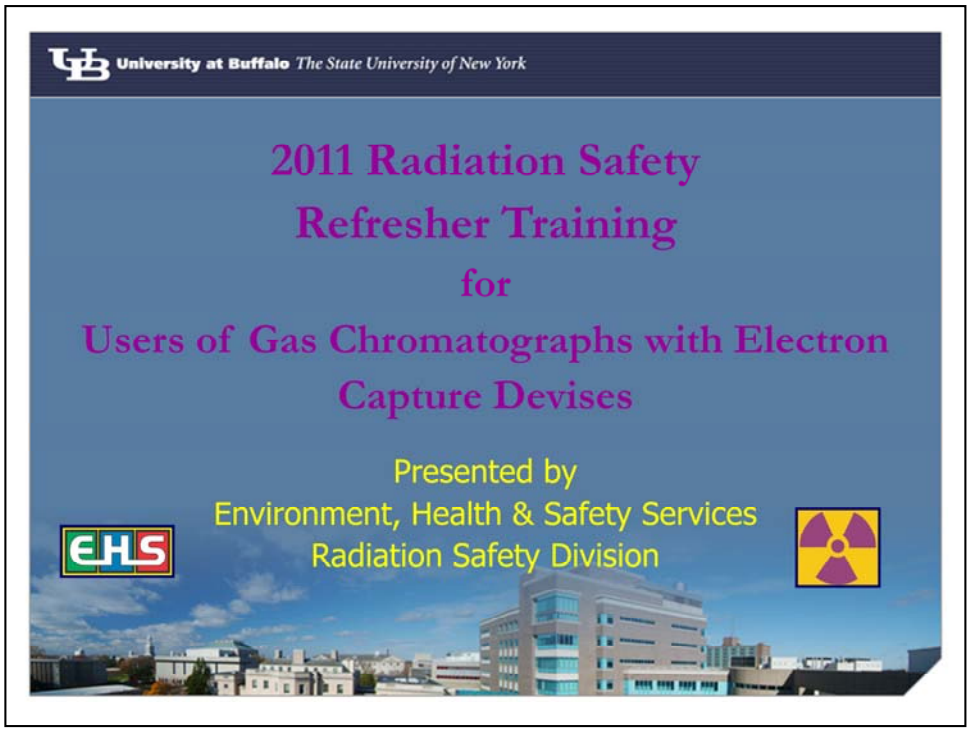
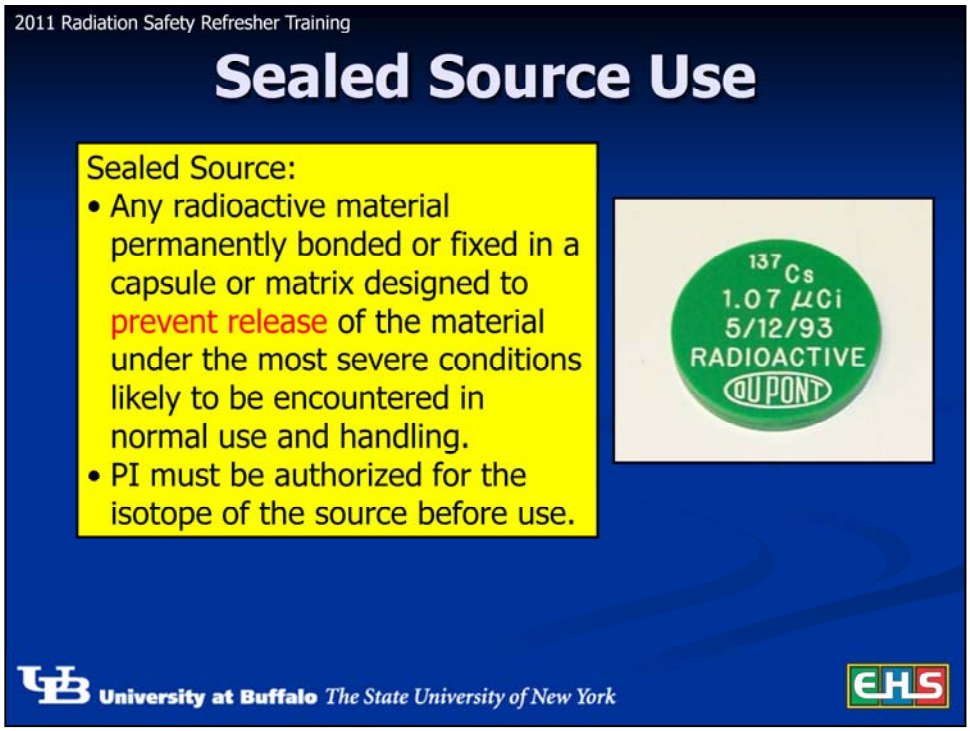


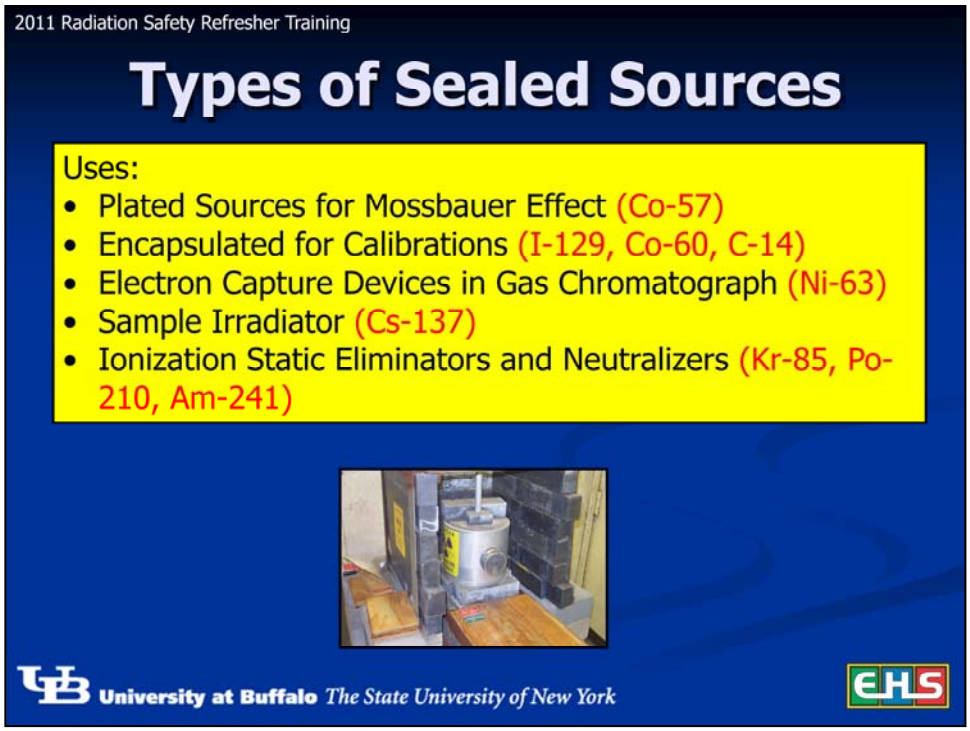
Welcome to the 2011 Radiation Safety Refresher Training session for users of **Gas Chromatographs with electron capture devises (ECD)**. As a radiological worker, training concerning the safety aspects related to using radioactive materials must be provided **annually**. All Principal Investigators (PIs) and Associate Investigators (AIs) authorized to use radioactive materials at the University at Buffalo (UB) work under a Radioactive Materials License from the New York State (NYS) Department of Health (DOH). The Radiation Safety Division of Environment, Health & Safety (EH&S) Services oversees this license and presents the Refresher Training.

We will try to keep this training as quick as possible while providing radiation safety program refresher reminders. The topics listed above are described in this presentation.



Sealed sources are encapsulated radioactive materials (in solid, liquid, or gas states) and can take many different forms. All forms share some type of encapsulation (typically inside metal or plastic) that prevents the radioactive contents from leaking or dispersing – barring tampering or a severe accident. In some forms, the radioactive material is an inherent part of the source and cannot be separated. Most "sealed sources" are designed to be handled without concern that the radioactive material will rub-off or be dispersed onto hands or clothing. There is, however, reason to be concerned about exposure to the radiation emitted from some types of sealed sources.

State and federal regulations control the use of radioactive materials at UB. The university has been issued a license by the New York State (NYS) Department of Health (DOH) that allows the use of radioactive materials and also requires UB to control and monitor the use of these materials. The safe use of radioactive materials is best accomplished when the end user and radiation safety personnel act in cooperation.



Sealed sources at UB take many different forms and contain a variety of isotopes:

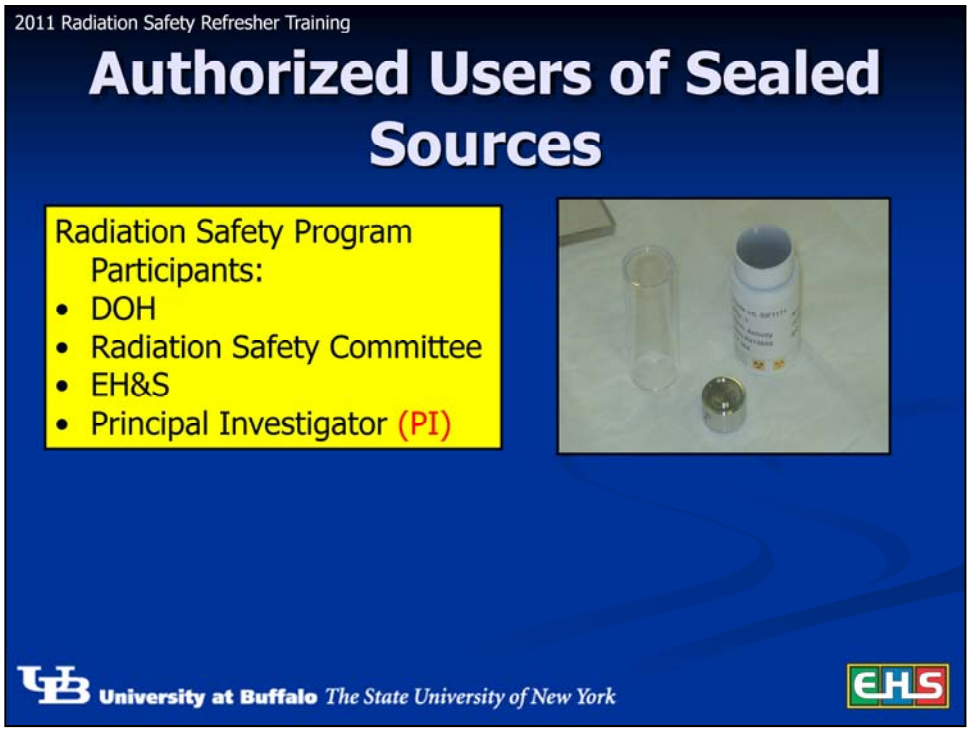
•Plated radioactive material (various nuclides) coating a disk or a planchette. This coating may be covered, depending upon the type of radiation emitted, by Mylar, aluminum, steel, or plastic.

•A capsule usually made of metal surrounds the radioactive material. These sources are often placed onto the end of metal or plastic handling rods. Another example of a capsule is when a mixture of radioactive compounds is placed into a container and welded or sealed closed.

•Ni-63 or H-3 electron capture devices found in gas chromatographs with a housing containing the source and an inlet and outlet ventilation to the housing.

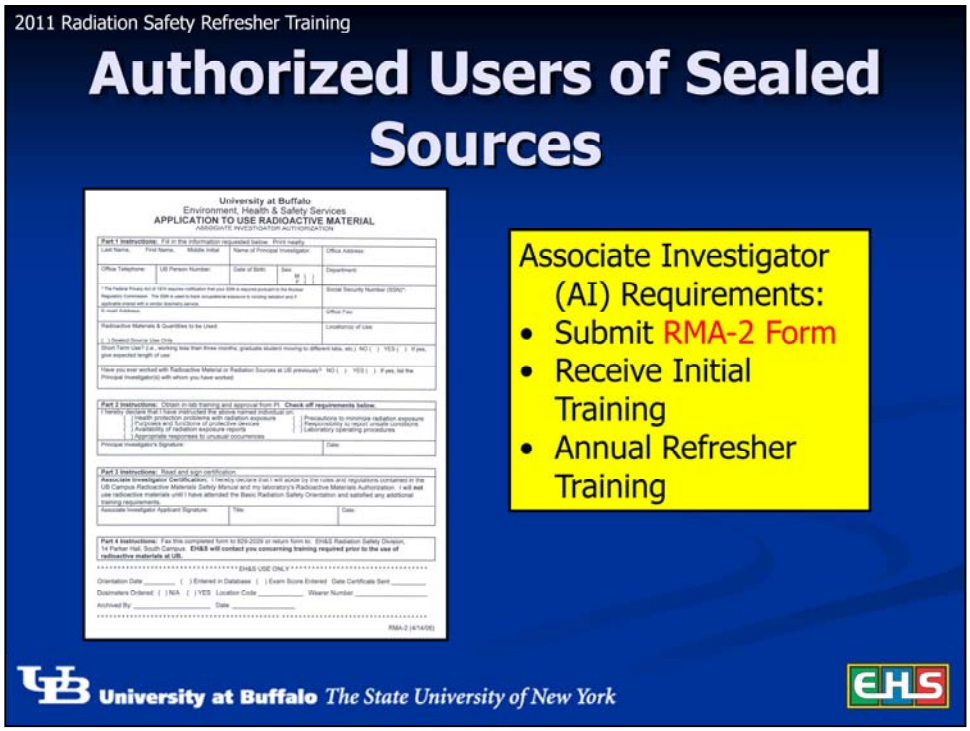
•Cs-137 sources of high activity, permanently housed in apparatus intended for irradiating animals or cells or other materials.

•Kr-85 (gas), Po-210, and Am-241 used to eliminate static and dust and neutralize and clean surfaces at remote distances.

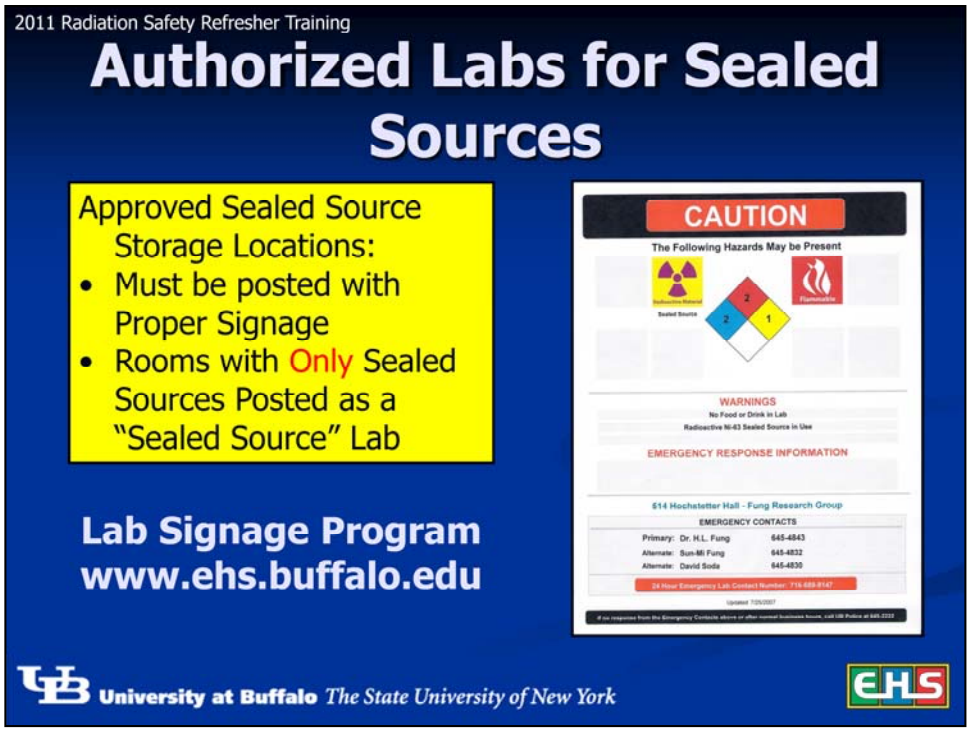


In order to possess or use radioactive sealed sources (or devices containing sealed sources) at UB, the Principal Investigator (PI) must have a radioactive materials permit approved by the Radiation Safety Committee (RSC). The PI's permit is an authorization to use radioactive material under DOH License 1049.

To obtain a permit, the PI must meet minimum experience and training requirements. This training is one of those requirements. The PI and everyone in a laboratory must satisfactorily complete the training before they begin to work with sealed sources.



By issuing a radioactive materials permit, the RSC recognizes that the PI has assumed certain responsibilities, including assuring that everyone in the lab will have the experience and equipment necessary to safely use the radioactive source(s). This includes helping Associate Investigators (AI) complete and submit the "Application to Use Radioactive Material" (RMA-2) form to EH&S (Form can be found at the EH&S website, www.ehs.buffalo.edu) and providing training mandated by state law. All sealed source users must be registered with EH&S using the RMA-2 application (unless the individual is using radioactive material as a student conducting supervised work for a course).

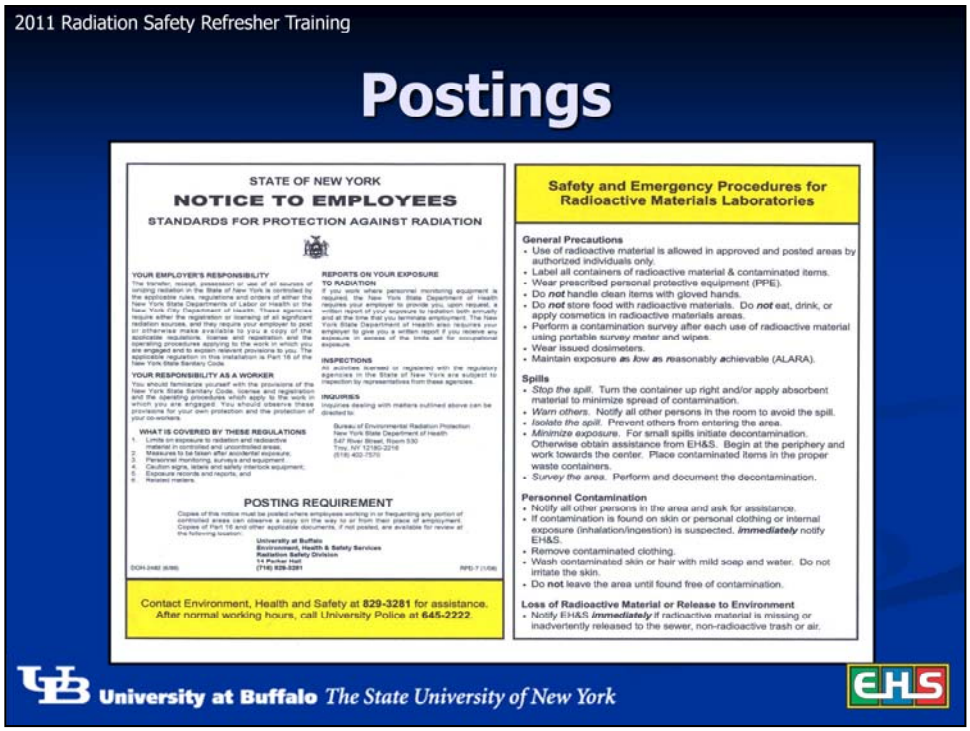


All labs with radioactive material must be posted with proper signage. Rooms with only sealed source radioactive material are posted as a "Sealed Source Only" lab. Labs that manipulate un-encapsulated radioactive materials are posted as Open Source labs.

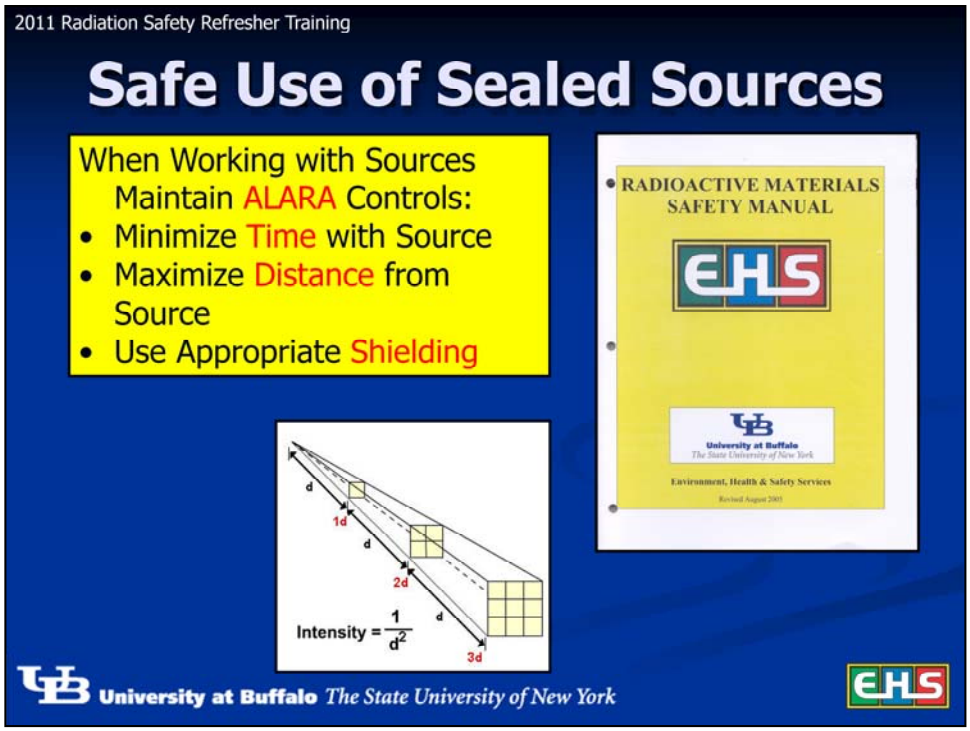
The type (nuclide) and amount (activity) of radioactive material in the sealed source determines the safety requirements for using the source. Under normal conditions, sealed sources present an external radiation hazard as opposed to a contamination hazard. When working with any radioactive materials, the main concern is controlling exposure to radiation. Since any radiation exposure presumably involves some risk to the individual involved, the level of exposure received should be worth the result that is achieved. In principle, the objective of radiation protection is to balance the risks versus the benefits from activities that involve radiation. Different uses of ionizing radiation warrant consideration of different exposure guidelines or means to reduce exposure.

EH&S has instituted a university wide Lab Signage Program. An example of the new sign is seen in the slide. Signage should contain information about all the hazards present within the laboratory. If your lab does not have up-to-date signage, please refer to the EHS website at www.ehs.buffalo.edu for information and to obtain the Lab Signage forms. Click the link for Lab Signage. Download and complete a form for each lab and then fax or mail to EH&S.

Direct link to lab signage page (http://www.facilities-



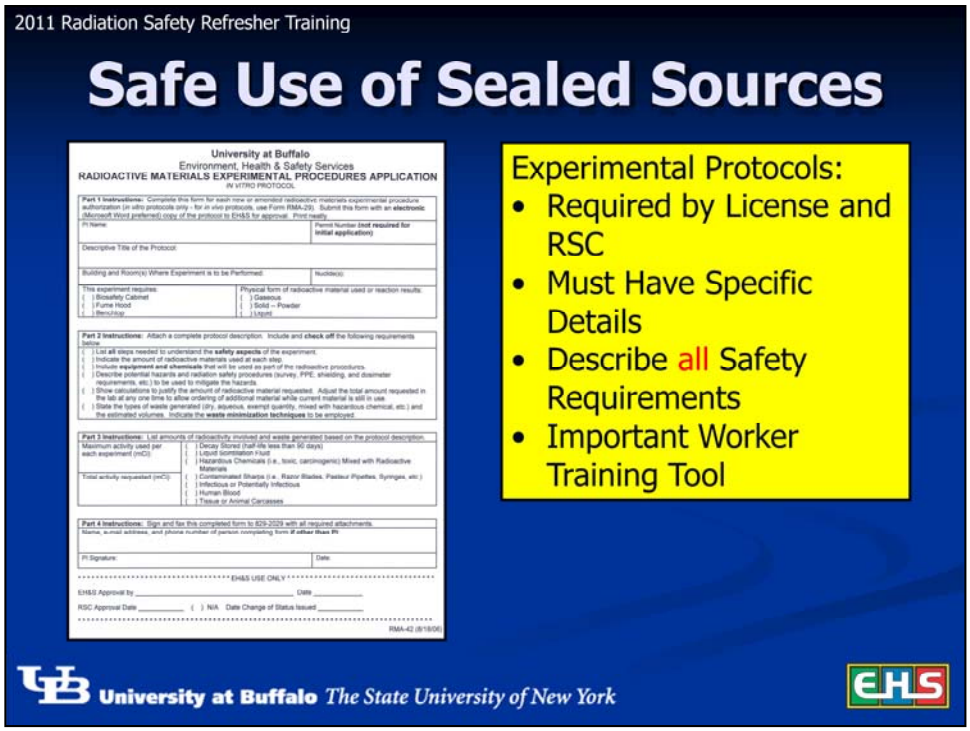
The “Notice to Employees” sign includes the safety and emergency information and is posted in a conspicuous location inside each lab. Only the radioactive materials posting with emergency contact information will be posted on each lab door. The “Safety and Emergency Procedures” sign provides general written information concerning requirements for maintaining a radioactive material permit and gives the steps to be taken to minimize the spread of contamination during an incident. And the “Notice to Employees” sign is required by the DOH to be displayed “wherever individuals work in or frequent any portion of a restricted area” **[Part 1613(b)(3)]**.



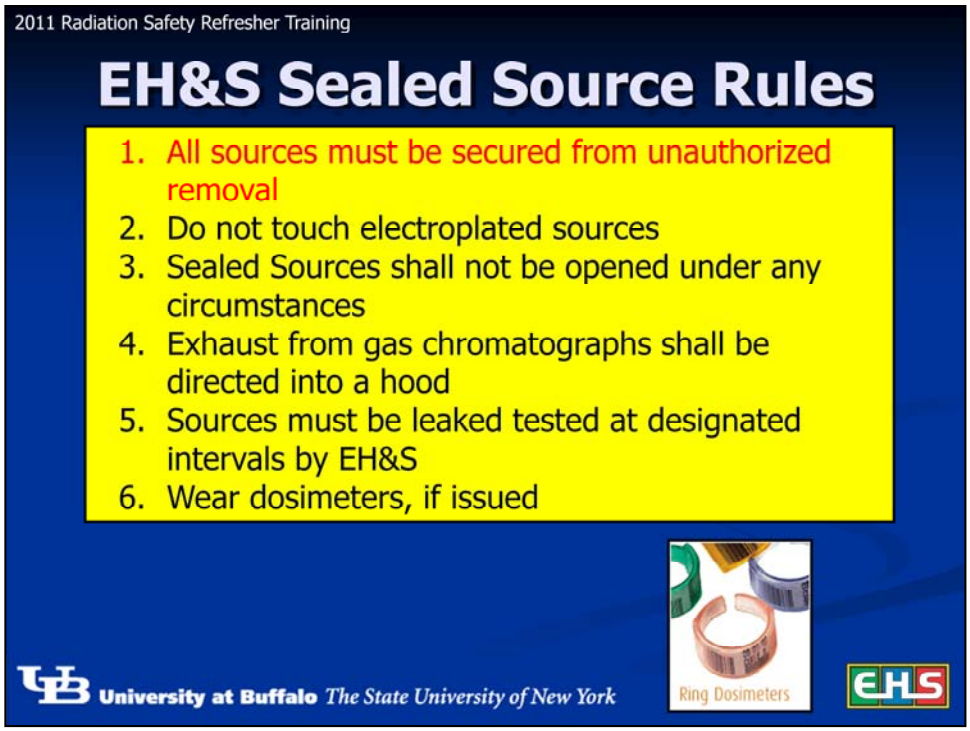
Sealed sources can emit any type of ionizing radiation, including alpha particles, beta particles, gamma rays, x-rays, or neutrons. An essential facet of radiation protection practice is the ALARA (As Low As Reasonably Achievable) philosophy. The ALARA concept gives primary importance to the principle that ionizing radiation exposure should always be kept as low as practicable.

When working with radiation, be aware that exposure is directly proportional to the time spent in the field. Minimize the amount of time exposed to the source to reduce dose. The dose received is inversely proportional to the SQUARE of the distance of separation. Thus, the distance of separation between a person and a source has a greater relative influence on dose than does the time factor. Use controls and tools to keep your body as far away as possible from the exposed source at all times.

A simple, yet effective, way of reducing radiation exposure in conjunction with or when the previous methods cannot be used, is by placing appropriate shielding between the user and the source. To properly utilize this method, it is necessary to understand what shield material works best for which types of radiation. Contact EH&S for help in designing necessary shielding for your source.

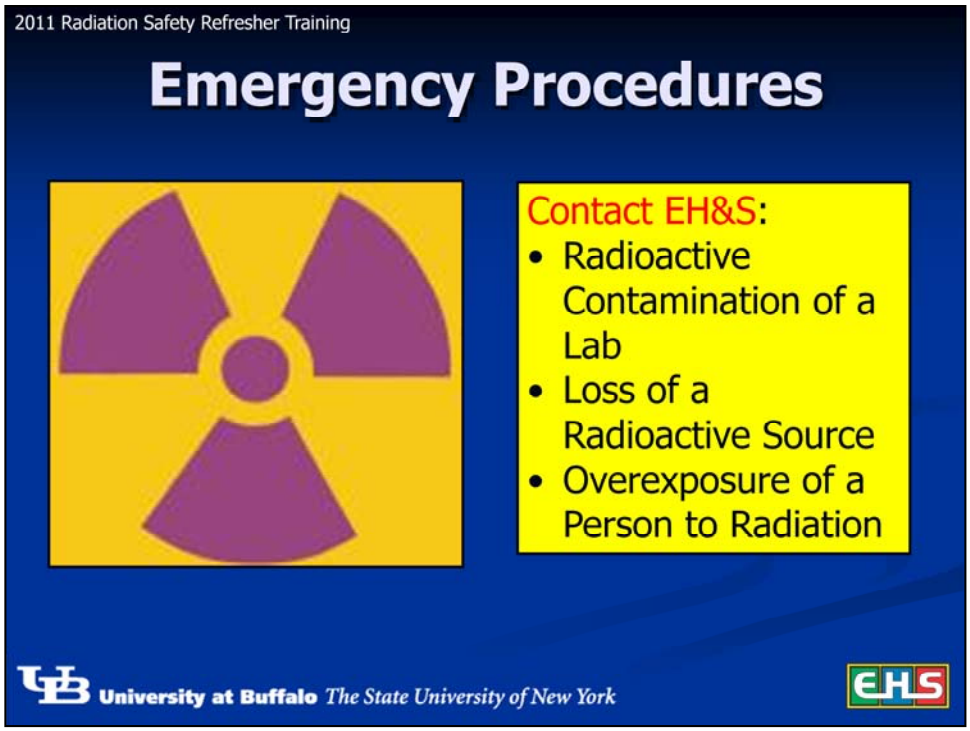


Anyone working with radioactive materials must be familiar with the approved safety protocol for the source being used. Use a "Radioactive Materials Experimental Procedures Application" (RMA-42) form to document all of the safety related requirements for the sealed source. The PI should provide these procedures, in written form, to each person involved in the experiment. If you have any questions about proper operating procedures for working with radioactive material, please refer to the UB "Radioactive Materials Safety Manual" that is available in each laboratory or call EH&S at 829-3281.



The UB "Radioactive Materials Safety Manual" lists the following safety requirements for working with sealed sources:

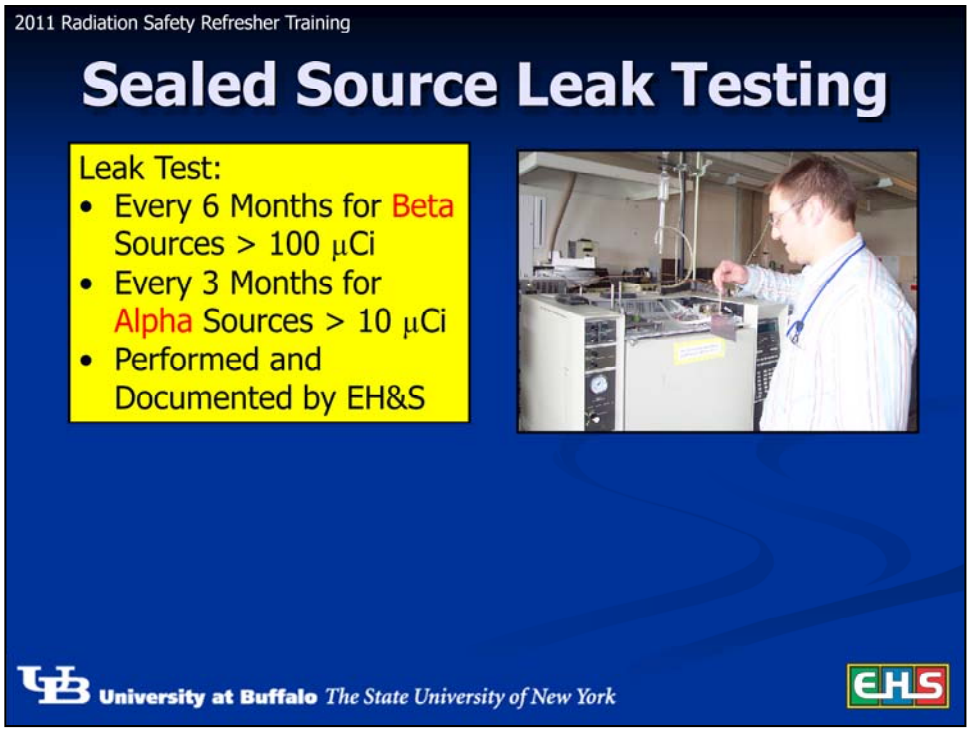
1. All sources must be secured from unauthorized removal. Storage containers must be properly labeled. If a sealed source is missing, notify EH&S promptly at 829-3281. Under some circumstances, UB must notify the DOH when a radioactive source cannot be located. EH&S will make the determination whether notification is necessary and will assist in efforts to locate the source.
2. Do not touch electroplated sources, as this may result in the removal of the active material. Do not use handling tools in such a way as to penetrate the surface of the source. Storage containers should not have material that abrades the surface of the electroplated sources.
3. Sealed sources shall not be opened under any circumstances. Only authorized individuals shall perform the repair and cleaning of sources.
4. The exhaust from gas chromatographs shall be directed into a fume hood whenever detectors are in use. Detectors shall be stored in a well-ventilated and secure location whenever they are not mounted in the chromatograph unit.
5. Sealed and electroplated sources must be leak tested at designated intervals by EH&S. Generally, alpha sources need leak testing every three months while beta sources require leak testing every six months.
6. Sealed source users who are working with sources of higher energies are given dosimeters to monitor any dose the user might receive to insure that ALARA is being practiced. Wear whole body dosimeter on the outside of protective clothing at collar level and ring badges under protective gloves.



If a situation representing a life-threatening emergency occurs in the lab, personnel should call University Police at 645-2222 from a safe telephone. If the situation is not a life-threatening emergency, EH&S should be contacted at 829-3281.

EH&S should be notified of any emergency involving radioactive materials, including but not limited to: radioactive contamination of a laboratory, loss of a radioactive source, or overexposure of a person to radiation. After normal business hours, EH&S personnel can be reached by calling the UB Police Department at 645-2222.

Inventory is a verification of the presence and proper storage of the sources listed in the EH&S sealed source database. Sealed sources are inventoried every three months. **If a source is found to be missing, EH&S must be notified as soon as possible.**



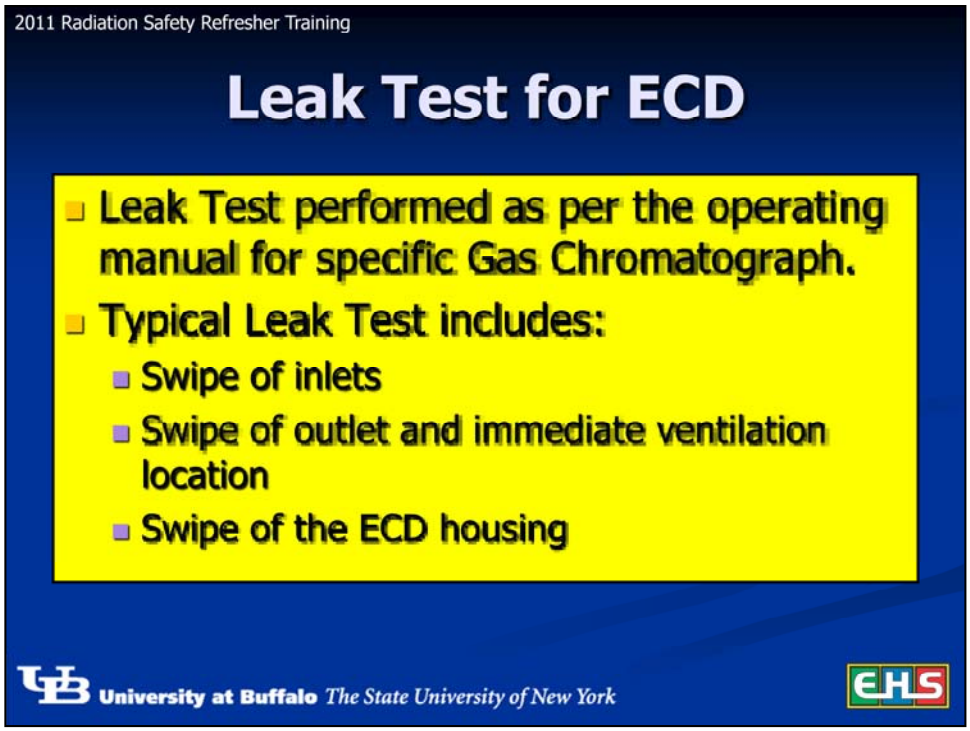
A Leak Test is a survey for removable contamination performed in accordance with the instructions provided with the source or by using safe handling practices. Leak tests are accomplished by wiping a piece of filter paper ("wipe smear") across a source or source housing. Radioactive contamination leaking from the source can then be measured by analyzing the filter paper using an appropriate detection system. Leak test and inventory requirements are stipulated in the DOH License 1049. EH&S follows all required schedules and limits, and performs the leak tests and analysis of wipes.

The following limits are used for leak tests at UB:

•No action is taken if a leak test on a source reveals removable contamination below 0.001 µCi per wipe.

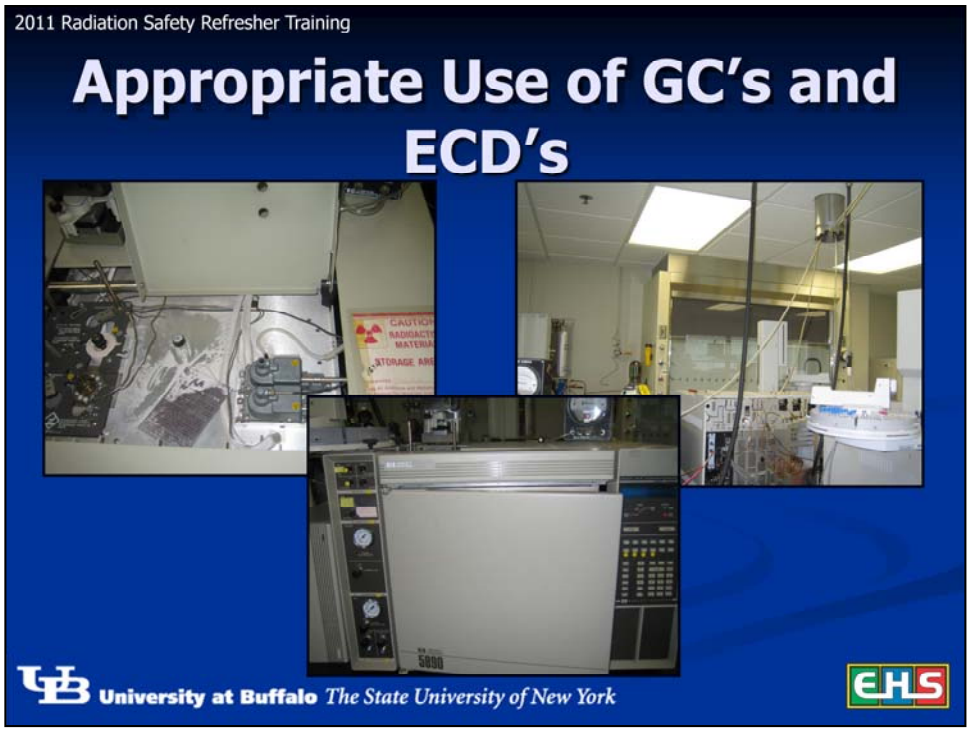
•If source wipes reveal contamination above 0.001 µCi per wipe, but below 0.005 µCi per wipe, EH&S recommends the source be removed from use.

•If the leak test reveals contamination above 0.005 µCi per wipe, the source is required to be removed from use and either repaired or disposed of appropriately. This level of contamination requires notification of state regulatory agencies.



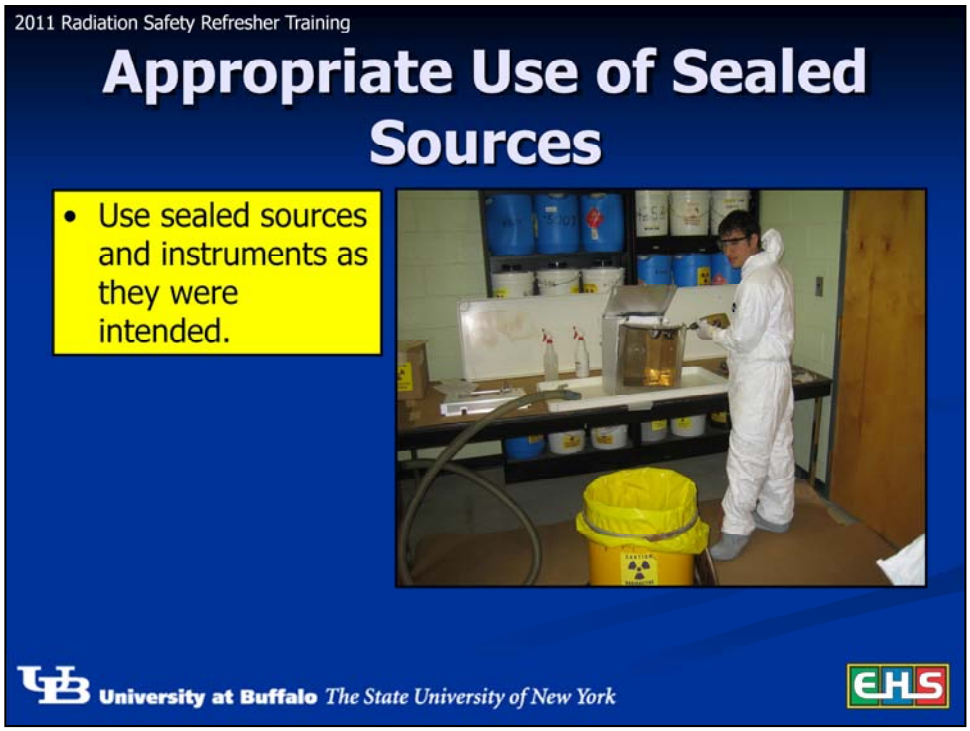
Each Gas Chromatograph (GC) on campus has an operating manual that is on file at radiation safety. The operating manual for the Gas Chromatograph states that the electron Capture Device (ECD) must be leak tested. The manual also describes how the ECD for that specific GC should be leak tested.

Leak test and inventory documentation are maintained by EH&S. The PI also receives a copy of the current leak test certificate. For more information pertaining to leak testing or inventory, please contact EH&S.



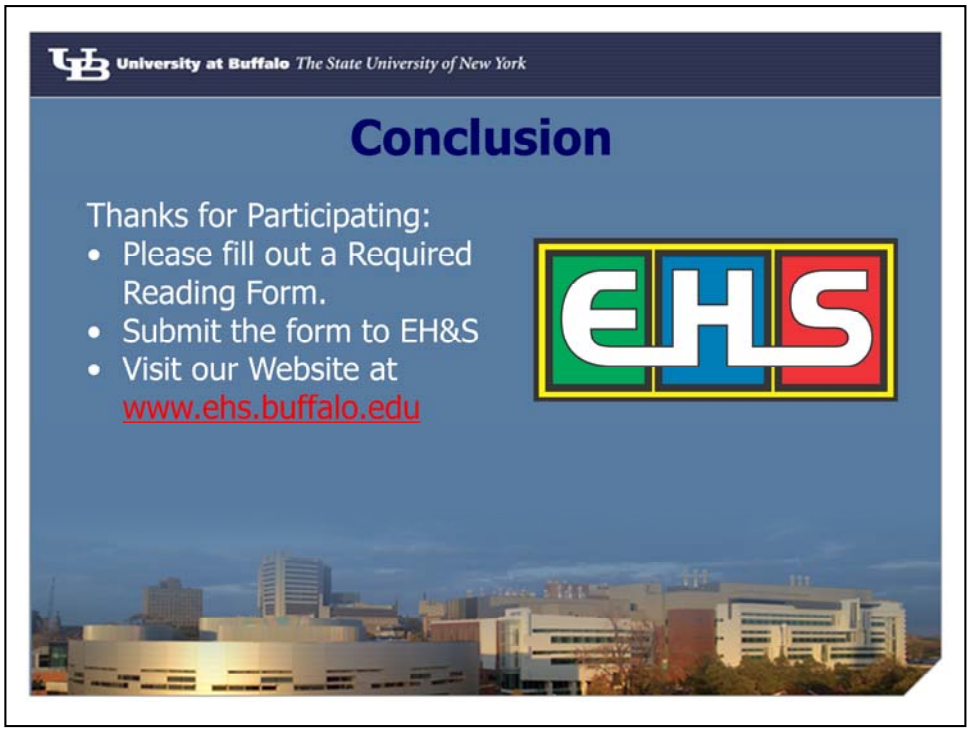
In 2009, EH&S discovered a leaking Ni-63 Electron Capture Device (ECD) inside an older model Gas Chromatograph (GC) during a routine leak test. The machine had been used to dry silica gel in the oven. The ECD did not have a gas column on it and was not properly capped, which allowed the GC fan to blow the silica gel through the ECD and strip Ni-63 from the source within.

This leak caused a large amount of Ni-63 to mix with the silica gel and contaminate the machine and could have potentially contaminated the lab. The GC had to be removed from the lab and be dismantled in order to decontaminate it. The machine eventually had to be scrapped. A significant amount of radioactive waste was generated during the decontamination. This waste is expensive to dispose of. If the GC could not have been decontaminated, the entire unit would have required disposal as radioactive waste.



Please make sure you use your sealed source and instrumentation in a manner as it was intended. Using equipment for something other than its intended purpose could result in source rupture and cause radioactive material to leak. If your lab has a gas chromatograph with an electron capture device that is not being used, make sure that it is capped to prevent gas or other substances from passing by the source. Decontamination of equipment is time consuming and can be costly.

Radioactive material can not be disposed through the regular waste stream. All radioactive material must be disposed in accordance with State and Federal regulation. ECD's from Gas Chromatographs must be removed and shipped to a certified vendor for disposal and the cost will be the lab's responsibility. Please contact EH&S Radiation Safety if you are planning on disposing of a ECD.



Thanks for reviewing this Sealed Source Refresher Training information. Remember the EH&S website (www.ehs.buffalo.edu) has links to guidance documents and forms that can be downloaded.

Work Cited:

Thanks to the University of Colorado (http://www.colorado.edu/EHandS/hpl/training/sspkt.html).