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Strengthening Radiation Protection of Workers –Twenty Years of Progress  
and the Way Forward**

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## **Occupational radiation protection of employees in industrial irradiation facility in Serbia - Risk Analysis**

The paper describes in detail the analysis of all risks that may occur during the operation of the Radiation Facility. All risks in the Radiation Facility can be divided into three categories:

1. Risks in routine use
2. Risks in special operations
3. Accidents

- Risks in routine use can be:

- a) Risk of irradiation of employees in the irradiation cell

There are three openings where a person could theoretically enter the radiation block:

I) An opening in the ceiling of the cell

II) Carrier passages

III) The labyrinth entrance door

- b) Risk of irradiation outside the irradiation block

In all places that can be reached by persons who are not related to the operation of the device, the dose rate does not exceed the value of  $2\mu\text{Sv/h}$  for a maximum source activity of 1 MCi.

- c) Non-nuclear risks

These are the risks associated with the presence of a conveyor and a drive winch for lifting the source.

- Risks in special operations:

- a) Maintenance-related interventions

For certain maintenance interventions, the security network must be switched to ACCESS LIMITED conditions. Under these conditions, any exceeding of the set dose threshold in the cell causes an audible danger signal.

- b) Loading and unloading the source carrier

These operations are performed under the ACCESS LIMITED condition. Switching to ACCESS LIMITED allows the plugs to be lifted using a crane located on the roof. The transport container is lowered to the bottom of the pool. If the springs in the pool are raised too high during these operations, this is immediately registered via the measuring line as an audible danger signal.

- Accidents can be:

- a) Cracking concrete protection

A crack in the concrete protection does not pose great danger. There is a possibility to lower the source to a safe position.

- b) Weakening of water protection

Emptying the pool does not cause an increase in the dose outside the facility. It just disables access to the cell. The case of a person entering the pool cannot cause serious consequences from the point of view of radiation if the person remains on the surface of the water.

- c) Dropping the source bar from the module

Although this case is almost unbelievable, in such a case the measuring line in the labyrinth reacts and states that the dose rate in the labyrinth is increased above the value of the set threshold. The conveyor stops automatically, and the staff is not exposed to danger.

- d) Pool contamination

The cobalt-60 source is encapsulated in a double welded sleeve made of stainless steel. They are manufactured and tested according to standard specifications. Perforation of both layers of steel can cause contamination of the water in the pool. Therefore, water is controlled for the presence of radioactivity.

This paper also describes the risks depending on the radiation zone (active zone, restricted zone, free access zone), as well as decontamination procedures, water and air treatment in the irradiation cell, safe waste management procedure, training, and supervision.

### **Speakers email**

ivica@vinca.rs

### **Speakers affiliation**

**Name of Member State/Organization**

Serbia

**Primary authors:** VUJCIC, Ivica (Vinca Institute for Nuclear Sciences, Belgrade, Serbia); MASIC, Slobodan

**Presenter:** VUJCIC, Ivica (Vinca Institute for Nuclear Sciences, Belgrade, Serbia)

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