



AUDIT AND ADVISORY SERVICES

Hazardous Materials Handling Audit

Project No. 12-588

June 29, 2012

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June 29, 2012

John Wilton
Vice Chancellor
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Vice Chancellor Wilton:

We have completed our audit of Hazardous Materials Handling per our annual audit plan in accordance with the Institute of Internal Auditors, Inc. *Standards for the Professional Practice of Internal Auditing* and the University of California Internal Audit Charter.

Attached is our audit report, including observations and management action plans. Thank you to Office of Environment, Health, and Safety and other departmental staff for their cooperative efforts throughout our audit process.

Please destroy all copies of draft reports and related documents. Also, please do not hesitate to call on Audit and Advisory Services if we can be of further assistance in this or other matters.

Respectfully reported,

Wanda Lynn Riley
Chief Audit Executive

cc: Associate Vice Chancellor Ron Coley
Director Mark Freiberg
Senior Vice President Sheryl Vacca
Associate Chancellor Linda Morris Williams
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**University of California, Berkeley
Audit and Advisory Services
Hazardous Materials Handling**

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OVERVIEW

Executive Summary

UC Berkeley is home to approximately 500 laboratories and 75 shops across approximately 70 separate organizational units that handle hazardous chemicals. Accountability for compliance with health and safety requirements on campus is shared across the Office of Environment, Health and Safety (EH&S), and individual academic and Physical Plant - Campus Services (PP-CS) departments, with primary accountability for ensuring safe procedures and conduct necessarily residing with the Principal Investigator and individual employees within each laboratory and shop.

The overall objective of our audit was to assess the adequacy of campus- and department-level activities to ensure faculty, staff, and student awareness of, and compliance with, relevant regulations designed to mitigate the health and safety risks associated with the handling of hazardous chemicals. Our audit was focused on procedures and controls designed to mitigate the risks associated with handling and storing hazardous chemicals.

Units included in our review were EH&S, Physical Plant-Campus Services (PPCS), Chemistry, California Institute for Quantitative Biosciences, Molecular and Cell Biology, and Electrical Engineering and Computer Sciences. The units included in our audit were selected based on a judgment of which units represented the most significant risk to the campus as measured by the volume and type of chemicals used and waste generated.

Our audit approach included reviews of EH&S and department safety program-related documentation, interviews with EH&S and department personnel, and physical inspections of a sample of laboratories (or shops for PP-CS).

Because of the inherent hazards in handling chemicals, it is not feasible to implement procedures to completely mitigate the risk that a chemical exposure or release may occur. We did identify, however, certain gaps in the campus' current approach to managing these risks that we believe should be addressed to provide greater assurance regarding the sufficiency and appropriateness of practices on campus. Our most significant observations pertained to (i) gaps in laboratory and shop personnel chemical hazard training, (ii) gaps in current internal inspection programs with regard to providing assurance that findings are appropriately prioritized and resolved, (iii) a lack of clear protocol with regard to coordinating the on-site response of first responders to chemical incidents, and (iv) delays in the inspection and repair of safety equipment.

Source and Purpose of the Audit

Audit and Advisory Services (A&AS) completed our audit of hazardous materials handling as part of our annual audit plan for FY 2012. The overall objective of our audit was to assess the adequacy of campus- and department-level activities to ensure faculty, staff, and student awareness of, and compliance with, relevant regulations designed to mitigate the risks associated with the handling of hazardous chemicals.

Scope of the Audit

Our audit was focused on procedures and controls designed to mitigate the health and safety risks associated with handling and storing hazardous chemicals. Process areas in the scope of our review were: hazardous chemical handling and storage in the laboratory and shop setting; hazardous waste removal, transport, and disposal; facilities management, including processes to ensure the proper consideration of engineering controls in the design/build stage and on-going inspection of engineering controls; incident response; tools and training; and monitoring. Procedures and controls related to biohazard and radiation safety were not included in our audit scope.

Units included in our review were EH&S, PP-CS, the College of Chemistry, California Institute for Quantitative Biosciences, Molecular and Cell Biology, and Electrical Engineering and Computer Sciences. The units included in our audit were selected based on a judgment of which units represented the most significant risk to the campus as measured by the volume and type of chemicals used and waste generated.

Our audit approach included reviews of EH&S and department safety program-related documentation, interviews with unit personnel, and inspections of a sample of laboratories (or shops for PP-CS). Our inspection procedures were based on the campus' 2011 self-inspection template developed by EH&S and used across all campus workspaces (including laboratories and shops) to perform and document health and safety self-assessments annually as is required by the California Division of Occupational Safety and Health (Cal/OSHA).

Background Information

Campus Chemical Use and Programs

UC Berkeley is home to approximately 500 laboratories and 75 shops across approximately 70 separate organizational units that handle hazardous chemicals. As of May 2012, approximately 925,000 pounds of chemicals were being stored in laboratory and shop environments across the campus, with approximately 150,000 pounds of chemical waste generated annually.

The framework for health and safety activities and programs on campus is established by the University of California (UC) "Policy on Management of Health, Safety and the Environment". The policy establishes the general requirement that health, safety, and environmental considerations be systematically integrated into all activities, as well as the principle that responsibility for health and safety is borne by each member of the University community, particularly supervisors. Guiding principles to implement the UC policy further address key elements expected to be incorporated into campus programs, such as ensuring clear roles and responsibilities, requirements for risk assessment of activities, the design of appropriate operational controls, and monitoring.

At UC Berkeley, accountability for compliance with health and safety requirements on campus is shared by EH&S, department management, and each individual. Specific roles and accountabilities for health and safety compliance on campus are delineated in the campus policy, "Responsibility for Environment, Health and Safety".

Under this policy, EH&S' primary accountability is "for tracking developments in environment and health and safety laws and regulations and determining...requirements that apply to campus. Requirements are met through the development of programs by EH&S ... for implementation by campus departments as well as through direct services, consultation, and compliance assistance provided by EH&S." Additionally, as part of an agreement entered into with the Environmental Protection Agency (EPA) in 1992 in response to EPA findings regarding the campus' handling of chemical waste, EH&S also conducts annual inspections of all laboratories and shops on campus. As of July 1, 2011 in light of changes to the campus' chemical waste handling program, this inspection program is no longer mandated; however, management has continued the program, recognizing its importance to the campus as a communication and monitoring mechanism.

Under the campus policy, responsibility for the oversight of compliance with environmental, health and safety obligations resides with unit deans and directors. Responsibility for ensuring safe procedures and conduct by employees in practice resides with each individual manager. Individual students, faculty, and staff also bear responsibility for their own health and safety.

Other structures on campus that play a critical role in ensuring employee safety include department safety committees which are required by state injury and illness prevention statutes, department safety coordinators, building committees, and building coordinators. Risks related to chemical hazards are primarily addressed through the department (versus building) safety structures, although in some cases there is overlap in roles and staffing.

Relevant Regulations

Health and safety requirements are dictated by external regulation, rather than by internal policy. Most relevant to our audit scope are the hazard communication and protective equipment standards established by the Occupational Safety and Health Act (OSHA) that pertain to non-production laboratories as outlined in the OSHA booklet "Laboratory Safety Guidance" and California Code of Regulations (CCR), Title 8, Section 3203 ("Injury and Illness Prevention Program" (IIPP)), which requires employers to have a formal program in place to identify and correct workplace hazards and prevent employee injury. Key requirements of an IIPP include: (i) training employees on, and monitoring compliance with, safe work practices, (ii) inspecting for and correcting unsafe work conditions, (iii) reporting and investigating all occupational injuries, (iv) encouraging employees to report unsafe conditions, and (v) communicating safety issues in a way that is understandable to all workers. EH&S provides a template to campus to facilitate IIPP development and documentation in accordance with regulations; however, each department is responsible for documenting and implementing its own IIPP.

Other regulations relevant but not central to our audit scope included: CCR, Title 22, which establishes requirements for hazardous waste management, and CCR, Title 19, which establishes requirements for fire and life safety activities.

Concurrent Events

During the course of our audit, there was a significant chemical release incident (a spill of 1,650 gallons of diesel fuel used to power an emergency generator) with financial and environmental impacts. A joint investigation was launched the City of Berkeley and campus officials regarding the cause of the spill; as of the issuance date for this report, conclusions have not yet been rendered. Because this incident was already being actively and independently investigated, we did not expand our audit scope to include an assessment of this specific event. As well, procedures and controls related to emergency generators in general were also not addressed by our audit.

Summary Conclusion

Because of the inherent hazards in handling chemicals, it is not feasible to implement procedures to completely mitigate the risk that a chemical exposure or release may occur. Managing these risks is particularly complex in a decentralized environment where risks and mitigation strategies are dispersed across multiple laboratories and shops, each separately overseen.

We did identify, however, certain gaps in the campus' current approach to managing these risks that we believe should be addressed to provide greater assurance regarding the sufficiency and appropriateness of practices on campus, as follows:

- Monitoring of training completion is not sufficient to ensure that laboratory and shop personnel are completing training related to the hazards of their work, including training on basic safety protocols or protocols related to specific research procedures;
- There is currently no process in place to provide reasonable assurance that laboratories have developed appropriate standard operating procedures (SOPs) for all hazardous work;
- Current inspection processes to identify and inform laboratories and shops of health and safety concerns are not sufficient to ensure that appropriate corrective action is taken and that potentially more pervasive health and safety concerns are addressed;
- Protocols for engaging with first responders in case of a chemical incident are not sufficiently well delineated to ensure first responders have the information they need to feel confident that the risks to their safety are controlled and, therefore, be willing to enter the affected facility;
- Inspection and/or repair of safety equipment is not consistently performed in accordance with established inspection and repair timelines to ensure the timely detection and repair of issues;
- There is currently no formal process to ensure the sufficiency of department safety programs relative to the risks inherent in that department's operations; and
- Laboratories and shops generally appear to dispose of waste on a timely basis; however, we found that unwanted chemicals, including particularly hazardous chemicals, often continue to be stored as opposed to disposed of, increasing the overall risk assumed by a given laboratory or shop.

We also noted gaps in procedures and systems related to controlling laboratory physical access, as well as in procedures and systems related to tracking chemicals stored on campus. Prior to our audit, management had already begun addressing these gaps through initiatives to replace related systems and, therefore, these findings are not detailed in our report. We have communicated the specifics of these observations to management for their consideration as they move forward with their system replacement plans.

Our specific observations, along with management's responses, follow in descending order of significance.

SUMMARY OF OBSERVATIONS & MANAGEMENT RESPONSE AND ACTION PLAN

Training Completion Monitoring

Observation

The completion of required health and safety training is inconsistently monitored at the laboratory, department, or campus level. Based on our review of training records for 18 laboratory members (students, faculty and staff) across three departments, only two members had completed the basic laboratory safety training that is required for all people working in the laboratory environment. As well, there were gaps noted in the completion of required training related to the Illness and Injury Prevention Program (IIPP), the local building emergency plan, hazardous material spill response, and hazardous waste disposal procedures. We were not able to verify the completion of laboratory member training related to the Chemical Hygiene Plan (CHP) because of the illegibility of many of the signatures in the CHP template training records. The new CHP template (expected to be issued by EH&S by early 2013) includes a line to document the trainee's printed name in addition to a signature.

We also noted similar gaps in the safety training records and training needs identification and monitoring for PP-CS and EH&S personnel who handle hazardous materials.

Health and safety training is critical to ensuring that students, staff, and faculty are knowledgeable about the hazards of their work and how to mitigate those hazards. Further, the failure to complete and document completion of health and safety trainings related to the hazards of an employee's job is a potential violation of Cal/OSHA requirements and may result in fines, penalties, and, in the event of an accident, possible criminal sanctions.

Management Response and Action Plan

Accurate and reliable determination of compliance training needs and documentation of training completion have presented challenges on campus for many years and across many subject areas. Several years ago, a significant step forward was made related to training requirements on sexual harassment prevention and on ethics when the UC system adopted the SumTotal learning management system (LMS, or "UC Learning Center"), which worked well for both of those topics, but not nearly so well for other compliance topics, including safety training.

Perhaps more than any other compliance area, safety training presents a tremendous challenge in training needs determination, training delivery, and training completion documentation because of the wide array of topics (IIPP, emergency procedures, physical hazards, various chemical hazards, etc.) and the wide array of affected employee types – including some safety training (e.g., radiation user training) that is required of some persons who are not even campus employees.

EH&S has been working for years on the many aspects of this challenge, including collaborative work with Human Resources, the Research Administration and Compliance Office, and the Center for Organizational and Workforce Effectiveness (CO_{WE}). One of the earliest outcomes of this

collaboration -- and a tool that remains available today to identify lab safety and compliance training needs -- is the table of "Required Safety and Compliance Training for Researchers" found online at <http://rac.berkeley.edu/training.html>.

EH&S long ago recognized the need for an online system enabling campus personnel to identify their specific training needs and requirements, to receive the needed training, and to maintain their training completion records electronically. In 2004, together with Human Resources, EH&S developed the Safety Training and Recordkeeping System (STARS). Originally intended to provide a "one-stop shop" to identify training requirements through a customized on-line questionnaire and to store completion records, the launch of a robust and fully functional STARS has been held up by HR resource limitations and competing priorities for HR staff.

Integrated into the previous version of the Human Resources Management System (HRMS), STARS was no longer supported by Human Resources after an HRMS upgrade. In an effort to preserve the training needs assessment component of STARS, HR agreed to disable STARS's record keeping features so that it could be used as a stand-alone needs assessment tool. This more function-limited version of STARS has been deployed in some campus units, but not all. A campuswide rollout is currently planned for Fall 2012, but this approach may be altered by the anticipated settlement agreement likely to come soon out of UCLA.

Unfortunately, since the purchase and launch of the system-wide UC Learning Center, which delivers training and stores records, work required to share data between STARS and the UC Learning Center has not been completed due to resource allocation issues outside of EH&S. This has left the campus with two complex stand-alone systems instead of one simpler unified solution. Furthermore, system-wide efforts to create a UC Learning Center training needs assessment tool have stalled due to the complexity of the project and a lack of resources.

One other major challenge needing to be resolved -- even with an integrated STARS/UC Learning Center solution -- is the "affiliate" issue. Many laboratory personnel (e.g., LBNL and HHMI employees) are "affiliates" rather than campus employees, and so they do not have records in the human resources system from which the UC Learning Center pulls its user data; these include undergraduates, grad students, post-docs and visiting scholars. Because there are no HR records for these individuals, they are denied access to the UC Learning Center. This has forced EH&S to create workaround systems for this large subset of the campus population. A process to add these users to the UC Learning Center exists and is called the "Affiliate Feed." However, it requires departmental staff to enter their affiliates. This has proven to be unreliable at best, leaving many of those who need access to the UC Learning Center out of the system. In order to ensure that all of those who need training are served, EH&S attempts to handle them on an as-needed basis, one user at a time.

Full implementation of STARS connected to the LMS will allow all campus personnel to (a) determine what safety training is required of them; (b) determine where to obtain the training; and (c) provide a record of the training (both needed and completed) viewable by supervisors and department safety coordinators.

Action Plan

In the May 2012 meetings of the Committee on Compliance, Accountability, Risk and Ethics (CARE) and the Compliance and Enterprise Risk Committee (CERC), EH&S Director Mark

Freiberg again highlighted the many significant deficiencies of UC Learning Center for broad-spectrum safety and compliance training recordkeeping. Chancellor Birgeneau and Executive Vice Chancellor and Provost (EVCP) Breslauer were present for the CARE meeting and they came to understand the issues. Associate Chancellor Linda Williams will be establishing a task force to improve the situation and she has asked Director Freiberg to help lead that effort. This work will require the engagement of AVC-HR Jeannine Raymond, COrWE Director Liz Elliot and other applicable campus leaders.

By August 31, 2012, EH&S will explore with both UC Davis and UC Riverside their newly created, centralized, online processes to add affiliates to the UC Learning Center. Implementing such a system on the Berkeley campus would help to close the gaps caused by lack of access but would require HR support and collaboration.

Should the above prove unsuccessful, we have a modified STARS system that can be launched by February 1, 2013 to identify required training as a stand-alone needs assessment tool, completely disconnected from the LMS. The LMS can then be used separately to deliver and store training records. However, in the era of Operational Excellence (OE), such a piecemeal system is not representative of the OE culture we are all striving towards.

Regardless of the next steps with STARS and LMS implementation, EH&S needs to more effectively escalate training compliance problems -- first to department chairs, then to deans, followed by formal communication from the Laboratory Operations & Safety Committee (LO&SC) to the vice chancellor -- research and/or EVCP. EH&S will have a written "escalation" procedure in place by the end of 2012.

Finally, to enhance outreach regarding the Lab Safety Training class required of all new employees and graduate students working in campus labs, EH&S will immediately begin to communicate directly with lab safety contacts, as well as with department safety coordinators, to seek full enrollment.

Standard Operating Procedures

Cal/OSHA requires that laboratories have standard operating procedures (SOPs) for work with hazardous chemicals. Based on a high-level review of SOPs developed by the laboratories included in our audit, we identified one laboratory with SOPs that were not sufficient with regard to the level of detail included. We also identified one laboratory that did not appear to have developed SOPs. While the remaining laboratories in our sample had developed detailed SOPs for some laboratory procedures, in general, protocols at the laboratory level for ensuring that SOPs are developed for all hazardous procedures on an on-going basis appear largely informal.

EH&S has developed "fact sheets" that serve as SOPs for some common hazardous chemicals; however, many laboratories work with specific hazards that are not addressed by the EH&S fact sheets. Over the past two years, EH&S has prioritized communicating with laboratories about the need to develop SOPs and has worked with departments to assist in the development of SOPs that have broader impact within departments. As well, department safety coordinators report that they also work with laboratories on an ad hoc basis to identify and recommend processes that should have SOPs. However, there is currently not a program in place to provide reasonable assurance that laboratories have developed appropriate SOPs for all hazardous work.

SOPs help ensure that hazards associated with processes, and necessary steps to mitigate those risks, have been considered and communicated. Further, not having SOPs for all hazardous procedures is a potential violation of the Cal/OSHA laboratory standard and may result in fines, penalties, and, in the event of an accident, possible criminal sanctions.

Management Response and Action Plan

EH&S began emphasizing the need for written SOPs in 2009, as a part of the Laboratory and Shop Inspection Program (LSIP). In the FY09/10 LSIP, the program re-educated labs on the requirement for SOPs (a topic already addressed in our Lab Safety Training course) and evaluated in each lab whether any had been written. In FY10/11, the LSIP monitored both further development of written SOPs, and documented training on the SOPs. Additionally, EH&S launched an SOP Sharepoint site in early 2011 to facilitate sharing of SOPs among research groups. To eliminate some challenges experienced in navigating the site, it has recently been moved off Sharepoint and onto the EH&S website. While the expertise in SOP content resides within each lab, the process of posting an SOP to the EH&S website has involved high-level review by EH&S staff to check that appropriate content and format are used. To date, submitting SOPs to EH&S has not been a requirement, partly because of EH&S staffing levels available to conduct these reviews.

Action Plan

There is a strong expectation that any settlement agreement stemming from the 2009 UCLA lab fatality will likely establish new and specific requirements related to the documentation of both SOP development and training. At UC Berkeley, our action plan for addressing SOP deficiencies will be finalized and implemented as soon as this information is available and EH&S staff availability and priorities are reconsidered. Our current plans are as follows.

In the FY12/13 LSIP inspections, the number of written SOPs available in each laboratory will be monitored and recorded in our LSIP database. The research group will also be briefed in person and via email on the applicable requirements (both those in the Cal/OSHA standard and any in the settlement agreement). In addition, a briefing to the Council of Science & Engineering Deans is being arranged by the EH&S director for Summer 2012; this briefing will emphasize the requirements related to written SOPs and training, among other related topics. The need for ongoing SOP development (whenever new processes are initiated) and documented training will be an issue the deans will be asked to address.

EH&S will continue our discussions of SOP issues with the LO&SC to determine the best methods for ensuring appropriate attention is given to SOPs by campus research groups. This may include a requirement for all SOPs to be posted on the EH&S website in a standard format that would be searchable. Additional EH&S staffing would be needed to review all SOPs posted.

Across the UC system, the EH&S offices are collaborating on the procurement or development of a new chemical inventory (CI) program/application that all of the campuses anticipate adopting sometime within FY12/13. EH&S staff are exploring whether this new CI program might be able to include features to track available SOPs and/or help research groups prioritize which hazardous materials need written SOPs the most urgently.

Inspection Finding Resolution Protocols

Observation

EH&S has a process for logging and following up on findings from the annual inspections. However, in general, remediation actions are closed based solely on the laboratory's assertion that the condition was corrected and the timeliness of remediation is not actively managed. In cases of highly hazardous findings, EH&S may be more directly involved to ensure sufficient and timely corrective action; however, there is not a formal protocol to risk-rank individual or aggregate findings to ensure that this degree of involvement occurs in all high risk cases where additional oversight is warranted. As well, unlike under the radiation and biosafety programs, there are generally no consequences to laboratories or shops that do not sufficiently address chemical safety and hazard-related findings or who have recurrent issues. For example, there may be instances when the frequency or nature of inspection findings suggests that a more comprehensive review of laboratory practices should occur before operations continue.

We identified a number of findings through our physical inspection of a sample of laboratories and shops, and interviews with the laboratory and shop safety contacts that highlight the need for improved follow-up and verification procedures to ensure that EH&S inspection findings or other noted instances of potentially unsafe conditions or practices are addressed. Our findings included "housekeeping" items, but did also include more critical lapses such as the improper use of personal protective equipment and insufficiently labeled or improperly stored hazardous chemicals and waste. Many of the issues we observed in laboratories had also been noted in the prior EH&S annual inspection (the most recent of which was conducted in March 2011), indicating that laboratories are likely not consistently correcting conditions or practices even when made aware of concerns. Our specific physical inspection findings have been communicated to both EH&S and the department safety coordinators to ensure proper follow-up and remediation, and to help inform compliance topics that should be reinforced with laboratory principal investigators and shop supervisors.

Absent formal and consistent protocols for ensuring that unsafe practices and conditions are prioritized and fully addressed, there is a risk, as was noted, that laboratories and shops will not take timely or sufficient corrective action to minimize the likelihood of a chemical accident. As well, laboratories that have critical, pervasive, or persistent issues may not be identified to ensure that additional monitoring and oversight is performed as warranted.

Management Response and Action Plan

EH&S launched the Laboratory and Shop Inspection Program (LSIP) 10 years ago in response to the EPA self-audit of the campus' rooms with hazardous materials. At that time, all EH&S inspection programs aside from those in Radiation Safety relied on the "good will" of the inspected research group to resolve the findings, and report back to EH&S if requested. With the LSIP, we designed an automated, simpler method for labs to report back to EH&S on all identified deficiencies. The system automatically sends email messages containing a link to a deficiency database that the researcher updates once the deficiencies have been corrected. This system can be sustained by the level of staffing currently available in EH&S.

Action Plan

EH&S recently requested funding for additional lab safety inspector positions. In addition, we are looking into some potential staff reassignments to provide additional support on chemical safety in campus labs. These changes would increase our chemical safety staffing to levels approaching most other major UC campuses. The additional staff positions would allow for in-person verification of deficiency correction. The exact number of additional staff needed to accomplish this shift will be determined and submitted to Administration & Finance executives once the terms of any UCLA settlement are announced.

One action that EH&S will take in FY12/13 to more assertively ensure the proper correction of identified lab hazards is to include in our LSIP inspections a spot check of each lab's most recent self-assessment documents to verify that they are filled out accurately, and that any hazards identified in the self-assessment process have been properly corrected. We will use our experience in FY12/13 to determine if additional staff resources would be needed to sustain this enhancement.

To help ensure our limited chemical safety staff resources are deployed to address the greatest hazardous materials risks, EH&S is also considering establishing a formal method of risk-ranking the hundreds of laboratories on campus. Those labs in a high risk group would be inspected more frequently, and those in lower risk groups would be inspected less frequently.

Also, EH&S is collaborating with the other UC EH&S offices to develop a standard lab inspection software program that is currently intended to house inspection data from all EH&S inspection programs (chemical, radiation, biohazards, etc.). This system would provide each inspector the ability to see what previous inspectors had noted in a given lab and follow-up on those earlier findings during their inspection. As this systemwide collaboration is just in the concept development phase, it is uncertain what the timeline or exact outcome will be, but the hope among the campuses is to have a program functional in 2013.

Finally, EH&S will work with LO&SC to establish a standard, written procedure for escalating any unresolved lab safety deficiencies to the proper academic management level. This will be in place by the end of 2012.

Chemical Incident Response

Observation

Prior to our audit, a chemical incident occurred in a campus laboratory that highlighted a gap in protocols related to chemical incident response in cases when first responder (e.g., Berkeley Fire Department (BFD)) assistance is required. Specifically, there were not sufficiently well delineated and vetted communication protocols for first responders to feel confident in the information provided related to the nature of the incident and the hazards they might encounter. As of report issuance, EH&S and the department housing the laboratory where the incident occurred have worked with the agencies that serve as first responders to agree on communication protocols for future incidents within the department's facilities. EH&S management has identified a need to tailor and extend these protocols to address similar gaps in other buildings and departments on campus; however, related materials have not yet been developed or communicated.

Management Response and Action Plan

A serious incident happened on campus in May 2011 where the efficacy of the coordination and communication between responders and campus personnel was sub-optimal, and BFD experienced some delays in entering the scene. Confusion over who was in charge, and who represented the University, raised additional concerns. In the aftermath, EH&S held a series of meetings with Berkeley and Alameda County Fire Departments, and campus personnel. A full report with lessons learned and action items was written. In November 2011, EH&S held two trainings with the affected campus unit and BFD to provide training on lab hazards and response coordination. In May 2012, EH&S held additional trainings for BFD on the hazards in other UCB lab departments. Now, after any hazardous materials incident involving the fire department, EH&S coordinates a debrief with the responders and the affected department to identify what worked well, as well as any areas for improvement.

Action Plan

EH&S will provide annual refresher training each Fall to BFD and Alameda County Fire on lab hazards and appropriate responses to lab incidents.

EH&S has developed a fact sheet informing campus units how best to interface with emergency responders, based on lessons learned from last year's incident. This fact sheet will be the basis for training delivered to campus department safety coordinators and building coordinators. The fact sheet will also be sent to all lab safety contacts for discussion at lab group meetings.

EH&S will continue to contact emergency response agencies immediately after any hazardous materials incident to debrief on the response and determine whether additional meetings would be useful.

Safety Equipment Maintenance

Observation

Based on a review of EH&S and PP-CS records related to fume hood inspections and repairs, repairs to fume hoods that fall below acceptable air flow measurements as defined by Cal/OSHA are not consistently made on a timely basis. Given the fume hood's primacy in ensuring the safety of laboratory procedures and the potential disruptions to research in the event a fume hood cannot be used, it is reasonable to expect that repairs should be completed within at most a one to two week period. Based on our review of records, it appears that, in approximately 30% of cases, repairs to fume hoods with unsatisfactory low (UL) air flow measurements had not been reported as repaired more than one month after the repair is requested. Based on our follow-up on a limited number of fume hood repairs, it appears that a key contributing factor to the noted delays is the lack of a clear and consistent understanding between EH&S and PP-CS regarding communication and prioritization protocols related to repairs. EH&S' labels fume hoods that are not safe to be used to notify laboratory personnel that they are not properly functioning. However, if repairs are not timely, there is a risk that researchers may perform work in fume hoods that do not provide adequate or optimal health and safety protection in order to minimize disruptions to research.

In addition, in four of nine laboratories and shops visited, eye washes were not noted to have been inspected on a monthly basis as is required. Eye wash inspection is the responsibility of either the laboratory or the building coordinator depending on the location of the eye wash and the individual building. Without timely and routine inspection of safety equipment such as eye washes, there is a risk that equipment in need of repair will not be identified and that it will not function properly if needed in case of an emergency.

Management Response and Action Plan

PP-CS has insufficient staff to perform all required emergency eyewash and shower tests. Thus, monthly eyewash flushes are the responsibility of the individual research groups (where the eyewash units are located within labs) and building management (where the units are located in common areas).

Action Plan

EH&S has been working with PP-CS over the last two months to develop an improved system for assigning proper priorities to fume hood repairs. The agreed upon document is being finalized at monthly meetings. Since fume hood repairs are handled differently at the College of Chemistry (Chemistry), this agreement is focused on the rest of campus. In summary, the process has been simplified to lead to better record keeping, information flow and communication. The new key components include listing only one hood on each PP-CS service tag, and clarifying what conditions warrant an "A" tag or a "B" tag. Besides continuing the monthly meetings to finalize the document, the next step is to address how Chemistry fits into the system. Possibly, this document may be merged with an existing EH&S/Chemistry agreement on EH&S' inspection protocols for Chemistry fume hoods. We plan to have a finalized and implemented written program by December 1, 2012.

To reinforce research group responsibilities for eyewash flushes (in many cases), EH&S will add this to the next round of the LSIP program and highlight it during the next self-assessment cycle.

Obsolete Chemicals

In a number of the laboratories and shops in the scope of our review, the laboratory safety contact asserted that many of the chemicals on hand, including certain particularly hazardous chemicals, were no longer being used or had been inherited and had never been used. The campus has a chemical exchange program in place; however, laboratories largely do not participate in this program reportedly due to concerns about potential effects using older chemicals might have on research results. Laboratories may be hesitant to dispose of unused or obsolete chemicals because of the associated costs.

There are safety risks associated with storing hazardous chemicals, particularly aging chemicals. As well, keeping unused chemicals in inventory complicates any efforts to monitor the use of hazardous chemicals on campus. The current chemical inventory system is not a perpetual system and does not provide for the monitoring of chemical use and aging. To the extent that chemicals may not be needed for research purposes, the risk of storing these chemicals may not be warranted.

Management Response and Action Plan

On several occasions in the past, EH&S has obtained funding to provide hazardous materials recharge fee “amnesty” programs to encourage the disposal of unneeded chemicals, particularly those of greatest hazard (e.g., toxic gases). EH&S is cautious not to provide these subsidized “amnesty” programs too frequently, as this can encourage stockpiling of unwanted chemicals in order to avoid the standard disposal recharges.

Action Plan

EH&S sought, and has recently been awarded, a TGIF Green Grant award to work with students to reinvigorate the Chemical Exchange Program (CHEX). This program provides a mechanism for researchers to share unused chemicals, and it supports the campus sustainability goal of achieving “zero waste.”

EH&S sends reminders to chemical inventory contacts when their chemical inventory is due. This happens once a quarter to the subset of contacts with inventories due that quarter. In this communication, EH&S will remind these contacts that they should dispose of chemicals that are no longer needed or safe to retain and that they should consider using the EH&S CHEX program for chemicals that may be reused elsewhere on campus. This will be accomplished over FY12/13.

Department Safety Coordinator and Committee Structures

Department safety structures (specifically, the Department Safety Coordinator and the Department Safety Committee) are central to supporting safety in the laboratory and shop setting on campus as the primary conduit for ensuring personnel are aware of health and safety requirements and for assisting personnel in resolving health and safety concerns. EH&S provides guidance to departments regarding expectations for, but does not formally review department implementation of, each structure. We noted two observations related to these structures as follows:

For the College of Chemistry, we noted that there is no standalone Safety Committee dedicated to addressing health and safety concerns. Chemistry currently promotes awareness and accountability through outreach conducted by its Environment, Health, Safety, and Security group (ccEHSS comprised of three FTE). However, the campus has established that each department must have a safety committee in place that meets certain minimum criteria, including meeting at least quarterly, maintaining a record of the matters discussed for at least one year, and communicating meeting outcomes to affected staff and faculty. Further, the campus recommends that the committee membership include representation from all major work groups within the department, including faculty, management, technical personnel, and student employees. These requirements and recommendations are designed to help ensure that health and safety concerns receive the visibility and, as applicable, corrective action they warrant department-wide. The current safety structure and protocols within Chemistry do not appear to meet these minimum requirements and guidelines.

We also noted a key potential vulnerability regarding the Department Safety Coordinator program. The department safety coordinator’s effectiveness in promoting and monitoring safe conditions and practices depends on the extent of their related knowledge relative to the types of hazardous activities within their department, as well as the number of laboratories or hazardous operations in

the coordinator's purview. With the exception of a few departments on campus, we understand that the majority of safety coordinators are not health and safety professionals.

Absent sufficient and robust department safety structures, the risk that unsafe conditions or practices may not be identified or properly resolved is increased. Given the importance of these structures to ensuring department-wide awareness of and compliance with health and safety requirements, we believe the campus could benefit from greater involvement by EH&S in ensuring the sufficiency and appropriateness of department safety structures.

Management Response and Action Plan

Cal/OSHA does not require all employers to convene safety committees, but does require an effective means of communicating about health and safety issues; where employers (departments) use safety committees as their primary safety communication tool, the agency does establish minimum meeting frequencies. For more than 15 years, EH&S has provided departments a template Injury and Illness Prevention Program (IIPP) that they can tailor to their operations. To help departments with relatively few hazards (such as office-based departments) take better advantage of the flexibility allowed under the Cal/OSHA regulation, EH&S more recently drafted a new campus-wide IIPP (not a departmental template) which clearly allows departments greater flexibility in safety committee meeting frequency. The current draft (to be finalized in 2012) requires two safety committee meetings each year in every department, and recommends -- but does not require -- more frequent meetings for departments with hazardous materials. This change is accomplished by clarifying that the safety committee is not the primary tool for communicating issues related to occupational health and safety; instead, other methods such as emails, postings, and trainings are designated as the campus's primary communication means on safety issues. The launch of this version of the IIPP has been held up by factors such as the training documentation difficulties discussed earlier.

In recent years, EH&S has greatly enhanced the effectiveness of safety committee meetings and structures in non-lab departments (such as Physical Plant-Campus Services), and with its new focus on laboratory safety -- and a request for additional lab safety professional staff -- EH&S anticipates greater engagement in lab department safety committees.

The role of the department safety coordinators (DSC) is as communication liaison between EH&S and campus departments; as such, DSCs are not expected to be health and safety professionals. While some units, such as Chemistry, have employed safety professionals in the DSC role, this is not expected of every department. To provide some safety professional education to DSCs, EH&S continues to hold DSC updates twice a year to apprise them of arising issues. EH&S staff have also collaborated systemwide to establish professional development training, such as the "EH&S Academy" sponsored by UCOP. To provide greater impact while limiting costs, current plans are to place the contents of the EH&S Academy on-line for DSCs to utilize at any time.

EH&S Action Plan

EH&S plans to finalize and issue its new campuswide IIPP to the campus during FY12/13. In conjunction with this launch, we will provide updated written guidance to DSCs regarding safety committee meeting frequencies and other changes.

EH&S will continue to explore and facilitate external and internal training opportunities for DSCs, including the on-line EH&S Academy once it is completed (date to be determined by UCOP).

Upon settlement of the UCLA case, and with the possibility of additional staffing, EH&S will continue to increase its involvement in lab department safety committees, and its engagement in evaluating and influencing department safety structures. At a minimum, EH&S will attend, or review minutes from, one safety committee meeting per year for each department with hazardous materials.

Chemistry Action Plan

The College of Chemistry has acted upon the audit findings by implementing a standalone Department Safety Committee that is meeting at least quarterly, maintains for at least a year a record of the matters discussed and documents that the meeting outcomes are communicated to staff and faculty. The committee has a core membership consisting of Dean Richard Mathies, Executive Associate Dean David Wemmer, Assistant Dean Alexander Shtromberg and Director of EHS&S Michael Kumpf and a rotating membership consisting of faculty, staff and students representing the Department of Chemistry and the Department of Chemical & Biomolecular Engineering. The core committee has convened on May 21 and on June 4 to discuss ongoing safety issues in specific research laboratories. These meeting minutes/notes are on file and can be viewed in 317 Lewis. The Committee will reconvene with broader representation in the Fall of 2012, by September 30, to discuss general safety issues that are more visible to the departments as a whole. Meeting minutes will be available for review one week following the meeting date. Within three months of the issuance of the new campus wide IIPP and guidance for department safety committees, Chemistry will implement any further changes, as necessary, to the department safety committee to ensure compliance with the standards.