

## **CODE OF PRACTICE ON THE USE OF SEALED RADIOACTIVE SOURCES FOR TEACHING PURPOSES IN SCHOOLS**

The use of sealed radioactive sources for teaching purposes in schools is governed by the Code of Practice on the Use of Sealed Radioactive Sources for Teaching Purposes in Schools issued by the Radiation Board. The Code of Practice is reproduced below for reference.

### **1. General Rules**

- 1.1 Students should not be exposed to ionizing radiation unless there is a valid reason for doing so: demonstrations and experiments that result in exposure should be relevant to the course of instruction. Any such exposure shall be kept to as low as reasonably achievable.
- 1.2 The use of sealed radioactive sources ("sources") in schools shall be solely for the performance of simple experiments to demonstrate fundamental principles, and the sources used and the methods of using such sources shall be such as to ensure that degree of hazard is very small.
- 1.3 No demonstrations or experiments involving the deliberate exposure of students, staff or any other persons to ionizing radiation shall be performed.
- 1.4 Experiments shall be carefully planned to minimize the exposure time, and preliminary rehearsals of the experiment procedure using simulated sources should be encouraged.

### **2. Control of sources**

- 2.1 The Radiation Board is the statutory body which controls the use and/or possession of radioactive substance and irradiating apparatus in Hong Kong. Schools deciding to avail themselves of the opportunities to possess and use sources for teaching shall apply to the Secretary, Radiation Board, 3/F., Sai Wan Ho Health Centre, 28 Tai Hong Street, Sai Wan Ho, Hong Kong, for exemption from requiring radioactive substances licence if the total quantity of radioactive substances does not exceed the limit specified in Section 3 below.
- 2.2 It shall be the responsibility of a graduate member of the science staff, who shall be designated the source custodian, to supervise the use of sources within the school. Should the source custodian leave the school for any reason, a fresh application for exemption will have to be made in respect of the newly appointed source custodian.
- 2.3 The source custodian shall be responsible for the procurement, storage, issuance and return of sources to storage, the correct use of all sources, and the disposal of sources.
- 2.4 The source custodian shall arrange for routine checks, at intervals not exceeding 12 months, of the condition of all sealed sources by wipe test and the efficiency of monitoring instruments. All the results shall be entered into a logbook which shall be made available for inspection by Radiation Board on request. (\*Wipe test -The source is wiped with a swab or tissue, moistened with ethanol or water; the activity removed is measured. Acceptance limit : 200 Bq)
- 2.5 All sealed sources failing the routine checks shall be considered as defective and withdrawn from use until proven otherwise by a competent laboratory approved by the Radiation Board.
- 2.6 The teacher-in-charge of a class shall account for all sources before the period of instruction is concluded.
- 2.7 Sources shall be used by a student only when under the direct supervision of a teacher.
- 2.8 The immediate responsibility of radiation safety in any experiment involving ionising radiation shall rest with the teacher-in-charge.
- 2.9 No sources shall be taken out of the school premises approved by the Radiation Board.

### 3. Storage and Labelling

#### 3.1. Maximum amount in store

The type, quantity and activity of sources kept in a school laboratory shall be the minimum practicable and shall in all cases be no greater than the following exemption limit:

Sealed sources	Quantity
Cobalt-60, Strontium-90, Radium-226, Americium-241	<ul style="list-style-type: none"><li>• Not more than two sources for each type</li><li>• Each source not exceeding 200 kBq in activity</li></ul>
Insoluble radium-226 sources to be used with diffusion cloud chamber	<ul style="list-style-type: none"><li>• Not more than 10 such sources</li><li>• Each source less than 750 Bq in activity</li></ul>

Remarks: Should a school wish to use other sources or radioactive substances not in the *Handbook on Safety in Science Laboratories* issued by the Education Bureau, the school shall apply to the Radiation Board for a licence (Tel: 3620 3746)

3.2. All sources should be kept in a locked metal container.

3.3. Access to this container shall be limited to an authorised staff member of the school.

3.4. The metal container shall be permanently labelled in such a manner to indicate that it contains radioactive substances.

3.5. Individual source should be stored in separate, appropriately labelled container or compartment within the locked metal container.

3.6. Each source shall be easily identifiable by the user.

3.7. Sources and their containers should be permanently labelled with the type of radionuclide together with the activity at a specified date.

### 4. Handling of sources

4.1 Sources shall be handled with care and unnecessary handling of sources shall be avoided. The following rules should apply :

- (i) Sources should be transported between the laboratory and their place of storage within the same school premises in their dedicated containers.
- (ii) Sources should only be handled by tongs or forceps. Teachers should note that specially designed tongs for the safe handling of sources are available from commercial suppliers.
- (iii) Alpha-emitting sources should be handled with extreme care because of the necessarily fragile nature of their construction.
- (iv) Sources should whenever possible be kept at a distance greater than 30 cm from the user, and should be pointed away from the human body.

**5. Damage to, Loss of and Disposal of sources**

5.1 Retention of defective, obsolete or unnecessary sources is undesirable and positive steps shall be taken for the safe disposal of such sources. They shall either be returned to the suppliers and the Radiation Board notified; or be disposed of in a manner approved by the Radiation Board.

5.2 In the event of damage to, or loss of any sources, the following shall be notified immediately :

Physicist on-duty (Tel : 6211 0058) and

Occupational Health Officer, Labour Department (First Call Tel: 9689 0378)

(Second Call Tel: 9689 0450)

In all cases, the Secretary of Radiation Board shall be notified in writing within 48 hours.

**6. The Degree of the Hazard**

When due consideration is given to the limitation on the type of source, the activity of radioactive substances to be used in schools, and the time in any one year such sources will be used by any one teacher or student, the degree of hazard from exposure to ionizing radiation to both teachers and students is very small. However, it is essential that students appreciate the nature of the hazard and the degree of care considered necessary in the handling of radioactive substances.

## 《在學校使用密封放射源作教學用途守則》

學校使用放射源作教學用途時，須遵守由輻射管理局發出的《在學校使用放射源作教學用途守則》。現把該守則轉錄如下，以供參考。

### 1 一般守則

- 1.1 除非有合理的原因（因應課程和教學上的需要使用放射源進行示範和實驗），否則不應讓學生暴露於電離輻射之下。任何此類暴露風險須保持在合理可行最低水平。
- 1.2 密封放射源（「放射源」）只限用於進行闡明基本原理的簡單實驗。學校須慎選所使用的放射源及使用方法，以確保把危險性減至最低。
- 1.3 不得進行任何會導致學生、教職員或其他人等不必要地暴露於電離輻射之下的示範或實驗。
- 1.4 所有實驗須有周詳的計劃，以盡量減少輻照的時間。如能利用模擬放射源預習實驗的程序，則更為理想。

### 2 放射源之管制

- 2.1 輻射管理局是管制在本港使用及/或管有放射性物質及輻照儀器的法定機構。擬管有和使用不超過第3節列明上限的放射源作教學用途的學校，須向輻射管理局秘書申請豁免領取放射性物質牌照，地址為香港西灣河太康街28號西灣河健康中心3樓。
- 2.2 學校須指派一名學位理科教師出任放射源監管人，負責監管放射源在校內的使用。倘該教師離職，校方應委任另一名監管人，並就此變動再行申請豁免。
- 2.3 放射源監管人須負責督導放射源的購置、貯存、取用和收貯、所有放射源的正確使用及其處置。
- 2.4 放射源監管人須至少每年一次利用「拭抹試驗法」檢查所有放射源（用沾有乙醇或水的棉球或紙巾拭抹放射源，然後量度棉球或紙巾的放射活度。放射活度上限為 200 Bq），及檢查監察儀器的效能。所有結果須作記錄，以便輻射管理局督察隨時檢查。
- 2.5 在例行檢查中若發現有任何放射源未符合要求，必須視為已失效，並立即停止使用，直至得到輻射管理局核准的檢驗所證明安全為止。
- 2.6 教師須負責在每教節完畢前清點所有曾使用的放射源。
- 2.7 學生只可在教師親自督導下使用放射源。
- 2.8 負責的教師須確保任何有關電離輻射的實驗均在安全的情況下進行。
- 2.9 放射源不得移離輻射管理局核准的校舍。

### 3 貯存和標籤

#### 3.1 存量上限

學校應當按實際需要，盡量存放放射活度較低的放射源。在任何情況下，實驗室存放的放射源種類、數量及放射活度不得超出下表所列的豁免上限：

放射源	數量
鈷-60、銻-90、鐳-226、鎳-241	<ul style="list-style-type: none"><li>• 每類不得超逾 2 個放射源</li><li>• 每個放射源的放射活度不得超逾 200 kBq</li></ul>
用於擴散雲室的不溶性鐳-226 放射源	<ul style="list-style-type: none"><li>• 不得超逾 10 個放射源</li><li>• 每個放射源的放射活度不得超逾750 Bq</li></ul>

註：學校如打算採用教育局《科學實驗室安全手冊》以外的放射源或放射性物質，須向輻射管理局申領牌照（電話：3620 3746）。

- 3.2 所有放射源應當存放於鎖上的金屬箱內。
- 3.3 教職員須獲校方授權，方可取用箱內的放射物質。
- 3.4 金屬箱外必須恆常展示警告標籤，以顯示箱內貯存放射性物質。
- 3.5 在鎖上的金屬箱內，個別放射源應當分別存放於附有適當標籤的獨立容器或小格子中。
- 3.6 標示應當清楚，方便使用者能迅速辨別各放射源。
- 3.7 所有放射源及其容器應當恆常展示警告標籤，標示放射性核素的類別及在指明日期的放射性活度。

### 4 放射源的處理

- 4.1 須小心處理放射源及避免不必要的接觸。處理時應當遵守以下守則：
  - (i) 在運送放射源往返校內貯存地點及實驗室時，應當把放射源置於原有的容器內。
  - (ii) 取用放射源時只應使用鉗子或鑷子。教師可向科學儀器供應商購買特別為安全使用放射源而設計的鑷子。
  - (iii) 密封  $\alpha$  放射源的結構脆弱，取用時應當特別小心。
  - (iv) 在進行實驗時，應當盡量與放射源保持至少 30 cm 的距離，並且不應把放射源指向任何人。

## 5 放射源的損壞、遺失及處理

5.1 失效、過期或不需要的放射源不應保存，而須以正確而安全的方法處置。學校須把這些放射源退回供應商，並通知輻射管理局，或採用輻射管理局認可的方法處置。

5.2 若有任何放射源損壞或遺失，學校須立即通知以下人士：

衛生署當值物理學家 (電話：6211 0058)及

勞工處職業健康醫生 (第一當值醫生電話：9689 0378)

(第二當值醫生電話：9689 0450)。

在任何情況下，須在48小時內以書面通知輻射管理局秘書。

## 6 對健康的危害

由於學校使用的放射源種類不多，而且放射活度受限，每名師生在全年使用放射源的時間亦很短，因此受電離輻射影響健康的風險極低。雖然如此，但仍必須讓學生認識放射源的危險性及小心處理放射性物質。