Health and Safety Challenges in Start-Up of a Multi-Discipline/ Open Lab Research Building

Yong Kim, Russell Furr, Lawrence M. Gibbs, Ling Sue Teng,
Stanford University, Department of Environmental Health and Safety

Introduction

At Stanford University, the recent construction and development of a large multi-discipline research building provided the University's EH&S staff the opportunity to address safety and compliance issues before they became entrenched.

Strategic efforts employed in this EH&S endeavor included:
- utilization of an institutional laboratory design guide
- review of building plans, and
- facilitating the safe move-in of research programs.

This presentation discusses the issues identified, challenges encountered, and lessons learned in ensuring the safe start-up of a large multi-discipline research laboratory building.

Project Background

The James H. Clark Center, completed in the Summer of 2003 at Stanford University, is the main hub for the University's Bio-X program. Located at the heart of the Stanford campus between the core campus science/engineering buildings and hospital and medical facilities, the building is to become a social magnet encouraging chance encounters and informal meetings between lecturers, researchers and students from diverse academic backgrounds.

One of the building's main goals is to foster an unprecedented degree of collaboration between scientists from different disciplines in order to meet some of the most pressing scientific and medical challenges of the coming decades. Such challenges can no longer be met by individual disciplines working in isolation, but require the combined expertise of multi-disciplinary teams. The building provides facilities for 700 academics from 23 different University departments working within dynamic teams.

Key EH&S Efforts During Building Start-Up

1. **Institute a Laboratory Design Guide:**

   The Stanford Laboratory Design Guide is a resource document for use by faculty, staff, and design professionals during the planning and early design phases of a project. This Guide is to be used in conjunction with Stanford's Facilities Design Guidelines and applies to construction projects for all Stanford University facilities, including leased properties. Stanford's Laboratory Design Guide was developed by first reviewing existing lab design guidance information, including an existing guide developed by UCSF, and then updating and customizing that information to meet Stanford's needs. Within EH&S, the various technical programs, including Occupational Health & Safety, Biosafety, Health Physics, Fire Safety, and Environmental Programs participated in generating initial draft guidance. EH&S then worked closely with stakeholders throughout campus to ensure that these guidelines were practical and represented current industry best practice for laboratories. This document continues to be routinely updated and edited to ensure that it continues to be useful to Architects, Project Managers, and all others involved in laboratory construction and renovation on the campus.
   http://www.stanford.edu/dept/EHS/prod/mainrencon/Labdesign.html

2. **EH&S review of building plans/ design:**

   EH&S was involved in early stages of building design review. As design development plans and drawings were drafted, EH&S participated in a reiterative review process to ensure appropriate structural and mechanical specifications for the facility. Information on research themes identified for the facility combined with chemical usage projections were used to evaluate laboratory layout issues such as the placement and number of fume hoods, biological safety cabinets, chemical storage areas and the location and proximity of break areas. Air-pressure relationships, exhaust re-entrainment, and the location and of animal holding areas are examples of other issues considered as a part of the plans review process. To ensure compliance with applicable fire and building codes the SU Fire Marshal's Office worked to develop a virtual chemical inventory that could be analyzed to ensure that the location and quantity of hazardous materials would not exceed applicable building and fire code requirements.

3. **Develop a Move-in Plan:**

   EH&S worked closely with move coordinators to ensure that Health & Safety requirements and practices were incorporated into move guidelines and practices. As large-scale moves require extensive coordination, planning, and timing, it is essential that health & safety be considered early in the process. A key part of this process was the development of a Move Manual for affected laboratories that covered all aspects of the move including scheduling/ timing, closure activities prior to move-out, preparing equipment, coordinating safe chemical moves, prevention of the co-mingling of incompatible chemicals, setting up the new laboratory upon arrival, etc. In addition to working with the Project Move Coordinator to develop a Move Manual, information on health & safety requirements and good practice were distributed by EH&S through a series of pre-move informational meetings with laboratory staff as well as visits to each laboratory by EH&S staff prior to and after completion of the move.

4. **Laboratory Setup**

   As Principal Investigator (PI) groups set up their laboratories in the new building, EH&S had several early opportunities to establish an infrastructure to effectively promote safety and related regulatory compliance within the research community. EH&S established a visible presence early during the move in phase so that building and laboratory managers as well as researchers would be reminded of health & safety issues and know where to turn when questions arose. Post-move walkthroughs of each laboratory help to identify trends and patterns of poor safety practices or compliance that can then be resolved. Some of the common problems identified included a failure to update the chemical inventory, incomplete hazardous material labeling, improper segregation of incompatible chemicals, and lack of restraints on gas cylinders. In order to provide emergency information on chemicals stored on laboratory inventories the Life Safety Box for each laboratory was updated with the appropriate hazard stickers, summary of chemicals in that lab area, emergency contact information, and room maps.

5. **Project Problem-solving:**

   Regardless of the quality of planning that takes place during start-up of a large research building, unforeseen problems are likely to surface, and as such, personnel should be designated and ready to expedite correction of such problems before they become entrenched. In the case of the Clark Center examples of problems that have arisen includes equipment not meeting ergonomic guidelines, emergency showers installed at heights greater than that prescribed by ANSI, and occupants not working with biological or radiological materials becoming concerned with the warning signs in adjacent open work areas. Each of these issues were able to be promptly responded to in a coordinated fashion with the Project Manager, EH&S, and the Building Manager.

Managing Hazardous Materials

Familiarizing Emergency Responders-- Life Safety Box system:
Besides providing initial building tours for local emergency responders, hazardous materials data are provided in Life Safety Boxes (LSBs) affixed outside of each main entrance to rooms storing hazardous materials. This program provides room-specific information primarily designed for quick access by emergency response personnel. The LSB consists of:
- Coversheet (US DOT hazardous materials warning labels, reflecting the room's main chemical hazards)
- Room-specific Emergency Contact Information
- Room Chemical Storage Map
- Hazardous Materials Inventory & Summary by hazard class

Maintained jointly by EH&S and the local management of each applicable area, the Life Safety Box system has been proven an effective way to provide on-site ready-access to valuable hazardous materials information in research facilities.

Chemical Migrations- Ensuring Safe Segregation of Chemicals:

During lab moves, ensuring safe segregation of chemicals is sometimes considered a minor detail-- but in the Clark Center where research programs will reside in shared open laboratories, this becomes a more critical issue. To assist researchers in avoiding accidental co-mingling of incompatible chemicals during the moving process, EH&S provided a color-coded sticker system to help them maintain proper chemical segregation during their transition from their the original lab to their new lab. Researchers not comfortable with the concept of chemical incompatibility rely on the University's on-line chemical inventory system for storage grouping guidance.

As research groups start settling in, they will continue to rely on the segregation system as an easy way to communicate chemical compatibility to neighboring personnel. Such a system will not preclude the future occurrence of incompatible chemical storage, but does provide researchers a practical tool to improve their awareness of proper storage practices.

Electronic Chemical Inventory System:

An institutional chemical inventory program can be a helpful EH&S tool during the start-up of a new research facility
1) Aiding in Facility Design-- Existing chemical inventory information can be used to more efficiently model chemical usage projections which are valuable in the design process to help ensure incorporation of necessary controls for fire/ life safety code (i.e., occupancy rating, fire sprinklers, flammables cabinets, and emergency eyewash/ showers).
2) Tracking chemical inventory shifts-- Although chemical inventories are a challenge to track during lab moves, use of an electronic inventory system makes it easier for research units to keep inventories organized and current.
3) Expedites regulatory reporting-- An electronic chemical inventory system allows EH&S to more easily obtain information for regulatory reporting such as Building/Fire code, Federal SARA Title III and State/Local business plan submissions.

Basic Keys to Success

1. Early and visible participation by Environmental Health & Safety in the building planning and construction design process to ensure appropriate safeguards are engineered into the building.
2. Early participation in the relocation planning. This helps to both disseminate health & safety information and to make sure that EH&S remains "in the loop" throughout the process
3. Good communication between all stakeholders. For example, moves involving multiple academic disciplines require that any important information be communicated directly to the responsible persons within each program.
4. Prompt, coordinated response to any problems that inevitably will develop.