

**Republic of the Philippines**  
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**DNRS BULLETIN NO. 88-01**

**SAFETY OF RADIUM SOURCES IN  
INDUSTRIAL APPLICATIONS**

**A. ADDRESSEES**

All industrial licensees with radium sources.

**B. PURPOSE**

This Bulletin is issued to remind licensees of the risks posed by encapsulated or sealed radium sources used in industry and to reiterate regulatory requirements regarding the safety in their continued use or storage as well as in their transfer to an authorized licensee.

**C. DESCRIPTION OF CIRCUMSTANCES**

The inspection and audit conducted by PAEC (now PNRI) of licensee facilities/devices revealed that physical inventory and leak tests of sealed radium sources have not been regularly performed by the licensees and that in many cases no leak tests have been carried out at all.

Due to the long half-life of 1620 years, radium-226 poses potential long term risks of unnecessary exposure to plant personnel and the public when the sources are lost or damaged.

CPR Part 2, Section 26 requires each licensee to "keep records showing the receipt, transfer and disposal of radioactive material, and submit copies of such records to the Commission as the Commission may require." This requirement entails periodic physical inventory to account for all sealed sources received, transferred or disposed to reveal any lost source. In the case of transfer of source, the transferor must ensure that the transferee is licensed to receive the type, form and quantity of radium to be transferred. Damaged or leaking sources must be disposed in accordance with the radioactive waste disposal procedure approved by the Institute (CPR Part 2, Section 14).

## **D. DISCUSSIONS**

### **1. Periodic Physical Inventory**

Radium sources may be lost during use or while in storage. For instance, while installed in an equipment, the source may be pilfered if proper warning signs and safeguards to prevent access by unauthorized persons are not provided. When the source is detached from the equipment under repair or maintenance, or under continued storage, it may be lost if not secured in a safe place, properly identified and segregated from other material, e.g., scrap materials.

When lost to individuals who are not knowledgeable about radioactive material and radiation, the source may be forcibly taken out of its shielded container and get damaged. People near the unshielded source get exposed to the radiation and get contaminated by the released radium and its decay products. Unaware of the contamination, those initially contaminated can spread the contamination to others and other areas.

In case the device with the source gets inadvertently mixed with scrap materials and melted in a steel plant, the plant equipment and personnel can become contaminated. The end-users of the metal products will be similarly exposed unnecessarily to radiation.

Periodic physical inventory will reveal any lost source. The shorter the interval between the time at which a source is lost and the time at which the loss is reported, the greater is the chance of recovery.

### **2. Periodic Leak Testing**

Encapsulated radium sources can develop leak during continued use or storage thereby subjecting to contamination plant equipment and personnel. Leaking sources must be detected as early as possible so that these can be withdrawn from use as soon as possible to prevent or minimize contamination. After decontamination, leaking sources must be sealed in a hermetic container and disposed of according to the Institute regulations.

There are several methods of testing sealed sources of radium for leakage, but the swipe and gross activity measurement methods are most

suitable for industrial radium sources. In the swipe method, the surfaces at or near the opening of the shielded container are swiped with such material as filter paper or cotton which is counted in a calibrated set-up. Detection of greater than 195 Bq. (0.005  $\mu$ Ci) Ra-226 of removable contamination indicate that the sealed source is leaking. The other method involves the measurement (e.g., in an ion chamber) of the bare source. An appreciable decrease in its nominal activity is an indication of leakage since it means that radon is escaping from the capsule and true equilibrium between Ra-226 and its decay products is not being maintained.

### **3. Transfer of Sources**

There have been instances in which radioactive materials have transferred ownership or possession such as when a licensee no longer uses the sealed sources and donates or sells these to other individuals or an institution. Any such transfer to an institution or individuals who do not possess any knowledge about radium and its proper handling poses a radiation hazard for the institution personnel, the individuals, and the general public. This is specially important when the transferee does not have the necessary facility to store the radium sources or perform the necessary tests, or is not aware of the pertinent materials licensing rules and regulation.

To reduce this risk, transfers of radium sources are allowed only to another licensee, to the Institute (PNRI), or as expressly provided for in the license.

The transferor is responsible for verifying that the transferee has a license which is valid and authorizes receipt of the source in the form and quantity to be transferred. Proof may be on the form of a copy of the transferee's license, or a certification by the transferee to that effect, and showing the license number and expiration date. For transfers other than to the Institute, the licensee is required to report within ten (10) days after the transfer indicating the particulars (e.g., license number, form and quantity of the source, date transferred, and the name, address and license number of the transferee).

## **E. REQUIRED LICENSEE ACTIONS**

In response to this Bulletin, licensees shall:

1. Conduct a physical inventory to account for all sealed radium sources received and

possessed, and submit to the PNRI a copy of the inventory report, including explanations on any discrepancy between present and originally possessed sources. Henceforth, licensees shall conduct quarterly similar physical inventory the report of which shall be kept and made available during PNRI inspection and audit, or submitted to PNRI when required;

2. Conduct or cause to be conducted leak tests on all sealed radium sources the results of which shall be submitted to the PNRI. Henceforth, quarterly leak tests shall be conducted the results of which shall be kept and made available during PNRI inspection and audit, or submitted to PNRI when required;
3. Review all transfers of radium sources made during the last five (5) years, if any, and inform the Institute of any instances in which the transferee's authority to possess radium sources has not been properly addressed/verified;
4. Review their existing procedures and make the necessary amendments to the radiation protection program regarding the following:
  - a) procedures to prevent loss of radium sources/devices during use or storage;
  - b) procedure for causing to conduct leak tests, and for disposing of damaged or leaking sources;
  - c) procedure for transfer of sealed radium sources to another licensee or to the Institute.

## **F. COMPLIANCE SCHEDULE**

Licensees shall inform the Institute of the actions taken to comply with this Bulletin within sixty (60) calendar days after receipt hereof.

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