



# Roles and Responsibilities of OAP Inspectors

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# Contents

- IAEA Training for Regulators on Authorization and Inspection of Radiation Sources
- General and Specific problems



# Nuclear and Radiation Regulatory framework

- Legislation
- Authorization
- Inspection
- Enforcement
- Emergency preparedness

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# Legislation

- Nuclear Energy for Peace Act
- Ministerial Regulations
- Nuclear Energy Board Orders
- Secretary General Orders
- Safety Guidance

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# Authorization

- Licensing
- Notification
- Exemption

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# Inspection

- Roles and Responsibilities of inspector stipulated in Nuclear Energy for Peace Act



# Objectives of Inspection

Inspections can satisfy the Regulatory Authority that:-

- the licensee complies with the legislation, regulations and any imposed conditions;
- facilities, equipment and work performance comply with requirements;
- persons employed by the operator, including contractors, possess the necessary competence;
- deficiencies and deviations are identified and corrected (or justified) without undue delay.

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# Responsibilities

Regulatory inspections must not:-

- diminish the operator's prime responsibility for safety;
- or
- substitute for the operator's control, supervision and verification activities





# Responsibilities and Behaviour of Inspectors

## Professionalism

Inspectors shall be -

- expert within their sphere of responsibility but recognising the limitations of their personal technical knowledge;
  - objective;
  - receptive to information and opinions from others;
  - inquisitive but not obtrusive.
- Decisions should have transparency and clarity.



# Responsibilities and Behaviour of Inspectors (cont.)

- ▶ Independence.
- ▶ Inspectors shall –
  - ▶ have no engagement in, or financial dependency with, promotional or regulated activities;
  - ▶ be formal and friendly (but not familiar) in transactions relating to regulated activities



# Responsibilities and Behaviour of Inspectors (cont.)

## Helpfulness

Inspectors shall:-

- maintain a balance between information dissemination and acting as a consultant;
- avoid providing detailed advice that might shift responsibility for operational safety to the regulatory staff;



# Responsibilities and Behaviour of Inspectors (cont.)

- ▶ On site enforcement
- ▶ Inspectors shall:-
  - ▶ respect their authority and not abuse their position;
  - ▶ inform their supervisor of actions taken (as defined by internal guidance procedures on the allocation of duties and responsibilities);
  - ▶ limit enforcement to that necessary, based on the perceived threat to health and safety;
  - ▶ ensure that their actions are justified, proportionate and transparent;



# Types of Inspection

## ► Pre-authorization inspection

- Prior to a practice starting work with radiation sources (to confirm structural shielding and other safety issues).

## ► Final inspection

- Cessation of operations leading to termination of an authorization (e.g. to confirm a decontamination report; the removal of warning signs, etc).



# Types of Inspection (cont.)

## ► Announced inspections

- Regular inspections to identify changes which might require a review of safety and/or modification of the conditions of the authorization.

## ► Unannounced inspections

- At varied intervals, particularly of potentially high risk practices where portable or mobile sources are being used (e.g. industrial radiography, well logging, etc.)
- Priorities and frequencies should be established in accordance with Regulatory Authority's inspection program



# Types of Inspection (cont.)

- ▶ Additional inspections may be required:-
  - ▶ in the event of abnormal events such as safety related incidents or accidents;
  - ▶ should there be significant changes in the practice (structural alterations, new radiation sources, changes in key personnel, etc);
  - ▶ to investigate complaints by staff or the public.



# Unannounced Inspections

## ► Advantages

- The practice is likely to be seen operating under its usual conditions.

## ► Disadvantages

- Key personnel might not be available to answer specific questions (eg. RPO, responsible practitioners, etc);
  - Some activities within the practice might not be in operation at the time.
- Appropriate timing of an unannounced inspection may require working knowledge of the practice's operations.



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# Inspection Program

The Regulatory Authority should establish an inspection program for each type of radiation practice detailing:-

- ▶ the types of inspections to be conducted;
- ▶ the frequency of regular inspections;
- ▶ the scope and depth of investigations;
- ▶ any exemptions from regular inspections.



# Inspection Program (cont.)

The scope and depth of inspection depends on the:-

- potential for significant exposure;
- reliability (past performance) of the licensee;
- qualifications and competence of the RPO;
- qualifications and competence of the workers;
- inspection records;
- resources of the Regulatory Authority



# Pre-inspection Preparation

- ▶ In preparing for an inspection, officers should:-

- analyse the available information

i.e. documents concerning the authorization including the safety assessment and history of the practices carried out.

- review previous inspection reports

i.e. noting previous non-compliance and any issues from past inspections that have not been resolved.

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# Pre-inspection Preparation (cont.)

- ▶ In preparing for an inspection, officers should:-
  - ▶ identify and prioritize potential problem areas;
  - ▶ select and/or prepare site or practice specific checklist(s);
  - ▶ decide, from the Authority's protocols or after consultation with their superiors, whether to perform an announced or unannounced inspection.



# Pre-inspection Preparation (cont.)

- ▶ In preparing for an inspection, officers should select equipment and instruments that might include:-
  - ▶ survey instruments for measuring radiation and contamination levels (calibrated, with detectors appropriate to the radiation type);
  - ▶ personal protective equipment;
  - ▶ personal dosimeters.



# Pre-inspection Preparation (cont.)

- ▶ where two (or more) inspectors may be involved:-
- ▶ designate one to take the lead role;
- ▶ suitably instruct assistants in their duties;
- ▶ through planning discussions with participating personnel, ensure there will not be any dissent or disagreement in public;
- ▶ Other than in exceptional circumstances, unannounced inspections should be avoided to minimize interference with patient treatments and to ensure the availability of key persons.

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# Pre-inspection Preparation (cont.)

- ▶ be familiar with the authority's inspection manuals for the type of facility to be inspected;
- ▶ prepare copies of the relevant assessment forms and inspection checklists;
- ▶ outline the order in which the inspection will proceed;
- ▶ confirm that they (and assistants) have approved personal radiation monitoring devices eg. film badge, TLD, OSL etc.



# Entrance Briefing

- ▶ The inspector should :-
  - ▶ unless it has been agreed to conduct an unannounced inspection, make an appointment at a mutually convenient time with the legal person at the facility, the radiation protection officer (RPO) or their delegate;
  - ▶ arrive on time;
  - ▶ ask to see the person with whom the arrangements for the inspection were made (or, if the inspection is without notice, ask to see the legal person or the RPO).





# Entrance Briefing (cont.)

- ▶ The inspector should :-
  - ▶ introduce themselves and any assistant(s)
  - ▶ produce identification showing the inspector's authority under the legislation to enter the premises; and
  - ▶ if the inspection is without notice, explain the purpose of the inspection.



# Entrance Briefing (cont.)

- ▶ Persons that might be involved at the entrance briefing include:-
  - the radiation protection officer;
  - a representative of the management;
  - a representative of the workers.
- ▶ The Inspector should be prepared to discuss:-
  - the purpose and scope of the inspection;
  - the inspection plan (which may require adjustments based on findings and the concerns of workers).



# Inspection Methodologies

- ▶ Inspections may involve:-
  - general observations of work practices;
  - examination of records;
  - examination of written guidance on working procedures;
  - interviews with management and workers;
  - independent measurements of radiation and contamination levels;
  - routine checks of safety control systems.



# Inspection Methodologies (cont.)

## ► Inspection manuals and check-lists:-

- help identify items to be checked during the inspection;
- are practice specific;
- provide the inspector with a resource on acceptable and unacceptable performance criteria;
- form part of the Authority's quality/management system
- can enable less skilled or experienced staff to conduct inspections.



# General and Identifying Information

- At inspection, check the validity of the authorization data. i.e.:-
  - name, address etc. of the licensee;
  - physical location of the facility;
  - the purpose and scope of the licence and validity;
  - radiation protection officer;
  - qualified experts and external services;
  - representative of the legal person;
  - information on any external workers and their employers.

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# Verification of Safety

- ▶ At inspection, check source security and safety i.e.:-
  - ▶ identification and location of sources (compare with the source inventory maintained by the licensee and the Regulatory Authority)
  - ▶ the placement and adequacy of source shielding;
  - ▶ safety control systems;
  - ▶ appropriate warning signs (in the local language);
  - ▶ physical protection of sources, in storage and in use, against theft, fire, etc.



# Verification of Safety (cont.)

- ▶ At inspection, confirm that the facility's written procedures:-
  - ▶ clearly allocate responsibilities for different operations and procedures;
  - ▶ give suitable guidance on working procedures;
  - ▶ give appropriate guidance on accident and emergency procedures;
  - ▶ provide appropriate and relevant training for workers.



# Verification of Safety (cont.)

- ▶ At inspection, confirm that management :-
  - ▶ recognizes its responsibilities and is aware of the authorization conditions;
  - ▶ provides adequate supervision over all operations;
  - ▶ gives sufficient support, authority and resource allocation to the RPO;





# Worker Protection

- ▶ At inspection, confirm arrangements and suitability of:-
  - ▶ the classification of areas
  - ▶ working procedures, local rules and supervision;
  - ▶ the monitoring of exposures and contamination;
  - ▶ the health surveillance program.



# Public Protection

- ▶ At inspection, confirm arrangements and the suitability of:-
  - ▶ visitor control;
  - ▶ control of non-occupationally exposed personnel;
  - ▶ the placement and shielding of sources;
  - ▶ management of radioactive waste and discharges;
  - ▶ monitoring of exposures and contamination.

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# Emergency Planning

- ▶ At inspection, confirm planning for emergencies.
  - ▶ Emergency plan
    - ▶ confirm reviews and update
  - ▶ Training and exercises
    - ▶ confirm that training is given; and
    - ▶ exercises are conducted.



# Records

- At inspection, check the following documents:-
  - licensing information, inspection reports;
  - regulations and codes of practice;
  - documents on allocation of responsibilities, working procedures and records:-
    - source information, inventory of sources;
    - transfers, disposal of sources and waste;
    - exposure monitoring results;
    - accident and incident reports.



# Exit Briefing

- ▶ Persons that might be involved at the exit briefing include:-
  - the inspector;
  - the radiation protection officer;
  - a representative of the management;
  - a representative of the workers.
- ▶ The inspector should be prepared to discuss:-
  - observations and conclusions from the inspection;
  - further (or immediate) action that may be required.



# General Problems

- ▶ ไม่มี หรือขาดต่ออายุใบอนุญาต
- ▶ Source inventory ไม่ครบ ไม่ถูกต้อง
- ▶ Area Classification
  - ▶ Controlled Area (8 working hrs.)
  - ▶ Non-Controlled Area
    - ▶ For non-radiation workers (8 working hrs.)
    - ▶ For public (24 hrs.)

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# General Problems (cont.)

## ► Shielding Calculation

- Annual Dose
- Weekly Dose
- Instantaneous Dose Rate (IDR)

# Specific Problems of Teletherapy (Co-60, LINAC)

- การเปลี่ยนแปลง workload หรือ Occupancy factor (T) จากที่เคยขออนุญาต
- การกำบังรังสีรอบห้อง
- ระบบ interlock
- ประตูห้องชำรุด ปิดไม่สนิท หรือปิดไม่ได้
- Co-60 และ Depleted Uranium
- LINAC และ Neutron Contamination
- QC program
- ระบบ Security



# Remote Afterloading Brachytherapy (Ir-192, Cs-137)

- มี **sources** มากกว่าที่ขออนุญาต เนื่องจากไม่ส่งออกตัวเก่าที่เปลี่ยนถ่าย
- ประวัติการเปลี่ยนถ่าย **sources**
- **Source** ค้าง
- การเปลี่ยนแปลง **workload** หรือ **Occupancy factor** จากที่ขออนุญาต
- การกำบังรังสีที่เพดาน และพื้น
- ระบบ **Interlock**
- ไฟเตือนหน้าห้อง
- ระบบ **Security**

# Implant Brachytherapy (I-125, Pd-103)

- Sources ใช้ไม่หมด และการจัดการกากกัมมา
- บัตรคนไข้ฝังแร่
- คำแนะนำการปฏิบัติตัว



# Eye Applicator (Sr-90)

- ▶ สถานที่จัดเก็บ **Safety, Security**
- ▶ การตรวจสอบการรั่วของสารกัมมันตรังสี
- ▶ กาคำนวณ **Dose** ที่ให้ผู้ป่วย



# Medical x-ray

- ▶ การกำบังรังสีของผนัง ประตู และกระจกตะกั่ว
- ▶ อุปกรณ์กำบังรังสีชำรุด ไม่เพียงพอ
- ▶ การใช้อุปกรณ์บันทึกรังสีประจำตัวบุคคล (มีไม่ครบ ติดไม่ถูกต้อง ไม่ส่งอ่านผล)
- ▶ QC program

# Nuclear Medicine (I-131, Tc-99m, etc.)

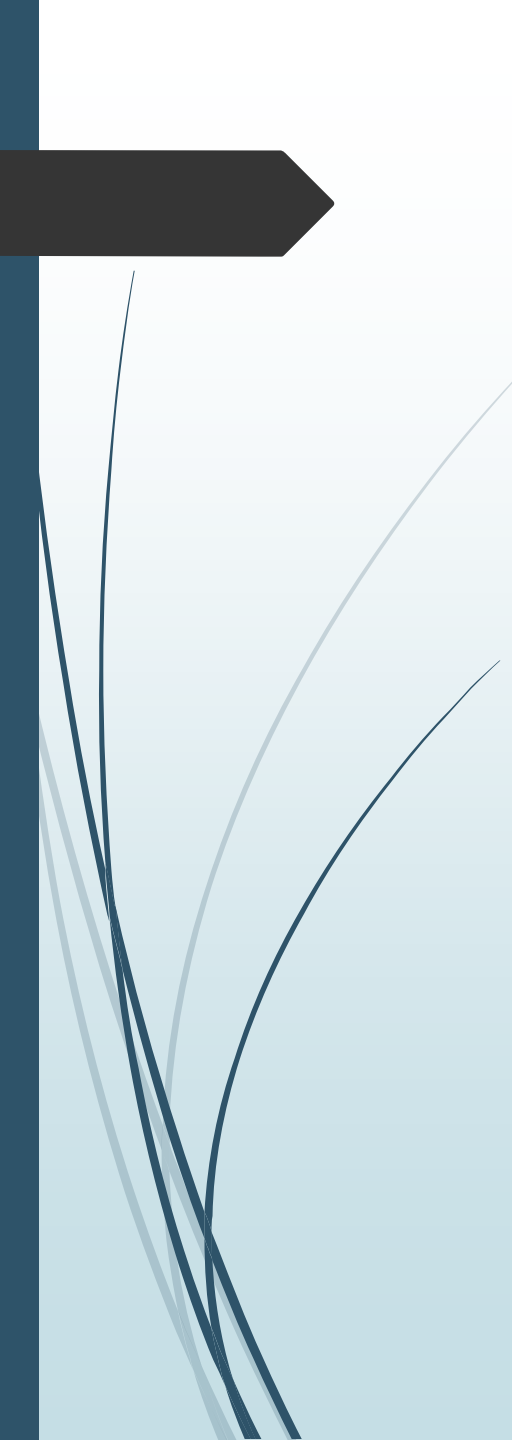
- ▶ เพิ่มห้อง เพิ่มเตียง โดยไม่ขออนุญาต
- ▶ การรับสารกัมมันตรังสีตอนเช้า
- ▶ การจัดการกาก ของเหลว ของแข็ง
- ▶ ระบบบำบัดน้ำเสีย (Clearance และ Discharge Level)
- ▶ Contamination นอกห้องพัก
- ▶ Internal Dose
- ▶ Radiation Protection สำหรับ Non Radiation Worker เช่น แม่บ้าน คนงาน

# Industrial Irradiator (Co-60, LINAC)

- ▶ ระบบ Interlock
- ▶ ระบบ Security
- ▶ QC Program ระบบความปลอดภัยทั้งหมด
- ▶ การตรวจสอบน้ำ

# Gamma Radiography (Ir-192, Co-60, Cs-137)

- ▶ จำนวน projector ทั้งหมด ข้อมูลการนำไปใช้งานนอกสถานที่
- ▶ ประวัติการเปลี่ยนถ่าย sources
- ▶ Capacity สถานที่จัดเก็บ
- ▶ การตรวจสภาพประจำปี
- ▶ การขนส่ง
- ▶ dose record ผู้ปฏิบัติงาน การรายงานผู้ได้รับรังสีสูง
- ▶ ระบบ Security



# Gauging (Level, Density, Thickness) (Co-60, Cs-137, Kr-85, etc.)

- ▶ จำนวน Source ทั้งหมด
- ▶ การป้องกันบริเวณหน้า Beam
- ▶ ระบบปิด เปิด shutter ชำรุด
- ▶ การถอดเก็บเป็น Spare Part สถานที่จัดเก็บ



# Well Logging (Am-241/Be, Cs-137, etc.)

- สถานที่จัดเก็บ
- Source inventory
- การนำ Source ขึ้นมาตรวจสอบ บริเวณสถานที่จัดเก็บ
- การขนส่ง

# Moisture-Density Gauge (Am-241 / Be, Cs-137)

- สถานที่จัดเก็บ
- วิธีจัดเก็บ
- มี RSO เฉพาะส่วนกลาง
- ผู้ปฏิบัติงานไม่มีความรู้เรื่อง Radiation Protection



# Standard Sources

- Source Inventory

- สถานที่จัดเก็บ

- การเบิกไปใช้งาน