**Fermilab**
**ES&H Section**

# MATERIAL MOVE SURVEY AUTHORIZATION TRAINING
## Course # 125

Explain the circumstances necessitating a Material Move Survey.

## PURPOSE OF MATERIAL MOVE SURVEY

A Material Move Request is required whenever an object is to be moved by Business Services Section or it is to be moved off-site. Part of this form requires a determination be made as to whether a material is radioactive or not. If there is a question as to whether the object is radioactive, a Material Move Survey must be performed.

Identify the instruments that can be used to perform Material Move Surveys.

## INSTRUMENTATION

There are three instruments approved for performing Material Move Surveys.

- Bicron Analyst
- Ludlum 177-4 (frisker)
- Eberline E140N

If you need an instrument to perform a survey, contact the ES&H Section Radiation Protection Instrumentation Team located at the Radiation Physics Calibration Facility (Site 38) at X4625.

Understand the actions that are to be taken for:

- High background levels
- Malfunctioning instrument
- Out of calibration instrument
- Failure of source and/or battery check

## GUIDELINES FOR USING INSTRUMENTS

1. Repairs, battery replacements and calibration of all survey instruments are to be done by the ES&H Section Radiation Protection Instrumentation Team located at the Radiation Physics Calibration Facility (Site 38) at X4625.

2. The instrument probes are fragile. Handle them with care. The Bicron Analyst probes contain a fragile crystal mounted on the end of a glass photomultiplier tube. The Ludlum 177-4 and Eberline E140N have a very thin foil which is easily pierced.

3. The response switch should be set to slow response for all the instruments. The Ludlum 177-4 and the Analyst have a selector switch on the back and the front respectively. The E140N has a dial that should be rotated all the way to slow.

4. Initially, the Analyst should be set to the X10 scale. With these instruments, the sensitivity of the probe is too high to allow it to use the X1 scale. The Eberline E140N and Ludlum 177-4 should be set on the X1 scale. If the meter pegs on a scale, then set it to the next higher scale, and so on.

5. Each instrument is equipped with audio capability which should be used to help identify those areas with increased count rates. *NOTE: Avoid using the audio near members of the public.*

Be able to report a survey measurement correctly.

6. To read the counts per minute, multiply your reading by the scale setting. For example: 360 cpm X 10 scale setting = 3600 cpm.

Demonstrate the procedure for performing a Material Move Survey.

Understand the actions that are to be taken for:

- High background levels
- Malfunctioning instrument
- Out of calibration instrument
- Failure of source and/or battery check

## PROCEDURE FOR PERFORMING A MATERIAL MOVE SURVEY

1. Check the overall condition of the instrument. If the instrument appears to have been abused, consider returning it for repair.

2. Check the calibration date on the instrument. The instrument is due for calibration the last day of the month indicated on the sticker.

   For example: Calibration sticker states calibration due January 1996. Therefore, the instrument is due by January 31, 1996 for calibration.

   If the instrument calibration is not current, return the instrument to the ES&H Section Radiation Protection Instrumentation located at the Radiation Physics Calibration Facility (Site 38) at X4625.

3. Perform a battery or power check before each use. If the instrument fails the check, return it to the Radiation Protection Instrumentation Team located at the Radiation Physics Calibration Facility (Site 38) at X4625.

4. Determine the background level of the area. A Material Move Survey can not be conducted in high background areas. The background reading for the Bicron Analyst must be less than 3000 cpm and on the Eberline E140N or Ludlum 177-4, the background reading must be less than 100 cpm. If the area background exceeds this level, move to a location where the background is lower.

5. Perform a source check. A sticker on the side of the instrument indicates what the instrument should read when the probe is inserted into the source check holder. Keep in mind that the range quoted does not include background levels. Wait until the needle stabilizes before determining if the instrument source checks. If the instrument fails the source check, return it to the ES&H Section Radiation Protection Instrumentation Team located at the Radiation Physics Calibration Facility (Site 38) at X4625.

6. Perform a survey on contact of ALL accessible surfaces. This survey should be done slowly as it takes some time for the instrument to respond. If the count or audio rate goes up, pause over the area for 5-10 seconds or until the needle stabilizes to get a more accurate measurement. Closed containers should be opened as packaging materials may provide some level of shielding preventing the material from being detected on the outside of the container.

7. After performing the survey, complete the appropriate sections of the Material Move Request.

Explain the circumstances necessitating a Material Move Survey.

Identify the criteria used to determine if an object is radioactive.

## CRITERIA FOR DETERMINING IF OBJECT IS RADIOACTIVE

There are some instances in which a survey does not have to be performed. If the person initiating the material move request is positive the item to be moved off-site has not been in a beamline enclosure and is not radioactive, a radiation survey is not required. If the possibility exists that the material may be radioactive, a survey must be performed.

If you are using a Bicron Analyst:

If the object reads greater than 2000 cpm above background with the background between 2000 and 3000 cpm on contact, the object is radioactive.

OR

If the object reads twice the background rate with the background is less than 2000 cpm on contact, then the object is radioactive.

If you are using an Eberline E140N or Ludlum 177-4:

If the object reads greater than 50 cpm above background, the object is radioactive.

If the object is radioactive, call the ES&H Section Environmental Protection Hazard Control Technology Team on X3741 for shipping instructions.

Complete the appropriate sections of a Material Move Request form.

## COMPLETING THE MATERIAL MOVE REQUEST

This training does not permit you to complete the sections of the Material Move Request dealing with the hazardous aspects of the object which you are surveying. It only addresses the radiological hazard and the first three colored lines of the form.

If the material is not radioactive and a survey was not performed (i.e. decision based on process knowledge):

1. Check the no box on the first line. In addition, print your name, ID number and sign your name on the first line.

2. In this instance, the individual initiating the request should complete the MMR Form.

If the material is not radioactive and a survey was performed:

1. Check the "no" box on the first line. In addition, print your name, ID number and sign your name on the first line.

2. Leave the second line regarding the nature and extent of radioactivity blank.

3. Complete the third line by printing your name in the authorized surveyor blank, providing your ID number, signing your name and indicating the specific survey instrument used to perform the survey. If the material was determined to be non-radioactive through process knowledge, this line should be left blank.

If the material is radioactive:

1. Check the "yes" box on the first line. Print your name and ID number and sign your name in the blanks that follow.

2. Check the "radioactive" box. Put the net counts over background on the left side of the blank provided for the nature and extent of radioactivity. Other information will be put on this line later.

3. Print your name in the authorized surveyor block. Then fill in your ID number, signature and the specific survey instrument used to perform the survey.

## EVALUATION

There are two aspects to this evaluation. The first is a written examination. The exam consists of 10 questions (fill-in-the-blank, multiple choice, and listing). A passing score is considered to be 75% or 15 out of the 20 possible points. Following the examination, there is a practical evaluation of the survey procedure.