Chemical Sciences Division

Fiscal Year 2016

Environmental Health and Safety

Self-Assessment Report

Chemical Sciences Chemical Safety

Approved By:_____ _____

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Executive Summary

This Chemical Safety Self-Assessment evaluated a wide variety of safety related chemical issues throughout the Chemical Sciences Division. Areas of focus were; waste management, chemical storage, disposal of old chemicals, and management of time-sensitive chemicals and sharps. Through the course of this Self-Assessment we identified HPLC effluent containers that were open. We vented these containers and designated them as waste containers. Issues with SAA, waste labeling, and containers of unknown chemicals were addressed. Sharps left on countertops, overflowing and improper sharps containers were addressed. A system of improved identification and management of peroxide forming solvents and time-sensitive chemicals was developed and implemented. Reactive metals and water reactive chemicals were identified, collected, and properly stored. Old or unused chemicals, and chemicals with obscured or deteriorating labels were disposed. All butane fuel stored in flammable cabinets were removed and located, as directed by our fire department. Furthermore, several chemical transport carriers were distributed in labs to prevent spills while transporting chemicals. As a result of addressing these deficiencies, the Chemical Sciences Division has prevented future chemical related accidents and incidents.

Introduction

Environment, Health, and Safety Self-Assessment is a process of continuously evaluating safety program effectiveness. This Chemical Safety Self-Assessment evaluated a wide variety of safety related issues throughout the Chemical Sciences Division. The Chemical Sciences Division conducted inspections to identify deficiencies in the division's chemical work, waste, and storage practices. Corrective actions were implemented, and all issues identified were addressed.

Assessment Methodology

Chemical Sciences Division Laboratory Chemical Assessment

Sherry Chan, Adam Bradford, and Martin Neitzel conducted periodic and repeated walk-arounds of all CSD laboratories over the course of January to August, 2016.

Areas of focus were:

- Waste (containers labeling, waste unknowns, and SAA posting)
- Chemical storage (compatibility, secondary containment, proper cabinet for chemical)
- Management of chemicals (old chemicals with deteriorated labels, time-sensitive chemicals)
- Sharps management (sharps uncapped, labeling on sharp containers, proper containers)

The CSD lab spaces were inspected by the team for a wide variety of safety related chemical issues. Findings were collected as a result of these inspections and brought to the attention of the Activity Lead or PI in charge of the space. The team then worked on solutions and corrective actions with the help of the Activity Leads or PIs in charge of the areas.

Assessment Results

The following findings were collected as a result of inspection of Chemical Sciences laboratory areas. Before and after pictures are presented for many of the items that were identified along with a description of the problem area in need of addressing. Although a full record of all issues identified is not presented in this report, a summary is presented, and all issues identified were addressed.

Figure 1: Open HPLC waste containers and examples of properly closed and vented containers.

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The top two examples, pictures 1 and 2 in Figure 1 are HPLC effluent containers that are open to atmosphere. Pictures 3 and 4 in Figure 1 demonstrate the proper closures used here at LBNL. This example in picture 3 is

Tygon® tubing used to vent to the house ventilation system. The example in picture 4 is a Justrite® carbon canister used to vent and capture any organic vapors. Six HPLC units were found in Chemical Sciences labs that were in need of proper venting.

Figure 2: Inspection of SAAs.

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All containers of waste need to have the proper, and properly filled out, red hazardous waste label affixed and placed in properly designated Satellite Accumulation Area (SAA). Picture 1 in Figure 2 shows a SAA is a poor state. All waste containers need to be closed unless actively adding waste to the container. For instance, the flammable can and the plastic jug depicted in Figure 2, picture 1 should be fully closed. Picture 2 in Figure 2 depicts a waste bottle that is in a hood that is not labeled as a Satellite Accumulation Area (SAA). This situation was quickly fixed by simply designating the hood as a SAA.

Figure 3: Waste containers in need of attention.

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Picture 1 in Figure 3 shows a container labeled as waste but without a proper waste label affixed. This situation was seen in other areas for used oil and wash chemicals. It is acceptable to recycle used oil or chemicals but they need to be labeled as used chemicals for recycling. Picture 2 depicts a plastic bottle of acid waste with only hydrochloric acid listed as the contents. This is inaccurate as there is clearly a blue substance also present. The accumulation log shows the blue color coming from copper sulfate, but this should also be listed on the red waste label. LBNLs waste department would like to have the top three contents listed on the label with all the contents listed on the accumulation log. Picture 3 shows a volumetric flask with a waste label affixed. This is unacceptable to the waste department but the stopper was frozen shut. We were able to remove the stopper with a pair of pliers being very careful to protect ourselves from the potential of the flask breaking. This material was transferred to a proper waste container and disposed of properly.

Figure 4: Unknowns needed identification before sending to waste.

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In various laboratory inspections, several unknowns were found. In some cases the writing on the containers was obscured/illegible, and in other cases there was too little information to determine what the contents were. For all of these items, we conducted an investigation to determine the contents. The owners were identified, sometimes by contacting people that had long left the lab, and these items were identified and disposed as waste. We also requested that researchers of the division add three items to all containers: the name of the chemical, the owner's name, and the date. Having this information will greatly assist us in determining the contents if the information is obscured or illegible.

Figure 5: Sharps were being mismanaged in a few areas.

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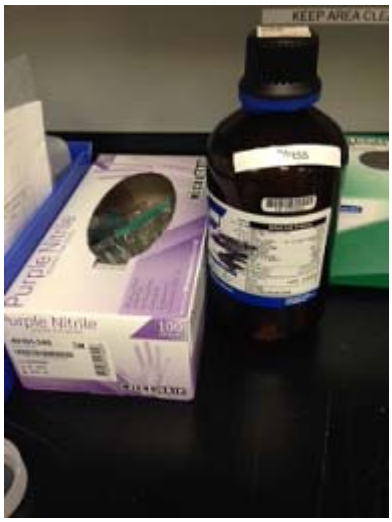
(3) 

Sharps left sitting unattended on bench-tops (1), overflowing sharps containers (2), and inappropriate sharps containers (3), were all found in Chemical Sciences areas (Figure 5). Each of these situations were rectified, and the researchers involved were educated to the need for better housekeeping and/or appropriate equipment.

Figure 6: Sharps waste container with open lid found in City of Berkeley inspection.

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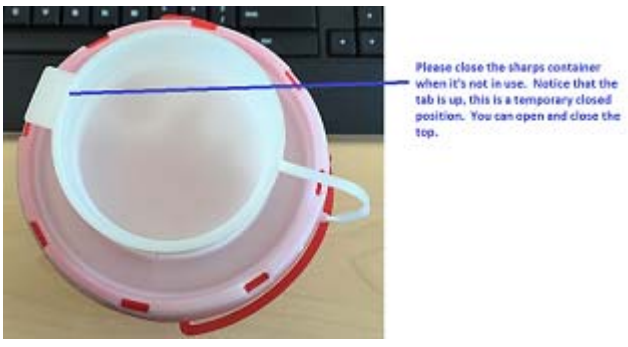
(2) 

The City of Berkeley waste inspectors requires that we close sharps containers that contain contaminated sharps when not in use (Figure 6). If the sharps are contaminated then they are hazardous and need to be treated as hazardous waste, include a waste label, and be kept closed unless actively adding waste to the container. The problem is that most sharps containers are designed to lock in place when closed. Thus, we purchased new sharps containers for contaminated sharps (see Figure, 6 picture 2). These are round with a round white lid that can be opened and closed for adding waste, but then can be closed and locked permanently for disposal.

Figure 7: Peroxide forming solvents needed tested and labeled.

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Figure 7 outlines our program to get better control of our peroxidizable solvents. We identified all of the peroxidizable solvents using the Chemical Management System database and lab walk-throughs, and in some cases, consolidated them for easier testing and management. All peroxidizable solvents were tested even if they were not due for testing so that we could get on a yearly schedule. Sherry Chan has set a calendar reminder so that we can now test all of these on a yearly basis.

Figure 8: Flammable solids were segragated and stored in a glove box.

Figure 8 outlines our program to get better control of our flammable solids and water reactives. We identified all of these chemicals using the Chemical Management System database and lab walk-throughs. In JCAP, we decided to consolidate and store them in a glove box for added safety and to keep the chemicals uncontaminated.

Figure 9: Sodium and potassium metal was segregated and stored in flammable cabinet.

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The team identified quite a large amount of sodium and potassium metal in JCAP. There is currently not an active WPC activity for the use of this material and we wanted to make sure that this material was stored properly. We consolidated all of these reactive metals in Building 70A where there is a current stock of reactive metals that are being properly stored.

Figure 10: Labs were cleaned and excess chemicals were disposed.

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One of the major undertakings for this Division Self-Assessment was to clean up lab spaces and dispose of old and unused chemicals, or chemicals that had their labels missing or deteriorated. We made a reasonable effort to find new owners for unwanted chemicals, and then disposed of all the rest. Figure 10 displays some of the chemicals that were destined for disposal as a result of our lab clean-ups.

Figure 11: Food is not allowed in lab!

It is not common to find food in labs, but the noodle bowls shown in Figure 11 were discovered in one of our walk-arounds. The researcher was identified and educated regarding the policy.

Figure 12: Butane fuel no longer allowed in flammable cabinets.

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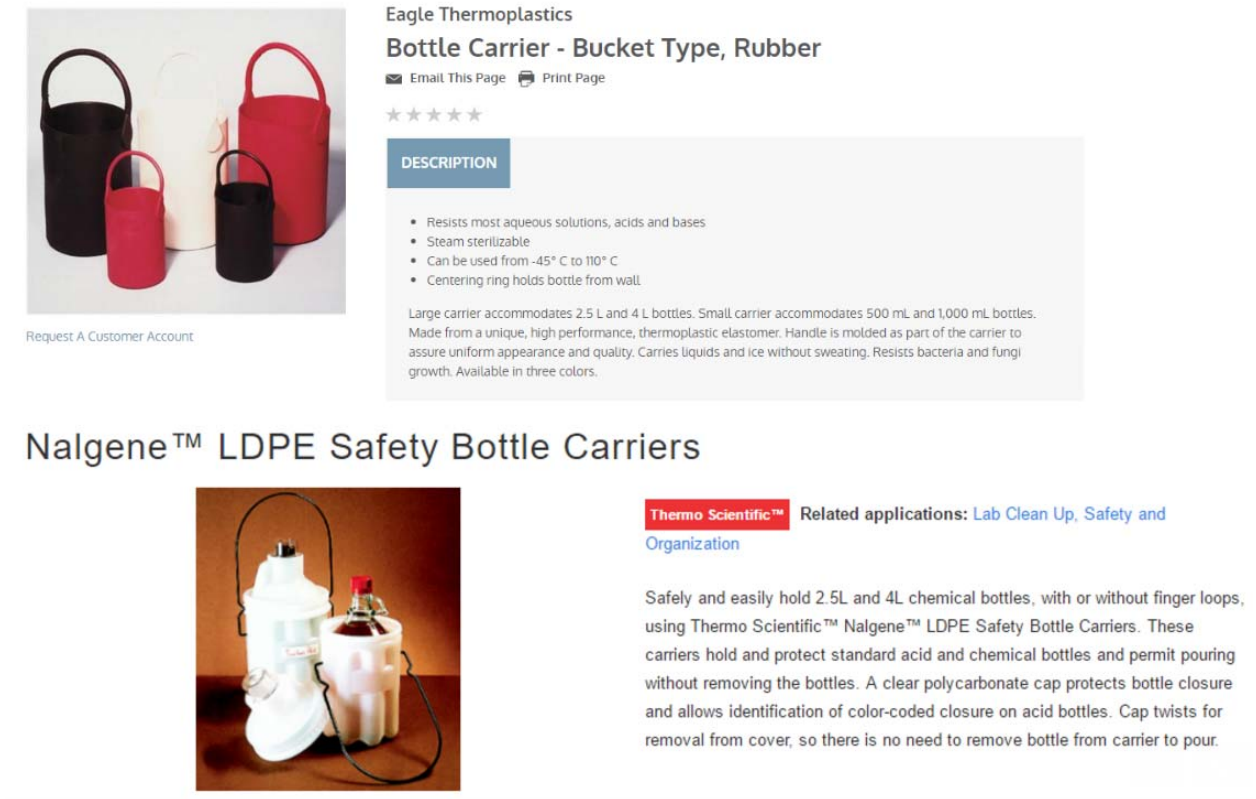
Our fire department would like us to stop storing butane fuel in the flammable liquid storage cabinets (Figure 12 picture 1). The concern is that a catastrophic release of the butane fuel could leak from the cabinet and create a flash fire trail back to the liquid flammables in the cabinet. All butane fuel is to now be stored in standard cabinets or on open shelves and away from other flammables, as shown in Figure 12 pictures 2 and 3. We searched the Division for these butane canisters and made sure they were all relocated.

Figure 13: Chemical bottle carriers for chemical hand transport.



We have not had a spill incident while transporting chemicals in the Division, but this is a real possibility when transporting large solvent bottles by hand. To proactively diminish this possibility, we have supplied new chemical carriers for Chemical Sciences Division personnel. Sherry Chan ordered 2 styles and 2 sizes, 4 Liter and 2.5 L pictured in Figure 13. She distributed these to the labs in JCAP, and Martin Neitzel ordered and distributed some of these chemical carriers to labs in buildings 2, 6 and 70A.

EHS has identified a number of chemicals which are time-sensitive and potentially hazardous if stored improperly or kept for too long. They have contacted researcher in an attempt to better manage these chemicals (see Appendix 1). Martin Neitzel has augmented this effort by contacting personnel at UC Berkeley, Oak Ridge NL, and Stanford Linear Accelerator to help produced a more comprehensive list. We are currently focusing on the following three categories:

1) Gases which are corrosive to their cylinders;
2) Materials which are explosive when dry;
3) Chemicals which are reactive or unstable upon depletion of their inhibitor.

We identified as many of these substances as we could using the Chemical Management System database and lab walk-throughs. Some of these compounds were disposed of because they were close to, or past, their expiration date, and for the rest of the materials, the PIs were consulted considering their management. This is an ongoing process. There is also another class of time-sensitive chemicals, e.g. compounds that are self-reactive upon increase heat or pressure. We hope to gain a more complete list of these classes of chemicals to better identify them in the Division, as well as develop better management strategies.

Conclusion

Environment, Health, and Safety Self-Assessment is a process of continuously evaluating safety program effectiveness. This Chemical Safety Self-Assessment evaluated a wide variety of safety related issues throughout the Chemical Sciences Division.

Areas of focus

- Waste (containers labeling, waste unknowns, and SAA posting)
- Chemical storage (compatibility, secondary containment, proper cabinet for chemicals)
- Management of chemicals (old chemicals with deteriorated labels, time-sensitive chemicals)
- Sharps management (sharps uncapped, labeling on sharp containers, proper containers)

Summary of Results

- HPLC effluent containers were vented and designated as waste containers in compliance with the City of Berkeley direction.
- Issues with SAA, waste labeling, and containers of unknown chemicals were addressed.
- Sharps left on countertops, overflowing and improper sharps containers were addressed.
- A system of improved identification and management of peroxide forming solvents was developed and implemented.
- Reactive metals and water reactive chemicals were identified, collected, and properly stored.
- Old or unused chemicals and chemicals with obscured or deteriorating labels were disposed.
- All butane fuel stored in flammable cabinets was removed and located on shelves or regular cabinets.
- Several chemical transport carriers were distributed in labs to prevent spills.
- A program to identify and manage time-sensitive chemicals was developed.

Through addressing deficiencies in the chemical storage, management of time-sensitive chemicals, deficiencies in our waste handling, and providing best practices for managing sharps and old chemicals, the Chemical Sciences Division has made great improvement toward preventing future accidents and chemical incidents.

Appendix 1:

Email related to time-sensitive chemicals

Dear Chemical Owners,

In an effort to improve our chemical safety, EHS has identified a number of chemicals which are time-sensitive and potentially hazardous if stored improperly or kept for too long. We are all familiar with peroxide formers, but there are other categories of time-sensitive chemicals that require special management as well. Although five such categories have been identified, we are focusing on the following three categories right now:

1) Gases which are corrosive to their cylinders;
2) Materials which are explosive when dry;
3) Chemicals which are reactive or unstable upon depletion of their inhibitor.

More information on each category is at the end of this message.

You have been identified as an owner of one or more chemicals which may be time-sensitive in one of these three categories. We are asking you to take a few simple steps right now to minimize the potential hazards of these materials. Keep an eye out for further information from EHS regarding the management of time-sensitive chemicals.

- Look through the list of time-sensitive chemicals (attached) for your containers, and determine if the CMS records are accurate and if the actual containers still exist. Use the dispose function in CMS to remove records for containers that no longer exist. Once this is accomplished, go through the list of remaining containers to decide if you need to keep them.

If you believe that some/all of the containers listed for you may not be time-sensitive, please contact Kurt Ettinger (krettinger@lbl.gov or ext. 2016) or Alyssa Brand (abrand@lbl.gov or ext. 7246) for assistance.

- Before creating a waste requisition, contact Kurt or Alyssa to evaluate any time-sensitive containers that you do not need to keep so that arrangements can be made for safe and compliant disposal.
- Check the Safety Data Sheet (SDS, formerly known as MSDS) for the time-sensitive chemicals that you intend to keep, and ensure that containers are stored according to the requirements in Section 7: Handling and Storage. Click here and follow the link to ChemWatch (Gold FFX) to search for high quality Safety Data Sheets.
- Do NOT attempt to move or dispose of explosive-when-dry chemicals which have crystals or dried product present.

- Do NOT attempt to move or dispose of cylinders of corrosive gases which display signs of extensive corrosion or which are more than two years old. Contact Kurt or Alyssa for help if you aren't certain of a cylinder's age.

If you need help determining how to safely store your time-sensitive chemicals or dispose of those that you no longer need, or if you believe you have found a container that is immediately dangerous, please contact Kurt Ettinger or Alyssa Brand in the EHS Division's Research Support Team for guidance. In addition, if you have any suggestions or ideas from your own experience with time-sensitive chemicals about prudent practices or how to manage these hazards, Kurt and Alyssa would love to know. Please call or email suggestions and ideas to Kurt or Alyssa.

Regards,

EHS Division Research Support Team