

# Improving Safety Culture While Executing Site Radiography

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**Abstract:** In order to improve safety culture of users of radiography equipment and to minimize accident possibilities due to Site Industrial Radiography [1], Radiation Safety Division (RSD) of The Ministry of The Environment ordered users of this technology to report their work program in advance. Thus, considering the possibility of inspection that may be executed by the competent authority – the RSD - during filming, users will take all necessary steps to minimize radiation hazards.

## 1. General:

Site Industrial Radiography is a common and widely used practice using high activity radioactive sources. Thus, possibility for accidents involving high activity sources and high exposure for the workers and the public is feasible.

Radiation Safety Division (RSD) of The Ministry of The Environment is responsible for protection of the Israeli public from Radiation risks. The division issues licenses to users of radioactive sources. One of the conditions given to Industrial Radiography companies is to inform RSD in advance before any site activity. Since most of the filming is for short endurance, it enables the RSD to execute inspections while work is still in process.

Industrial Radiography is a practice used in Israel by several companies. They possess about 25 sources of  $^{192}\text{Ir}$ ,  $^{75}\text{Se}$ , and  $^{60}\text{Co}$ , activities vary from 1.11 TBq to 3.7 TBq.

Information given to RSD includes time, place, endurance, source type and activity, equipment and team names. (Att.1).

## 2. Exposure calculation:

Usually, during Site Radiography two Radiation fields exist: high dose field for very short time, while the source travels from its shielding to filming point and back. A second one during the filming, for a longer time and lower radiation rate. We considered radiation field intensity, time and the geometry of the area.. (Att.2).

## 3. Safety Factor:

According to BSS-115 [2], Maximum annual exposure allowed for the public is 1.0 mSv from all practices. Constrained for a single practice by a factor of 0.3, gives 0.3 mSv/a as a maximum allowed annual dose for the public, or about one third of the limit. We adopted this figure as a “Safety Factor 3”. It means that when planning the activity, the Radiography team should prepare the means that maximum accumulated dose for the public would not be greater than 0.3 mSv/a, if the special activity is going to be used in the certain area for 40 hours a week, 52 weeks a year. (Although we deal with public exposure, we used actual working hours figures).

In order to maximize safety, the safety factor 3 was adopted for activities in sparse areas. In populated areas we adopted safety factors of 5 and 10, which means that calculations should consider 0.2 mSv/a or 0.1 mSv/a as constraints.

#### 4. Summary:

After three years of implementation of this control system, doing sample inspection, we found that the yearly accumulated dose for the public, due to site radiography actions, is about 25  $\mu$ Sv, which is only 7.5% of the maximum exposure allowed (300  $\mu$ Sv/a).

As a “by product” of the possibility of inspection, we improved the defense in depth attitude of the workers and the companies.

#### References:

- [1]: Accidents in Industrial Radiography and Lessons To Be Learned, Working Material, IAEA, Vienna, 1997.
- [2]: Basic Safety Standards No.115, International Atomic Energy Agency, Vienna, 1996.

Chief Radiation Safety Officer  
 Ministry of The Environment  
 Radiation Safety Division

Company	Working Place	Endurance	Repeating?

Time of Beginning	Technicians Names	Source & Activity	Other Equipment
Date:	1.	1.	1.
Hour:	2.	2.	2.
	3.	3.	3.

How To Arrive:

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

RSO's  
 Signature: \_\_\_\_\_  
 \_\_\_\_\_

## Attachment 2

### Parameters and Exposure Calculations

1. The source used for Radiography filming was \_\_\_\_\_ activity\_\_\_\_\_.
2. The monitoring and personal dosimeters used were:\_\_\_\_\_.
3. Time of every filming:\_\_\_\_\_. No. Filmings :\_\_\_\_\_.
4. Time of source travel from shielding and back\_\_\_\_\_.
5. Distance from public area\_\_\_\_\_.
6. The action was repeated \_\_\_\_\_ times.
7. Maximum Radiation rates on end of public area:
  - a. While source travel:\_\_\_\_\_.
  - B. While filming:\_\_\_\_\_.
8. Accumulated dose:
  - a. While source travel:\_\_\_\_\_.
  - B. While filming:\_\_\_\_\_.
9. Overall accumulated dose:\_\_\_\_\_.
- 10.Safety factor:\_\_\_\_\_.
- 11.Overall accumulated dose multiplied by safety factore:\_\_\_\_\_.
12. Compared to annual maximum aloud dose(BSS-115):\_\_\_\_\_
- 13.Remarks and comments of inspector: \_\_\_\_\_.