

ON THE IMPLEMENTATION OF THE SYSTEM OF DOSE  
LIMITATION FOR THE SAFETY OF WORKERS AROUND  
RADIATION SOURCES AND REACTORS

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ABSTRACT

The system of dose limitation for the safety of workers around radioactive sealed and unsealed sources and nuclear in-radiological protection (comptant authority).

In the present work, general description of the Egyptian comptant authorities, the need of health physicists to implement the nuclear energy programme and how to attract new ones, the annual dose equivalent for occupational workers, the monetry value for unit dose equivalent and setting release limit are discussed.

INTRODUCTION

In 1977 the system of dose limitation was developed by the International Commission on Radiological Protection (1). When the International Atomic Energy Agency and International Organization decided to implement the system of dose limitation two Radiation Protection experts from Egypt took part in the expert group meetings.

When the basic safety standards for radiation protection was published by IAEA in 1982 (2), the system of dose limitation was proposed by GOMAA to be implemented at the Egyptian Atomic Energy Authority. In May 1983, the Atomic Energy Authority of Egypt recommended the implementation of the system of dose limitation to the central Authority for Radiological Protection of Egypt.

In June 1983, The Central Authority for Radiological Protection of Egypt (3) approved the implementation of the system of dose limitation in Egypt in principal.

The Egyptian low for radiological protection (1960) (4) indicate that the all radiological protection activities should be controlled by the Ministry of Health or the Atomic Energy Authority of Egypt. Along side with the radiological protection low the Egyptian regulations for radiological protection (1963) (5) was based on IAEA and ICRP publications. Four working groups are

formed in July 1983 to rewrite the Egyptian regulations according to the system of dose limitations. The working groups are grouped according to the type of exposure as occupational, medical, members of the public and emergency and accidental.

#### THE EGYPTIAN COMPTENT AUTHORITY

During 1982, the nuclear safety commission of Egypt is formed. In 1983 the commission is renamed as the nuclear regulatory and safety commission of Egypt (6).

The commission is responsible from the control of open sources and reactors as well. The research centres of the Atomic Energy Authority are responsible on radiological protection of its workes.

The radiation protection committee of the Nuclear Regulatory and Safety Commission are responsible on the formulating regulations, codes and guides for radiation protections and to ensure that the regulation are implemented within the research centres the Atomic Energy Establishment and outside. The AEE is issuing liscence for open sources and research and power reactors after recommendations by the NRSC.

The radiation protection Exactive Bureau of the Ministry of Health is controlling the use of sealed sources, X-ray machines and accelerators. The technical committee for radiation protection of the same Ministry is issuing Liscences for persons and the working places.

The national comptant Authority of Egypt is the Central Authority for Radiological Protection. The main objective of the Central Authority is to lay down the national radiation protection policy and to suggest the up dating the radiological protection law. During the June Meeting the CARP approved the use of Becquerel as a unit of activity, the Gray as a unit of absorbed dose and the seivert as a unit of dose equivalent along side with the special units of Curie, rad. and rem.

#### THE NEED FOR HEALTH PHYSICISTS

The future plans for the nuclear energy in Egypt includes the following activities:

- (1) Eight nuclear power plants by the year 2000, and
  - (2) Uranium mining,
- Health physicists are needed for participating in:
- (a) Review and assessment of the nuclear safety reports for nuclear installations.

- (b) Liscensing of nuclear installations.
- (c) Operation of the nuclear installations as inspectors.

Health physicists are also needed for radiation protection work at Nuclear Power Plant and the Research Centres of AEE and for controlling the use of open sources for medical and other purposes. For the growth use of sealed sources and accelerates for medical and radiographic purposes the Ministry of Health is also in need for health physicists.

In Egypt, Radiation Protection work is done by radiation protection experts and health physicists.

Radiation protection experts in Egypt are physicists granted Ph.D. in Physics with two years of experience in the field of radiation protection or health physicists having five years of radiation protection experience.

While health physicists are physicists with B.Sc. in Physics with one year diploma in radiation physics with two years experience in radiation protection.

In order to attract physicists to be health physicists a new diploma in health physics is now recognized at Cairo University. Furthermore, a new department is now recognized at the Faculty of Science of Cairo University for Biophysics. In these courses the system of dose limitation is part of the teaching programme.

Alongside with the previous courses training programmes in radiation protection and the use of ionizing radiation for various purposes are organized by the Atomic Energy Establishment Centres and the Ministry of Health for technicians and scientists.

#### ANNUAL DOSE EQUIVALENT

For the last 20 years the average annual dose equivalent for occupational workes of the Atomic Energy Establishment in Egypt is 2.50 mSv (7). The system in use is the film badge and nuclear emulsion. Future plans is aimed to reduce cases of exposures greater than 10 mSv by appling the ALARA principal and for personnel dosimetry the systems of TLD and SSNTD which were experimented for more than ten years shall be in use for occupational exposure.

#### OPTIMIZATION FOR PROTECTION

In order to apply the ALARA principal, a monetary value for unit of collectine effective dose equivalent ( $\alpha$ ) should be assessed.

Following Webb's (8) definition:

$$\alpha = 0.4 L + C \quad (1)$$

where ICRP estimated a total loss of life expectancy of 0.4 man year per man Sv, and L is the annual mean per Caput income, and C is the cost of additional medical care per man Sv.

$$\text{In Egypt } I = \text{L.E. } 810 \quad \text{US\$ } 1000 \quad (2)$$

where C = cost of medical care x induction rate for cancer, i.e.,

$$C = \$ 10,000 \times 10^{-2} \text{ Sv}^{-1} = \$ 10^2 \text{ Sv}^{-1} \quad (3)$$

The value of  $\alpha = 500 \text{ US\$ per sievert.}$

In practice this value is not enough to buy radiation protection equipments since these equipment are usually made at the developing countries, so, the value I recommended should be ten times the suggested one.

#### SETTING RELEASE LIMITS

For setting release limits (9), the Egyptian recommendations are still under study and for the critical group the following relation is developed:

Annual exposure =  $\epsilon$  annual dose equal limit,

where  $\epsilon$  is  $1/100$ ,

where the annual exposure is due to external and internal exposures.

#### REFERENCES

- (1) ICRP-26, 1977. Oxford, Pergamon Press.
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- (5) Egyptian Regulation for Radiological Protection, 1963.
- (6) Egyptian Atomic Energy Authority, order No. 4, 1983.
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- (8) M.A.M. Webb, IAEA Working Document (not edited) on the value of unit collective dose ..., Vienna, April, 1982.
- (9) IAEA Safety Series No. 45B, 1982.