



AUDIT AND ADVISORY SERVICES
SANTA BARBARA, CALIFORNIA 93106-5140
Tel: (805) 893-2829
Fax: (805) 893-5423

August 22, 2019

To: John Sterritt, Director of Environmental Health & Safety
Environmental Health and Safety Services

Re: **Lab Safety and Hazardous Materials Handling
Audit Report No. 08-19-0007**

We have completed a limited review of lab safety and hazardous material handling as part of the 2018-19 annual audit services plan. The audit was conducted in conformance with the *International Standards for the Professional Practice of Internal Auditing*. Enclosed is the report detailing the results of our work.

We sincerely appreciate the cooperation and assistance provided by Environmental Health and Safety personnel during the review. If you have any questions, please contact me.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "Ashley Andersen", with a long horizontal line extending to the right.

Ashley Andersen
Director
Audit and Advisory Services

Enclosure

cc: Chancellor Henry Yang
Chuck Haines, Assistant Chancellor for Finance and Resource Management
Garry Mac Pherson, Vice Chancellor Administrative Services
Renee Bahl, Associate Vice Chancellor Design, Facilities & Safety Services
Alex Moretto, Research Safety Division Manager
UCSB Audit Committee
Alexander Bustamante, Senior Vice President and Chief Compliance and Audit Officer

This page intentionally left blank.



UCSB Audit and Advisory Services

Internal Audit Report

Lab Safety and Hazardous Material Handling

August 22, 2019

Performed by:

Antonio Mañas-Melendez, Associate Director

Irene Camargo, Senior Auditor

Karen Quintana, Staff Auditor

Approved by:

Ashley Andersen, Audit Director

Report No. 08-19-0007

EXECUTIVE SUMMARY

OBJECTIVE

The purpose of the audit was to determine if adequate internal controls have been implemented over hazardous material handling by UCSB Environmental Health and Safety (EH&S) and laboratories within campus departments to ensure compliance with University policies and procedures and external regulations. The objective of our audit was to determine whether:

- Lab inspections are performed annually and follow up of findings are completed within a specified time period.
- Hazardous material inventory is listed in UC Chemicals and are current with inventory in the laboratory or storage rooms.
- Original hazardous material manufacturer labels and hazardous waste labels meet required criteria.
- Hazardous material storage and hazardous waste areas follow general and required guidelines.

CONCLUSION

Based on the results of the work performed within the scope of the audit, we found laboratories did not always comply with official label requirements. Our work further identified opportunities to improve tracking of inspections, inventory controls, and hazardous chemical storage.

OBSERVATIONS, RECOMMENDATIONS, AND RESPONSES

1. LABORATORY INSPECTIONS

OBSERVATION

Environmental Health & Safety (EH&S) performs annual inspections of campus labs; however, we identified potential issues of inconsistent lab inspection inventory.

EH&S conducts campus lab inspections by Principal Investigator (PI). We reviewed inspections since implementation of the UC Inspect¹ system by PI and identified 34 PI's that may not have had an annual lab inspection. We were informed some of the inspection files in 2017 were not properly uploaded into UC Inspect. In addition, we found some of the PI's were linked to another PI making it challenging to track annual inspections.

We found inspections, in our sample of five PI's, were performed annually from 2017 to 2019; however, one of the five inspections in 2017 was not properly uploaded into UC Inspect. In addition, we verified that our sample of five inspections included finding follow-ups. If there was a finding noted in the report, the finding was either marked as resolved at the time of the inspection or noted as resolved within a specified period.

RECOMMENDATION

We recommend Environmental Health and Safety verify that all laboratory spaces have been inspected and evaluate additional alternatives to ensure that lab spaces identified in the future are properly identified, tracked, and inspected.

MANAGEMENT RESPONSE

Environmental Health and Safety will verify that all laboratory spaces have been inspected and evaluate additional alternatives to ensure that lab spaces identified in the future are properly identified, tracked, and inspected.

Expected completion date: May 1, 2020.

2. INTERNAL CONTROLS OVER HAZARDOUS CHEMICAL MATERIAL HANDLING

OBSERVATION

We performed a limited review of internal controls over hazardous chemical material handling associated with chemical and waste label requirements, inventory controls, and storage requirements. We concluded that labels do not always include the required information, inventory is not updated on a regular basis in UC Inspect, and storage areas could be improved to ensure safety.

¹ UC Inspect: provides streamlined inspections and inventory control using a mobile device.

Label Requirements

We found that overall the official manufacturer chemical labels included required information; however, hazard identification could be improved to include distinct hazardous label identifiers. Our review of hazardous waste containers identified some waste containers did not have an official campus waste label and several campus waste labels were missing required information.

Official Manufacturer Hazardous Chemical Labels

We reviewed 25 official manufacturer hazardous chemical labels. We found 24 of the 25 manufacturer labels met the official manufacturer label requirements to include: manufacturer identity label; secondary containers included information from original identity label and hazard warnings; were identified as flammable, corrosive, oxidizer, reactive or toxic. However, we found:

- One manufacturer hazardous chemical had been repackaged into a secondary glass container without the official manufacturer label information, chemical warning, and hazard classification².
- Three official manufacturer labels that did not have the Globally Harmonized System (GHS)³ hazardous label identifiers.

These three chemicals may have been purchased prior to the 2016 Hazard Communication Standard⁴ (HCS) compliance requirement by which employees must be informed of dangers and hazards associated with chemicals used in the workplace.

Official Campus Waste Labels

In addition, we reviewed 23 chemical waste containers for official campus waste label requirements to include: use of official campus waste label; identification as flammable, corrosive, oxidizer, reactive or toxic; identification of elements in liquid or solid; original labels defaced when reusing containers; start date identification. We found:

- Three waste containers did not have an official campus waste label.
- Eight campus waste labels did not classify the chemical waste as flammable, corrosive, oxidizer, reactive, or toxic.
- Four waste labels did not classify the physical state⁵ of the chemical.
- Start date⁶ on waste labels did not always fulfill the requirements:
 - Six campus waste labels did not include start dates.
 - One start date did not include the day of the month.

² Hazard classification: provides specific criteria for classification of health and physical hazards.

³ Globally Harmonized System: is a system for harmonizing hazard classification criteria and chemical hazard communication elements worldwide.

⁴ Hazard Communication Standard: requires employers in the United States to disclose toxic and hazardous substances in workplaces.

⁵ Physical state: solid, liquid, or gas.

⁶ Start date: The first drop of chemical waste added to the container.

- One waste start date had exceeded the 270 day requirement⁷ to remove the chemical from the lab.

Clear and consistent labeling throughout campus will ensure that chemical hazards are easily distinguishable and understood by employees and emergency personnel in case of an incident.

Hazardous Material Inventory

We determined that the inventory in the laboratory is not up-to-date and does not match the inventory in UC Chemicals. We identified:

- Three of 15 hazardous chemicals tested were in UC Chemicals inventory; however, they were no longer in inventory in a lab or storage room.
- Quantity of chemicals, although minor, was less in the laboratory or storage areas than in UC Chemicals.

Inventory is only performed annually. Therefore, it is not a real time inventory, nor does it reflect current chemical quantities. Laboratories complete an EH&S questionnaire annually for inspectors to update in the system. The use of barcode labels could assist in reconciling inventory and benefit labs by maintaining a more accurate inventory of chemicals on hand for purposes of inventory control and reordering chemicals.

Accurate hazardous chemical inventory should be maintained to ensure the safety of employees, regulatory compliance, and to minimize costs and waste. Inventory allows laboratory staff to identify chemicals and quantities in their lab. UC Inspect can assist in electronically tracking inventory additions and subtractions in real time.

Storage Requirements and Guidelines

We reviewed five selected labs to ensure hazardous material storage complies with general and waste requirements. We determined that overall storage requirements were met; however, storage of chemicals and waste materials could be improved to consider all safety precautionary measures.

Hazardous Waste Storage Requirements

We found hazardous materials were stored in appropriate containers, and glass containers were completely sealed with screw tops. We verified that waste gas cylinders had safety caps, and sharp objects were stored in puncture proof containers. However, we observed:

- One lab stored hazardous chemical waste on top of a cabinet. The waste bin was not secured to prevent spillage.
- One lab stored hazardous chemical waste in the fume hood. Fume hoods may be used temporarily to store small quantities of waste materials, but should be used for testing chemicals and not serve as a designated waste storage area.

⁷ UCSB requires to remove hazardous chemical waste in less than 270 days to comply with county safety regulations.

General Storage Guidelines

In addition, we reviewed general storage prudent practices to ensure labs follow standard guidelines for storage of hazardous chemical materials. We observed five general chemical storage areas and found:

- Hazardous chemicals stored higher than five feet were located behind glass cabinet doors or on shelves with safety guards. However, we observed in one storage room, personnel did not use adequate equipment to reach chemicals located on shelves higher than five feet.
- One storage area had chemical materials stored on top of cabinets. Even though this is not recommended practice, a safety guard on the top of the cabinet was installed to prevent spillage.

All five storage area exits were free of stored materials to allow egress and access in case of an emergency. Proper storage of hazardous chemicals is as important to safety as proper chemical handling. Storage requirements and guidelines reduces the risk of exposure from hazardous effects that could result from an accidental spill or a chemical reaction.

RECOMMENDATION

We recommend Environmental Health and Safety evaluate and develop outreach and targeted training to PI's and Researchers on improving their laboratory regulatory compliance to:

- Properly complete the official campus waste labels.
- Remove waste chemicals within 270 days from the start date on the official campus waste label.
- Store hazardous chemical waste in a designated area that is safe from hazardous exposure and use of proper equipment to reach hazardous chemicals that are stored on shelves higher than five feet.
- Promote the use of bar codes to reconcile inventory and update UC Inspect more frequently to provide accurate inventory controls.

MANAGEMENT RESPONSE

Environmental Health and Safety will evaluate and develop outreach and targeted training to PI's and Researchers on improving their laboratory's regulatory compliance in the following areas:

- Proper filling out of the official campus waste labels.
- The removal of hazardous waste within 270 days of the date marked on the official label.
- Storage of hazardous chemical waste in appropriate designated areas.
- Promote the use of bar codes to reconcile inventory.

Expected completion date: May 1, 2020.

GENERAL INFORMATION

BACKGROUND⁸

The office of Environmental Health & Safety (EH&S) promotes a safe and healthful environment for research. Through education, auditing and monitoring, technical consultation, and the provision of direct services. EH&S assists the campus in meeting its obligations for compliance with the state and federal health, safety, and environmental regulations.

EH&S Laboratory Safety Program

Lab Safety provides training, information, and inspections to foster safe and standard lab practices to protect workers against chemical and physical hazards. In addition, Lab Safety reviews all new lab construction and renovation plans, assists labs in developing their Occupational Safety and Health Administration (OSHA) Chemical Hygiene Plans⁹, and investigates lab accidents and coordinates hazardous materials emergency response activities. All laboratories which use chemicals are subject to the Cal-OSHA standard titled: "Occupational Exposure to Hazardous Chemicals in Laboratories"; commonly known as the "Laboratory Safety Standard".

The Laboratory Safety Review Program

EH&S inspects all lab spaces on campus at least annually. However, it is strongly recommended that labs initiate periodic self-inspections (recommend minimum of twice a year). Prior to the EH&S visits, a self-inspection checklist is generally distributed to aid laboratories in establishing their own audits. The list does not include every possible safety issue, but are general guidelines. Most items are based on applicable regulations or UC policy. Radiation and biohazard issues are not addressed in the checklist because they are highly specialized and these labs receive targeted EH&S visits.

In 2019 EH&S instituted a "lab safety review program". This is an enhanced version of the former safety inspection program, in which an EH&S representative contacts each research group for an appointment to meet with a knowledgeable group representative. The sit-downs are generally less than an hour. Due to the large number of new UC lab safety policies/procedures in recent years, it is a good opportunity to review a group's understanding, answer questions, and hear from researchers about their concerns.

The results from these reviews are summarized within an online tool known as UC Inspect. The application allows for efficient communication and tracking of findings and corrections.

⁸ EH&S website.

⁹ Chemical Hygiene Plan is a written program developed and implemented that sets forth procedures, equipment, personal protective equipment, and work practices to protect laboratory workers from harm due to hazardous chemicals.

Hazard Communication Standard¹⁰

In order to ensure chemical safety in the workplace, information about the identities and hazards of the chemicals must be available and understandable to workers. OSHA's Hazard Communication Standard (HCS) requires the development and dissemination of such information:

- Chemical manufacturers and importers are required to evaluate the hazards of the chemicals they produce or import, and prepare labels and safety data sheets to convey the hazard information to their downstream customers.
- All employers with hazardous chemicals in their workplaces must have labels and safety data sheets for their exposed workers, and train them to handle the chemicals appropriately.

In 2012, the HCS was revised to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) to provide a common and coherent approach to classifying chemicals and communicating hazard information on labels and safety data sheets. The GHS was developed by the United Nations for international standardization of hazard communication and classification and adopted by OSHA. Chemicals purchased prior to March 2016 were not required to have the GHS hazardous identifier. By June of 2016, all manufactured and distributed chemicals had to be in full compliance with the revised HCS.

Policies and regulations on hazard identification with respect to labeling and Safety Data Sheets are:

- Labels on incoming containers of hazardous chemicals are not to be removed or defaced.
- The primary campus access to Safety Data Sheets is through the internet. Individual labs are encouraged to maintain their own hardcopy files as well.
- For chemical substances developed in University laboratories, the provisions for hazard determination, training, and labeling shall be those stated in the Laboratory Standard.

SCOPE

The limited scope of our work included lab inspections and follow up, hazardous material inventory, label and storage requirements. A hazardous chemical is defined by the HCS as any chemical which can cause a physical or health hazard as determined by the manufacturer.

Specifically, we:

- Reviewed UC and UCSB policies, state and federal regulations, best practices, and other guidance concerning lab safety.

¹⁰ California Code of Regulations, *Hazard Communication Standard*, Title 8, Section 5194 and OSHA Brief, *Hazard Communications Standards: Label and Pictograms*.

- Conducted interviews with Environmental Health & Safety and lab personnel to obtain a better understanding of the process and internal controls in place and to identify areas of concern.
- Selected a sample of laboratories handling hazardous chemical materials and determined whether:
 - Inspections were performed annually and follow up was documented.
 - Label requirements included required criteria for official manufacturer labels and campus waste labels.
 - Inventory control processes were adequate and current.
 - Storage requirements followed best practices.

CRITERIA

Our audit was based upon standards as set forth in the UC and UCSB policies, best practices, and other guidance relevant to the scope of the audit. This audit was conducted in conformance with the *International Standards for the Professional Practice of Internal Auditing*.

This review emphasized, but was not limited to, compliance with:

- UC Policy, *Management of Health, Safety, and the Environment*, dated October 2005.
- UC Policy, *Laboratory Safety Training*, dated October 2013.
- UC Policy 5400, *Environmental Health and Safety*, dated June 1989.
- UCSB Laboratory Safety Manual and Chemical Hygiene Plan.
- UCSB Hazard Communication Program.
- California Code of Regulations, *Hazard Communication Standard*, Title 8, Section 5194.
- OSHA Brief, *Hazard Communications Standards: Label and Pictograms*.

AUDIT TEAM

Ashley Andersen, Audit Director
Antonio Mañas-Melendez, Associate Director
Irene Camargo, Senior Auditor
Karen Quintana, Staff Auditor