

THE PROTECTION FROM POTENTIAL EXPOSURE IN THE BRAZILIAN LEGISLATION

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ABSTRACT

The Brazilian Legislation contemplates the work in potential danger places for practices involving originally inflammable materials, including explosive materials, and finally electricity. After the Goiânia accident, ionizing radiation was also included in the Brazilian Legislation, except for federal civil servants that were excluded because they work under special legislation. Immediately after the ICRP Publication-64 : "Protection from Potential Exposure: A Conceptual Framework" had become available , the potential exposure danger for federal civil servants was also acknowledged, and the federal government issued a new legislation based on three levels of danger, that favored them. Thus, we could include in the new legislation the main concepts of the framework suggested by the ICRP publication-64. This paper intends to discuss the manner in which the ICRP publication-64 was introduced in the Brazilian Legislation.

I INTRODUCTION

The Brazilian legislation contemplates those who work in potentially dangerous places, in practices involving inflammable material (Law nº 2573 of August 15, 1955) explosive material (Law nº 5880 of May 26, 1973) and electricity (Law nº 7369 of September, 1985) because of the possibility of electrocution.

This legislation is based on an old fashioned policy, according to which the employer must pay an extra amount in the salary if the practice does not present the same normal safety conditions.

After the Goiânia accident, the ionizing radiation was included in the Brazilian Legislation through Decree nº 97458 of January 01, 1989, and was included in the regulation norm nº 16 of the Ministry of Labor, except for the federal civil servants, who were excluded because they have on special legislation.

In December 17, 1991, Law nº 8270, concerning federal civil servants salary, as well as it's readjustments and restructuring and other provisions , came into effect, and article nº 12 states:

Article 12 - Federal civil servants will receive additional salary concerning insalubrity and potential risk, in terms of the legal norms and regulations pertaining to workers in general and based on the following percenteges:

I - five, ten, and twenty percent, concerning insalubrity in the minimum, medium and maximum degree respectively.

II - ten percent, in the case of potential risk.

§1 The additional amount for ionizing radiation will be received in five, ten and twenty percent, according to what is determined by the regulations.

§2 The gratuity for work involving X-rays or radioactive substances will be based on ten percent.

The author of this paper was invited by the Brazilian Nuclear Energy Commission to present scientific bases to support the federal decree mentioned in §1 above.

Next, the author was invited to participate in the study group responsible for the drafting of the decree that was submitted to the workers' associations, which eventually resulted in federal decree nº 877 of July 20, 1993. The decree contemplated the scientific bases established in the draft, which are the main objective of this paper.

II SCIENTIFIC BASES USED IN THE DECREE Nº 877 OF JULY 20, 1993

First we must mention that any individual has the right to receive the additional amount if he is working in a place where there is the possibility to receive the expected radiation doses that exceed the annual dose limits for workers, in case the potential risks become real.

The ICRP publications (1) were used to set the scientific bases. In these publications (1) we referred mainly to the following items:

4th. International Congress on
Radiation Protection, Vienna, Austria,
~~Vienna~~, April 14-19, 1996. U. 4

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(29) At levels of effective dose below about 0.1 Sv, only stochastic effects are expected to occur and the probability of their recurrence is assumed to be directly proportional to the effective dose. The relationship of probability of harm to dose is therefore linear without threshold in this range. A nominal proportionality coefficient of $5 \times 10^{-2} \text{ Sv}^{-1}$ for the probability of fatal cancer in the general population, given a dose and dose rate effectiveness factor (DDREF) of two for low dose or dose rate, is used by the Commission in ICRP Publication 60.

(30) For absorbed doses higher than approximately 0.5 Gy, delivered over a short period, some deterministic effects begin to occur in addition to stochastic effects. The dose response relationship for attributable death approximates a sigmoid curve, although the exact shape depends on a number of factors, such as the dose rate and the distribution of the exposure over time. For a dose to the whole body of approximately 3 Gy, the probability of death is about 0.5 in the absence of medical attention. For acute doses higher than about 6 Gy, delivered over a short period, practically all irradiated individuals will suffer an acute syndrome and are likely to eventually die as a consequence of the irradiation.

(61) Limits are used in radiation safety to control the risk to individuals from all stipulated sources of exposure. However, in order to establish requirements to constrain exposure to individuals from a particular source, the Commission has recommended the use of constraints in the process of optimization, which are source related and should be established in a manner such that the sum of the risks from all relevant sources does not exceed the individual limit. For the treatment of potential exposure, the Commission recommends that the limits of risk be of the same order of magnitude as the health risk implied by the dose limits for normal exposures. However, the dose limits themselves are not applicable to potential exposure situations.

(62) Constraint for individual risks from potential exposure situations can be obtained by constraining the probability from specific potential exposure scenarios or event sequences leading to exposure, or by constraining the magnitude of the exposure or both, i. e., by limiting the probabilities of doses being incurred and/or the doses themselves. This may be achieved through measures...

From items 29 and 30, we see that the dose response relationship is linear up to 0.1 Sv, quadratic up to 0.5 Gy and a sigmoid curve over up to 3 Gy, where the probability of death is about 0.5 in the absence of medical attention.

In this case, we can associate approximately the three reference levels of §1 Law n° 8270 mentioned above, with these three different dose ranges using what was stated in item 61 of the ICRP publication (1), i. e., the limit of risk must be of the same order of magnitude as the health risk implied by the dose limits for normal exposure.

Following this reasoning, if the individual has an attributed dose for the potential risk above 1/10 up to 1 of the worker's annual limit dose for normal situations, he will receive the maximum additional value. If he receives an attributed dose for potential risks between the annual dose limit for the public and 1/10 of the worker's annual dose limit, he will receive the intermediate additional value. For smaller attributed doses for the potential risks, he will receive the minimum additional value.

There is still one more factor to be considered: the area occupancy time. This factor offers the probability to meet the person in the area at the moment of the accident. In this case, the area occupancy factor, T, used by the National Council on Radiation Protection (2) of the United States of America.

If the individual has an attributed potential dose based on potential risk above 1/10 of the annual dose limit for workers and remains in the workplace for more than 1/16 of the normal weekly working time (40 hours /week), he has a right to the maximum additional value. If the individual remains in the workplace for less than 1/16, but more than 1/80 of the weekly working time, he has a right to the intermediate additional value. If the fellow remains less than 1/80 of the weekly working time, he has a right to the minimum additional value.

The same reasoning is applied for the person that, according to the attributed potential dose has a right to receive the intermediate additional.

REFERENCES

- (1) Protection from Potential Exposure: A Conceptual Framework, ICRP Publication 64, Pergamon Press, 1993.
- (2) Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energy Up to 10 MeV, NCRP Publication 49, 1976.