

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1710

FUNDAMENTAL PRINCIPLES FOR PROTECTION
IN THE DESIGN AND CONSTRUCTION OF INSTALLATIONS
FOR WORK ON UNSEALED RADIOACTIVE MATERIALS

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BRIEF HISTORY

The ISO Recommendation R 1710, *Fundamental principles for protection in the design and construction of installations for work on unsealed radioactive materials*, was drawn up by Technical Committee ISO/TC 85, *Nuclear energy*, the Secretariat of which is held by the American National Standards Institute (ANSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1710 which was circulated to all the ISO Member Bodies for enquiry in October 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Greece	Sweden
Belgium	Hungary	Thailand
Brazil	Iran	Turkey
Canada	Israel	U.A.R.
Chile	Italy	United Kingdom
Colombia	Netherlands	U.S.A.
Czechoslovakia	Poland	U.S.S.R.
Denmark	Romania	Yugoslavia
France	South Africa, Rep. of	
Germany	Spain	

The following Member Bodies opposed the approval of the Draft :

New Zealand
Switzerland

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

FUNDAMENTAL PRINCIPLES FOR PROTECTION IN THE DESIGN AND CONSTRUCTION OF INSTALLATIONS FOR WORK ON UNSEALED RADIOACTIVE MATERIALS

1. SCOPE

This ISO Recommendation gives the principles for protection to be applied in the design and construction of an installation in which work will be carried out on unsealed radioactive materials.

Principles relating to the working of these installations are excluded from the scope of this ISO Recommendation. However, when the correct application of these principles implies the use of components which should be specified from the start of construction, those components are mentioned in the text below.

The sites referred to by this ISO Recommendation are all scientific, medical, or industrial installations for work on unsealed radioactive materials, with the exception of nuclear reactors for which the regulations are of a special nature.

The principles intended to prevent a criticality accident or to minimize its consequences are the subject of ISO Recommendation R 1709, *Principles of criticality safety in handling and processing fissile materials*.

2. GENERAL PRINCIPLES

The aim of protection is to ensure that persons working inside an installation and those working outside or living in the neighbourhood receive dose equivalents as low as possible and, in any case, not exceeding the maximum limits permissible for workers or population.

To achieve this aim it is necessary not only to observe a certain number of precautions pertinent to work but also to specify some requirements particular to the design and construction of the building. The precautions which are stated in this document proceed from the following general principles :

(a) protection against external irradiation* may be obtained

- by shielding;
- by distance;
- by limiting the duration of exposure;
- or by a combination of these means.

(b) protection against contamination may be obtained

- by confinement, for example, by limiting the volume or surfaces which may become contaminated, and by preventing this contamination from spreading into the atmosphere of adjacent rooms or being carried there by the movement of persons or objects;
- by preventing, through wearing appropriate equipment, direct exposure of persons to contamination or by limiting the duration of this exposure;
- by decontaminating surfaces and cleaning the atmosphere of working areas to minimize contamination;
- by monitoring and controlling the activity of liquid and gaseous wastes;
- by taking special precautions for the disposal of radioactive solid wastes;
- or by a combination of these means.

* In this document external irradiation is intended to mean the irradiation produced by a source external to the organism and not constituted by an atmospheric contamination.

3. CLASSIFICATION OF INSTALLATIONS ACCORDING TO THE WORK TO BE PERFORMED THERE

The severity of the requirement to be complied with during design and construction in pursuance of the above principles will be related to the kinds and activities of material likely to be used during work.

In this document, a distinction is made between installations for work with high, moderate, and low activities without fixing any precise limits : in fact, it seems preferable to leave it to the authorities of each country to fix these limits. However, an example of the application of the division into three categories is given in Appendix Y for the radiochemical laboratories.

4. PRINCIPLES RELATING TO INSTALLATIONS FOR WORK ON HIGH ACTIVITY

4.1 Distribution of areas

4.1.1 *Division into zones.* The application of the general principles mentioned in section 2, and particularly the care of containing contamination, leads the designer to the isolation of the most dangerous areas from those less dangerous, thus dividing the inside of an installation into several zones in which, due to the expected risk of irradiation or contamination, the foreseen conditions of work will be different.

Four fundamental zones are distinguished in the layout of an installation; these are, in increasing degree of risk :

ZONE 1, which must be designed and constructed in such a way that, in circumstances of normal operation, the annual doses* received by workers continuously staying in this zone do not exceed 3/10 of the annual maximum permissible doses.

Criterion for external irradiation (in the absence of any risk of atmospheric contamination) : level such that the dose which could be received in the above-mentioned conditions does not exceed 1.5 rem per year for the most sensitive organs.

Criterion for atmospheric contamination (in the absence of any risk of external irradiation) : annual mean less than 3/10 of MPC** applicable to workers for a 40 hours presence week.

ZONE 2, which must be designed and constructed in order to ensure a sufficient containment of contamination towards zone 1 or outside and so that, in circumstances of normal operation, the annual doses received by workers continuously staying in this zone, if they may exceed 3/10 of annual maximum permissible doses, do not exceed these annual maximum permissible doses.

Criterion for external irradiation (in the absence of any risk of atmospheric contamination) : level such that the dose which could be received in the above-mentioned conditions does not exceed 5 rems per year for the most sensitive organs.

Criterion for atmospheric contamination (in the absence of any risk of external irradiation) : quarterly mean less than MPC** applicable to workers for a 40 hours presence week.

ZONE 3, where, as the risks are higher than in zone 2, the annual dose received by workers who might stay there continuously could exceed the annual maximum permissible dose so the stay in this zone will be subject to a limit of duration or subject to the wearing of special equipment. Zone 3 must be designed and constructed in order to allow this condition of work and to ensure a sufficient containment of contamination towards zones 1 and 2 or outside.

Criterion for external irradiation (in the absence of any risk of atmospheric contamination) : level such that the dose received during continuous stay would exceed 5 rems per year for the most sensitive organs.

Criterion for atmospheric contamination (in the absence of any risk of external irradiation) : the quarterly mean may exceed the MPC** applicable to workers for a 40 hours presence week.

* Throughout the text, "dose", used for convenience, stands for "dose equivalent".

** Maximum permissible concentration.