12. LABORATORY SURVEYS

12.1 RADIATION SURVEYS

Radiation surveys of areas in which unsealed radioactive materials (RAM) are approved to be used or stored must be performed and documented on a regular basis. The results of the surveys must be recorded in an acceptable format and maintained as a laboratory record available for inspection by Radiation Safety Staff or by other inspectors, such as Nuclear Regulatory Commission (NRC) inspectors.

12.2 SURVEY METHODS

Surveys usually consist of a series of two types of measurements made at a number of locations within a laboratory area:

- a survey instrument reading of the radiation dose rate
- a test for removable contamination, the so-called "wipe test"

Survey results are documented on a form such as the sample Radiation Survey Sheet, available for customization.

Dose Rate Measurements

Dose rate surveys are conducted to document the radiation dose in and around areas where RAM is used or stored, for comparison to specific dose rate action levels and regulatory limits. The surveys also are valuable in identifying areas where radioactive contamination may be present. The measurements are made with a hand-held survey instrument in all areas of RAM use and storage. Dose rate measurements are required if gamma or x-ray emitting radionuclides are approved for use in the laboratory, and are also useful in open-window mode for identifying contamination from most beta-emitting radionuclides (tritium is the notable exception). Periodic dose rate measurements can also be useful to laboratories that possess only sealed sources of radioactive material, as a method to document that the source(s) remain in the expected location(s) and are not leaking or otherwise compromised, though documentation of this type of measurement is not required.

In the typical survey, a dose rate measurement is recorded at every location where a wipe test measurement is made. Dose rate surveys are documented using units of millirem per hour (mrem/hr). [Note: Many survey instruments display exposure rate in units of milliroentgens per hour (mR/hr), however the NRC considers the radiation exposure rate in mR/hr to be equivalent to the dose rate in millirem per hour (mrem/hr)].
Wipe Test Measurements

Wipe test measurements are made to quantify “removable” radioactive contamination, for comparison to specific regulatory removable contamination limits. The wipe test is accomplished by wiping the tested surface with a piece of absorbent paper, e.g., a filter disk, and then by assaying the removed activity. The assay is typically done with a liquid scintillation counter (LSC) although some laboratories use sensitive gamma counters. The required sensitivity almost always precludes the use of a portable survey instrument, e.g., a GM detector, for the assay. In certain cases, however, Radiation Safety Staff can allow wipe test assay by portable survey instrument. If you need this special consideration, contact us at 314–362–3476.

The removed activity is expressed in the units of disintegrations per minute (dpm) per 100 square centimeters of surface tested, i.e., units of dpm per 100 cm². Determination of the removed activity in dpm/100 cm² requires knowledge of the detection efficiency of the assay device in order to convert counts to disintegrations (or cpm to dpm) as well as the approximate area of the tested surface in increments of 100 cm². As an example, if an area of 200 cm² is wiped and a net count rate of 125 cpm is obtained from an instrument with an efficiency of 0.75 cpm/dpm (75%), the removable activity level is reported as 83 dpm/100 cm². Advice concerning how to determine the efficiency of an assay system may be obtained by calling Radiation Safety Staff at 314-362–3476.

A typical monthly or weekly wipe test survey of a laboratory consists of about 10 to 20 wipes of areas likely to be contaminated when unsealed radioactive materials are used, such as freezers, refrigerators, fume hoods, bench tops, floors, areas around radwaste containers, and sinks. All designated "break rooms" and “wash sinks” must be surveyed. Areas of the lab that would not be expected to become contaminated, such as desks, telephones, door knobs, light switches, etc, should also be randomly surveyed to assure that contamination has not occurred. It is a good practice to rotate the non-radioactive areas tested so the whole laboratory will be monitored over time and problem areas can be identified and decontaminated.

12.3 SURVEY FREQUENCY

Areas in which only small quantities of radioactive material are used in single operations (less than 200 microcuries at a time of any isotope) must be surveyed at least monthly. Any use of material above 200 microcuries (of any isotope) requires a survey within seven days of use.

Fume hoods shared by more than one Authorized User and used for iodinations must be surveyed immediately following each iodination.

During periods of non-use, when radioactive materials are in storage only, areas of RAM storage, radwaste storage, and approved “break rooms” or “wash sinks” must still be surveyed monthly. For extended periods of non-use, all radwaste must be transferred to Radiation Safety Staff for disposal.

During periods when there is no use or storage of radioactive materials of any kind within the lab, members of the lab staff must perform both meter and wipe surveys of all “break rooms”, “wash sinks”, RAM-approved sinks, and at least five other locations within the main lab.
regardless of the isotopes for which they are approved. This is to demonstrate the ongoing capability of the lab staff to perform these types of surveys, and is required as long as the Authorized User’s authorization remains “active”. Transferring the authorization to “inactive” status will alleviate the lab staff from this requirement.

12.4 SURVEY ACTION LEVELS

An area must be cleaned if the removable contamination level exceeds 200 dpm/100 cm², or if the exposure rate exceeds approximately two times the background reading. A repeat wipe test of the location must then be made and recorded to verify that the removable contamination level is less than 200 dpm/100 cm². All contamination should be reduced to a level as close to background as is reasonably achievable. Please contact Radiation Safety Staff at 314–362–3476 if you are unable to reduce your exposure rates or removable contamination to the levels listed here.

Locations in the vicinity of stored sources of radioactive material should be posted (using a sticker that may be obtained from Radiation Safety Staff) if the exposure rate to personnel present in the area regularly exceeds 0.2 mR/hr. Advice regarding shielding requirements for stored gamma-emitting radionuclides may be obtained by calling Radiation Safety Staff at 314–362–3476.

12.5 SURVEY RECORDS

The radiation survey records must include the following information for each survey:

- A drawing of the laboratory/room identifying the surveyed areas.
- Room location, radionuclides in use or storage, and equipment used for assay and monitoring.
- Wipe test results recorded in dpm/100 cm² and survey instrument results, if applicable, recorded in mrem/hr.
- Any corrective actions taken and the follow–up survey information.
- Signature of the person performing the survey and the full date of survey.

A sample Radiation Survey Sheet form is available and may be customized for recording the periodic radiation surveys.

Radiation survey records should be retained and be accessible in the lab at all times. Please consult your Radiation Safety Inspector for guidance on how and when to properly dispose of old survey records.