

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1709

PRINCIPLES OF CRITICALITY SAFETY
IN HANDLING AND PROCESSING FISSILE MATERIALS

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BRIEF HISTORY

The ISO Recommendation R 1709, *Principles of criticality safety in handling and processing fissile 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. 1709 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	Switzerland
Brazil	Israel	Thailand
Canada	Italy	Turkey
Chile	Netherlands	U.A.R.
Colombia	New Zealand	United Kingdom
Czechoslovakia	Poland	U.S.A.
Denmark	Romania	U.S.S.R.
France	South Africa, Rep. of	Yugoslavia
Germany	Spain	

No Member Body opposed the approval of the Draft.

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

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**PRINCIPLES OF CRITICALITY SAFETY
IN HANDLING AND PROCESSING FISSILE MATERIALS**

1. SCOPE

These principles apply to all operations with fissile materials outside the cores of nuclear reactors but within the boundaries of nuclear establishments. They are concerned with the limitations which must be imposed on processes and equipment because of the unique nuclear properties of these materials by which they can support nuclear chain reactions. These principles apply to quantities of fissile materials in which nuclear criticality can be established.

This ISO Recommendation states the factors and technical criteria which form the basis on which the procedures relating to criticality safety should be established. It does not cover details of equipment design or of operational procedures, nor does it refer to the effects of radiation on man or materials or to sources of such radiation, either natural or the result of nuclear chain reactions. Transport of fissile materials outside the boundaries of nuclear establishments should be governed by appropriate national and international regulations.

2. PROCEDURES

2.1 General

Common industrial procedures are not sufficient for operations with fissile materials and should be supplemented by appropriate regulations to enhance criticality safety in the process.

2.2 Responsibility

Ultimate responsibility for criticality safety in all operations should rest clearly on process management through the normal management chain of command. Individual responsibility should be clearly defined and recorded in establishment instructions.

2.3 Specialist advice

The advice of specialists in criticality safety should be obtained when assessing the safety of a process and of operational procedures. It is recommended that these specialists be independent of normal process management and that they should directly advise the manager of the establishment. The safety features of all designs and operational procedures for processes should be assessed by two separate, and preferably independent, groups. At least one of these groups should be skilled in the interpretation of experimental criticality data as well as being familiar with process operations.

2.4 Criticality assessment

- 2.4.1 Criticality assessment should begin as early as possible in the design stage of new processes or whenever a change is contemplated in an existing process. Consideration should be given to the basic forms of control to be employed, for example, restriction of vessel geometry, limitations on mass, use of process control instrumentation, or any other feature or combination of features. Wherever possible, controls other than administrative ones should be used for criticality safety.
- 2.4.2 As part of the initial assessment, consideration should be given to the need for a radiation monitoring system to detect the occurrence of a criticality accident.
- 2.4.3 Criticality assessment should take account of abnormal conditions and non-routine operations. Consideration should be given to the most reactive system that could be produced in the course of normal operations or that is a technically possible result of abnormal circumstances.
- 2.4.4 Unusual occurrences or situations should be investigated to determine their possible effects on criticality safety.

2.5 Training

Adequate training in criticality safety should be given to all personnel involved in operations with fissile materials.

2.6 Operational control

- 2.6.1 Careful operational control should be exercised over all processes and materials to enforce compliance with the safety assessment.
- 2.6.2 Clear and comprehensive written operating instructions, including safety instructions, should be prepared for all normal and non-routine operations with fissile materials.
- 2.6.3 Regular reviews and inspections of process procedures should be instituted to guard against the accumulation of a number of minor changes in process conditions causing the initial assessment to be invalidated.
- 2.6.4 Accountancy procedures should be established to ensure that the location and movement of fissile material can be adequately controlled and recorded.
- 2.6.5 Emergency and radiological protection procedures should be prepared and rehearsed for use in the event of a criticality accident.
- 2.6.6 Actions to be taken following a criticality accident should be carefully considered and prescribed in order not to cause any further accident.

2.7 Movement within the establishment

The movement of fissile material within an establishment or between stages of a process should at all times be fully controlled according to clearly defined procedure.

2.8 Dispatch and receipt of material

Appropriate arrangements should be made between the consignor and consignee before fissile material is dispatched from an establishment. Provisions should be made for the receipt of unexpected or damaged packages of fissile material.