LOANING RADIATION SURVEY EQUIPMENT TO NON-LANL ORGANIZATIONS

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the process for responding to requests by non-LANL organizations and individuals to borrow radiation survey instruments.

Scope

This procedure applies to group members who are responsible for loaning the dedicated radiation survey instruments to non-LANL organizations and individuals.

In this procedure

This procedure addresses the following major topics:

Signatures

Prepared by: Andrew Green, MAQ	Date: 2/15/05
Approved by: Michael McNaughton, Dose Assessment Project Leader	Date: 2/16/05
Approved by: Terry Morgan, QA Officer	Date: 2/16/05
Work authorized by: Jean Dewart, MAQ Group Leader	Date: 2/16/05

02/18/05

General information about this procedure

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Instructions for Using Radiation Survey Equipment	2
2	Equipment Loan Record	1

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	6/9/98	New document.
1	12/7/99	Changes made to process and approval documentation.
2	2/18/05	Form and titles revised.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- Group Leader
- group members who loan instruments to non-LANL organizations or individuals

Not required to train to this procedure are:

- members of non-LANL organization s and individuals who use the instruments

Training method

The training method for this procedure is **self-study** ("reading") and is documented in accordance with the procedure for training (MAQ-024).

References

The following documents are referenced in this procedure:

- MAQ-024, "Personnel Training"
- ESH-1-07-85.1, "Operational Checks of Beta/Gamma Survey Instruments"
- ESH-1-07-86.1, "Operational Checks of Alpha Survey Instruments"
- ESH-1-07-89.0, "Operational Checks of Alpha/Beta Dual Use Probes"

Checking out loaner radiation survey instrumentation

Receiving requests

A non-LANL organization or individual may request loaner instrumentation by calling MAQ. The **group leader** receives the requests and ensures the steps below are performed.

Training users

Members of non-LANL organizations or individuals that request instruments must be trained in their use and the fundamentals of radioactivity. Ensure any organization requesting the instruments has received the training by checking with the group training coordinator. Exceptions to this rule may be granted by the division office or the group office.

Steps to loan instruments

To loan out radiation survey instruments, perform the following steps:

Step	Action
1	Ensure instruments are available and have current calibrations.
2	Perform an instrument function check on the equipment before releasing. If possible, follow the appropriate HSR-1 procedure (ESH-1-07-85.1, ESH-1-07-86.1, or ESH-1-07-89.0; see references and ESH-1 home page).
3	Include a copy of Attachment 1 with the instruments being loaned.
4	Prepare a receipt for the instrument(s) being loaned containing the information in Attachment 2. Include the model and serial number of the instrument(s). Obtain the signature of the borrower on the receipt.

NOTE: No property removal form is necessary for these particular instruments. Special arrangements have been established with the HSR Division property control representative. The instruments have HSR Division instead of LANL property IDs; they are checked out to an MAQ group member.

Retrieving instruments for recalibration

The E-600 will not operate past the calibration date entered in memory. The instrument must be retrieved and recalibrated so the user can continue to use it. Keep a log or otherwise track the recalibration dates and retrieve the instrument before or soon after the recalibration due date.

Checking out loaner radiation survey instrumentation, continued

Check on unreturned equipment

If the equipment has not been returned within a week after the calibration expiration, call the borrower and inquire about when the equipment might be returned. If the borrower wishes an extension, make appropriate records to document the extension.

Records resulting from this procedure

Records

The following records generated as a result of this procedure are to be submitted **within 2 weeks** as records to the records coordinator:

- receipt for the borrowed instruments

Click here to record “self-study” training to this procedure.

INSTRUCTIONS FOR USING RADIATION SURVEY EQUIPMENT

Connect all cables and detectors before switching the instrument on. *Do not connect or disconnect while instrument is switched on.* Once the cables and detectors have been connected, set the instrument response switch to *Slow*, *Med*, or *Fast.* The slower the response is set, the more stable the readout will be, but it will take longer for the reader to respond to fluctuations in the radiation being measured.

Switch instrument on by selecting Ratemeter, Integrate, or Scaler mode to perform measurements.

- Ratemeter mode is generally used to sweep large areas
- Scaler determines the count rate (cpm) and is usually used where areas have been divided into grids and a single reading is taken within each grid. The instrument determines count rate by counting the number of detection events and dividing that value by the time.
- Integrate mode will count the detection events between pressing start and stop (using the asterisk button). Total count time is manually controlled.

Determine background. Background should always be established using the same medium to be surveyed. Example: A parking lot is to be surveyed. Background should be established on a parking lot that is not suspected of being contaminated. If both ratemeter and scaler modes are to be used to conduct the survey, determine background in each of these modes.

Determine value that is statistically different from background by calculating a trigger level. The trigger level is the 95% upper confidence level of the background. This value is the mean background + two standard deviations of the background. The standard deviation of the background is $s_b = \sqrt{\frac{R_b}{t_b}}$ where s_b is the standard deviation of the background, R_b is the background count rate and t_b is the background count time. Note that this equation cannot be used for dose rate or dpm readings. For those readings, the standard deviation of background should be determined using multiple background counts.

The Spkr key is used to turn the speaker on and off.

Survey the area. A suggested method is to sweep the area of interest at a rate of approximately 5 cm/sec. When surveying for alpha, the probe should be within ½ cm of the surface being surveyed. When surveying for beta, the probe should be within 1 cm of the surface. The instrument should be operated in ratemeter mode. If an area is found that exceeds the trigger level, the probe can be held stationary over that area. If high readings persist, try a stationary 1 minute count in scaler mode. **Caution**: Use extreme caution when using the alpha probe because if it touches the area being surveyed, the mylar covering of the probe will tear and the instrument will have to be repaired before continuing measurements.

At any time during the survey, values may be stored ("logged") in the E-600. Log the values by pressing the Log key once (this stores a sequential survey point number) and then a second time (this stores the survey value). A map of the area should be drawn prior to the survey so that the sequential survey point number can later be hand-mapped to a location.

Probes to use with E-600 instrument

Probe	Radiation detected	Potential source	Comment
SHP-270	beta/ gamma	Cs-137, Co-60, Sr-90, Uranium	Window open for beta emitters, but over-responds to gamma energies <200keV with window open. Exposure rate, approximate background of 15 to 20 μR/hr.
SPA-3	gamma	Cs-137, Co-60, Uranium	Suggested for large area surveys, cpm or exposure rate measurements, approximate background of 7-10 k cpm, 10 to 25 μR/hr
SHP-330	alpha/ beta	Sr-90, Uranium, Tc-99	cpm measurements, approximate background of 0 to 1 cpm alpha and 20 to 25 cpm beta.
SHP-380AB	alpha/ beta	Sr-90, Uranium	cpm measurements, approximate background of 0 to 1 cpm alpha and 125 to 150 cpm beta.
SHP-280 (3" Neutron rem Detector)	neutron	Direct penetrating radiation source, e.g., accelerator, critical assembly, or reactor	Typically used in conjunction with a 9" neutron sphere (use ratio of 9"/3"). Helps in determination of the energy spectrum of the neutron flux. Does not respond to thermal neutrons because of cadmium covering. Responds between 2 keV-1 MeV with corresponding count rate per mrem/h of 1800 to 15. This means this detector over-responds to lower energy neutrons and under-responds to higher ones.

cpm = counts per minute MeV = million electron volts, a measure of particle energy
keV = thousand electron volts, a measure of particle energy

To change probes: TURN OFF INSTRUMENT! Squeeze the cable connectors on the ridged sections to remove them from the E-600 and the probes. DO NOT yank on the cables – this can damage or loosen the connections.

Loose cables can cause the count rates to jump around erratically. Should this occur, check cable connectors or try another cable but TURN OFF INSTRUMENT to change cables.

For alpha particles, the detector in the SHP-380AB is ZnS. Take care not to puncture the very thin mylar window. If the mylar film is punctured, the light leak will cause the alpha response to rise to very high levels instantaneously. Temporary field repairs can be performed by the LANL field rep; the mylar film can be replaced by LANL HSR-4 personnel.

Background values are given in the table above simply to give an approximate idea of a realistic background. This is an indication that the instrument is functioning properly. Approximate backgrounds are outside in air in the White Rock area. Backgrounds are different in media other than air and in other locations, and can vary with time. Background values used for a survey should be established as described above.

EQUIPMENT LOAN RECORD

This is a record of equipment loaned to non-LANL organizations or individuals by the Meteorology and Air Quality Group (MAQ), Los Alamos National Laboratory. The recipient will make every reasonable effort to protect and maintain the equipment in the condition in which it was received from LANL. Equipment will be returned upon request by LANL.

This form is from MAQ-226

Equipment description	Property/Serial/ ID number	Calibration start date	Calibration end date	Condition upon return	Comment
Meter: E600					
Gamma: SHP-270					
Alpha/beta: SHP-330					
Alpha/beta: SHP-380-AB					
Gamma: SSPA-3					
Cable CA-100-60					
Equipment Case					

Equipment is loaned to:

_____ _____ _____
Borrower signature Name (print) Date

_____ _____
Address Phone

LANL Representative:

_____ _____ _____
Signature Name (print) Date