

# **4.4 Optimization of occupational radiation protection in industrial radiography**

## **Part 4**

# Radiation Protection Programme (RPP)



Covers the main elements contributing to protection and safety



Key factor for the development of a safety culture



Encourages a 'questioning and learning attitude' to protection and safety



Effectiveness depends on management commitment

# Structure of the RPP

Assignment of responsibilities

Classification of areas

Local rules

Individual and workplace monitoring

Record keeping

Education, information and training

Methods for reviewing/auditing the RPP

Emergency plans

Medical supervision

Quality system for the RPP

# Qualified Experts



Provide advice on observance of the GSR



Registrants/licensees to identify suitable Qualified Experts



Registrants/licensees to inform the Regulatory Authority of their arrangements with the Qualified Expert

# Classification of Areas – controlled area

Registrants and licensees shall designate as a controlled area any area in which specific measures for protection and safety are or could be required for:

- Controlling exposures or preventing the spread of contamination in normal operation;
- Preventing or limiting the likelihood and magnitude of exposures in anticipated operational occurrences and accident conditions.

In industrial radiography, controlled areas include:

- shielded enclosures
- site radiography
- gamma source stores
- emergency situations (temporary areas)

# Controlled Area Requirements (I)



# Controlled Area Requirements (II)

Restriction of unauthorized access



**Controlled area  
Radiation**



**No unauthorized entry**

# Controlled Area Requirements (III)

Individual and workplace monitoring





# Controlled Area Requirements (IV)

## Local Rules

**Work in a controlled area should be carried out in accordance with a written set of local rules.**

Put down in writing :

person(s) responsible for supervising the work

description of controlled area

general radiation safety measures

dose investigation levels

emergency plans

# Supervision

Radiation Protection Officer (RPO) supervises the work

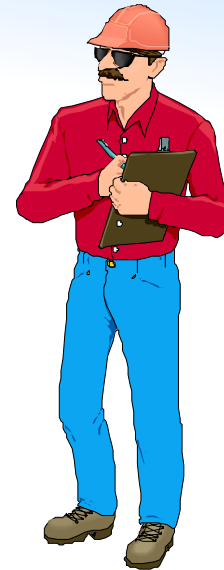
ensures all reasonable steps taken to ensure local rules are followed

Should be enough RPOs to ensure adequate supervision at all times

## Monitoring Arrangements

Radiographers provided with approved dosimeters and personal alarming dosimeters (direct-readout)

Radiation monitors used to survey compound/ site radiography area



# Use of personal alarm and TLD



## Other Monitoring (II)

Failure to monitor to confirm a gamma source has retracted (eg in industrial radiography) can result in high exposures.



# Record keeping

Source accountancy

Dose records

Dose rate monitoring results

Checks on safety systems and warning devices

Equipment maintenance (QA Programme)

Source leak test certificates

Radiation monitor test or calibration certificate

# Education, information and training

Professional Radiography Qualifications

Radiation protection training

Requirements of local rules & emergency plans

## Emergency plans

Contingency plans consider reasonably foreseeable accidents

Provide instruction to limit the consequences

Rehearse!

# Protection of the public

Emergency plans to consider possible accidents involving the public:

- necessary precautions
- actions to limit consequences

Emergency preparedness to include :

- Communications with Emergency Services
- (Fire & Rescue, Police)
- Rehearsal of emergency plans

# Audits and Reviews

Aim : To enhance the effectiveness and efficiency of the RPP

Objectives :To identify and correct problems that may prevent the achievement of the programme objectives

Conducted by competent persons



# Organizational Responsibilities

Different organizations:

- have **different responsibilities** that they must implement;
- **must work together** to ensure radiographic operations are performed safely.



# The main results of an ergonomic study in the nuclear field

When discussing with hierarchy of the clients it appears that:

- The activity while considered as important is often badly known
- It is most often considered as an “easy job”: it would “**only**” consist in placing the films cassette at the right spot and to expose it through a source. The radiographer have “**only**” to carefully follow the technical procedures concerning quality or safety and his mission would be safely fulfilled.

This correspond to a quite simplistic representation among deciders, which lead to consider that the accidents are mainly due to “human factor”.

# It is not such an easy work

## Defining the restricted area



Since some other activities still go on, even at night, it is not always easy to block out all the entrances. Often also the only solution consists in fixing the tapes with sello tape.

Different tricks concern the fixation of the film cassette and of the guiding tube in a sometimes overcrowded environment, still respecting the standards of the trade so as to keep quality. Various means are then used, sello tape without which nothing could be done, sandows, straps, etc.

Fixing the film cassette and the guiding tube



## Often performed in bad working conditions



The accessibility to the organ to be controlled is often quite difficult;



The work has to be performed in very crowded premises with different types of materials



Sometimes it has to be done in a semi darkness



The presence of scaffoldings near the pipes, insulation or biological protection around the pipes



Often, work performed during night time to avoid the presence of many other operators nearby

All these factors act jointly on the probability of accident and on the increase of “normal” exposure, as illustrated now by a few pictures

*Ergonomic study for EDF, by A Garrigou France*

# The transport of the equipment may be quite difficult



# Risky and uncomfortable postures



# The main conclusion of the ergonomic study

The study then concluded that the human error is essential but is often connected to a **lack of organisational reliability** ;

“The management of uncertainty and the time pressure play a vital role in the occurrence of incidents, especially since the work is carried out at night, when vigilance is lower anyway. The difficulties increase because of the hardship of manual handling and of some postures

That should take into account all types of occupational risks , including conventional as they have an important impact on the probability of accidents as well as on the normal exposure increase!

*It also pointed out some technical gaps such as the absence of clear information on the presence of the source outside of its container*

# Vigilance Degradation Factors

