corrosives. In a shop where oil is used or stored, absorbent booms and floor-dry and sturdy chemical-resistant gloves should be available. Locations of hazardous materials storage and spill response equipment are indicated on BEAP maps.
2. Hazardous materials spills shall be cleaned up only by personnel familiar with the hazards of the material and trained in chemical emergency response. Any spill or release of an extremely or acutely hazardous material, or any spill large enough to take two people more than 30 minutes to clean up, should be handled by the Environmental Office hazardous materials contractor.
3. The BEAP contains detailed instructions on hazardous materials spills, or other releases. Also refer to Chapter 15, Emergency Response, of this handbook for spill response procedures and BEAP guidelines.
4. All spills must be recorded on a spill cleanup log posted in the vicinity of the hazardous materials storage or use area.
5. After a spill has been cleaned up, the resulting material must be managed as a hazardous waste. Complete a Form A and contact the Hazardous Waste group for pick-up. (Refer to the Hazardous Waste Chapter).

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3.9.5 Inspections

1. 1 Unless prior approval has been given by Code QE, all hazardous materials

storage areas must be inspected weekly. Hazardous materials inspections must be documented and maintained on site for 3 years. An example Environmental Self-Inspection form is included as Appendix B of this chapter.

2. Hazardous materials inspections must include, but are not limited to, the following questions. Other items may be added, and the checklist may be customized according to the needs of the operation.
    - Are all materials correctly segregated?
    - Are hazardous materials storage areas clearly labeled and identified, describing hazard class(es) of materials in storage?
    - Are all containers (and secondary containment, if needed) labeled to identify the material and hazard?
    - Is the secondary containment free of liquid or debris?
    - Are all containers in good condition?
    - Is the hazardous materials inventory current?
    - Are MSDS available for all hazardous materials in inventory?
    - Is a designated spill kit located nearby, and is it easily accessible?
    - Are emergency procedure signs posted?
3. Daily inspection of aboveground storage tanks without secondary containment is required.
4. Inspection records must be maintained onsite for a period of three years.
5. Refer to http://q.arc.nasa.gov/qe/compl/hazmat/ for Inspection Form

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3.9.6 MSDS Usage

MSDS are the basis for several different health, safety, and environmental regulatory compliance requirements. They are intended to be a useful source of information about handling, storage, disposal, and emergency protocol for each hazardous material present. MSDS are discussed in the Ames Health and Safety Manual APR 1700.1, Chapter 24, Chemical Hazard Communication Plan. MSDS must be available at hazardous material locations.

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3.9.7 Inventory Reporting

All hazardous materials in use at any time during the year must be included in the operation's inventory of hazardous materials. Each year, personnel from the Environmental Office compile and update the centerwide inventory and report it to the Santa Clara County Health Department, Hazardous Materials Compliance Division. This information is the basis for AmesÕ hazardous materials storage permits and fees. The information in the inventory is also used to satisfy numerous other regulatory requirements.

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3.9.8 Training Requirements

1. All employees who use, handle, or store hazardous materials must receive training in the safe use, handling, and proper storage methods specific to the materials and hazards associated with their normal work. Employees must also receive training on how to read and understand MSDS and how to respond to a hazardous materials spill.
2. A minimum of 16 hours of training are required for employees who handle hazardous materials. This training includes a minimum of hazard communication and spill response classes as well as additional classes in hazardous materials management (i.e., Hazardous Waste Environmental Essentials, Stormwater Pollution Prevention, PCB Management, chemical specific training,etc.).
3. All employees are required to complete BEAP training annually, or within 90 days of hire. Training must be documented through Code QE training department.
4. For specific training requirements and regulatory references, refer to Chapter 7 of this handbook, Environmental Training. Class schedule information is available at http://dq.arc.nasa.gov/qh/training.

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3.10 Metrics

a. Percent compliance with federal, state, and local hazardous materials storage regulations.

   Goal: number of violations / inspection = 0

b. Percent of findings corrected within 30 days.

   Goal: 100% of inspection findings corrected within the 30 days given by the County.

c. Percent of personnel working with hazardous materials who have received pertinent training.

   Goal: Training is kept current for 100% of employees working with hazardous materials.

d. Percent of BEAPs updated within 1 year from lst revision.

   Goal: 100% of BEAPs updated at least once per year.

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3.11 Sources of Additional Information or Assistance

Building Emergency Action Plans (http://q.arc.nasa.gov/qe/compl/beap/)
Environmental Office ([redacted]

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3.12 Appendices

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