INTERNATIONAL STANDARD

ISO 23133

First edition
2021-01

Nuclear criticality safety — Nuclear criticality safety training for operations

Sûreté-criticité — Formation à la sûreté-criticité dans le cadre de l'exploitation

Reference number
ISO 23133:2021(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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ISO 23133 was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 5, *Nuclear installations, processes and technologies*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Experience of criticality accidents and evidence of operations history worldwide has indicated that human errors on different levels (management, operations staff, and/or operations supervisors), through lack of understanding or ignorance of nuclear criticality safety, have contributed to accidents.

In order to maintain nuclear criticality safety for facilities handling and processing fissile material it is necessary to ensure the operations staff, operations supervisors, and management are suitably trained in nuclear criticality safety. This document was developed in response to demand for a definition of the minimum nuclear criticality safety training requirements for operations staff, operations supervisors, and management.

This training is distinct from that of the training necessary for nuclear criticality safety staff in that it is tailored to suit the needs of maintaining nuclear criticality safety for operations. This document sets out standards for achieving and maintaining an adequate level of understanding and knowledge in order to operate nuclear facilities safely with respect to nuclear criticality safety.

This document covers high-level training for maintaining nuclear criticality safety. This includes preparedness for and response to a potential criticality accident. ISO 11320 contains more specific training provisions on emergency preparedness and response. This document supports integrating such provisions, when relevant, within the training program for operations staff, operations supervisors, and management.

Nuclear criticality safety — Nuclear criticality safety training for operations

1 Scope

This document specifies minimum nuclear criticality safety training requirements for operations staff, operations supervisors, and management.

This document is applicable to areas, processes or facilities containing quantities of fissile material for which nuclear criticality safety assessment is required as defined in ISO 1709.

This document is not applicable to the transport of fissile materials outside the boundaries of nuclear establishments.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
operations staff
workers who, in the act of carrying out activities as part of a facility or process, have duties for maintaining nuclear criticality safety

Note 1 to entry: These include staff and (sub)contractors performing activities in accordance with written procedures as part of production, processing and handling of fissile material. They may also include workers such as maintenance workers, and health physics monitors if they could have an effect on nuclear criticality safety either through action or inaction as part of their duties**.** They do not include support staff, whose actions would not be expected to affect fissile material processes.

3.2
operations supervisors
individuals who direct or supervise *operations staff* (3.1) in the production, processing or handling of fissile material, and who accept responsibility for the safety of operations under his/her control

3.3
management
individuals with overall responsibility for the nuclear criticality safety of operations for a site, process or facility

3.4
nuclear criticality safety staff
individuals competent in the assessment of nuclear criticality safety requirements

Note 1 to entry: The staff might not be competent in nuclear criticality safety for all fissile material operations carried out on a nuclear site but will be familiar with the fissile material operations for which they provide nuclear criticality safety support.

3.5
trainee
individual being trained in nuclear criticality safety

3.6
criticality trainer
individual competent in delivering nuclear criticality safety training

3.7
training coordinator
individual who provides assistance and advice to facilitate nuclear criticality safety training

3.8
nuclear criticality safety program
arrangements and procedures implemented in order to ensure nuclear criticality safety for a site, facility or process

3.9
operations nuclear criticality safety training program
program detailing the training requirements, method of delivery, and evaluation process for *operations staff* (3.1), *operations supervisors* (3.2) and *management* (3.3)

4 Operations training

4.1 General

Subclauses 4.2 to 4.6 define the high-level requirements for nuclear criticality safety training for operations. Detail of the roles in the training program and specific requirements for how some aspects of the high-level requirements are to be met are presented in the proceeding clauses.

4.2 Operations nuclear criticality safety training program

The nuclear criticality safety program shall include an operations nuclear criticality safety training program.

4.3 Objectives

An operations nuclear criticality safety training program shall address the following principal training objectives:

a) Understanding of the nature of a criticality accident so that the severity of the hazard and the need for maintaining safety are understood.

b) Understanding of the mechanisms and activities to control nuclear criticality safety.

c) Understanding that everyone involved in operations, directly or indirectly, can affect nuclear criticality safety.

d) Understanding of nuclear criticality safety relating to operations in the specific workplace.

e) Understanding of the role of emergency preparedness and response in mitigating the consequences of a criticality event.

Sufficient training shall be provided and confirmed to be effective, in keeping with Clauses 6, 7 and 8, before commencement of activities associated with processes that may present a criticality hazard and before operations supervisor duties are commenced. Where on-the-job training is provided, activities may commence before nuclear criticality safety training is complete provided that the trainee is subject to direct supervision by an individual trained in nuclear criticality safety. The continued effectiveness of training shall be evaluated or refresher training shall be required as detailed in Clause 9.

NOTE It is not an objective to train trainees so that they become criticality safety specialists.

4.4 Training of operations staff

Training in nuclear criticality safety shall be provided with due consideration of the nature of the work operations staff perform and the sensitivity of that work in maintaining nuclear criticality safety.

Operations staff working according to procedures that are required to maintain nuclear criticality safety will require a greater extent of training than those staff who do not perform those duties or those who perform tasks that are intrinsically less sensitive for maintaining nuclear criticality safety.

EXAMPLE Staff in a facility handling inventories of multiple critical masses, with nuclear criticality safety based on administrative control of batch sizes, will typically require a higher level of training than a facility handling small fractions of a critical mass.

The scope and the level (depth) of training shall be formulated to enable the operations staff to operate a process with sufficient understanding of the criticality hazards associated with that process, and the importance and reasons behind the controls identified to maintain nuclear criticality safety.

Understanding the reasons behind the controls may reduce the risk of operations staff deviating from procedures and/or responding inappropriately to unexpected process conditions. Analysis of past criticality accidents and near-miss data has revealed a number of instances where inadequate understanding of the reasons behind the criticality safety controls has been a contributory factor.

4.5 Training of operations supervisors

Certain roles are particularly important in maintaining nuclear criticality safety. A supervisory role to operations staff is one such role, as are those roles responsible for making decisions which could significantly affect nuclear criticality safety (e.g. operations manager or shift team leader). These key safety roles are termed collectively in this document as operations supervisors (as defined in 3.2).

It is necessary for operations supervisors to have a more comprehensive understanding of the nuclear criticality safety issues and their significance. This could include understanding of typical or common themes that have caused criticality accidents and the need to maintain systems to monitor, maintain and improve nuclear criticality safety in a facility. The specific content of the required training is discussed in Clause 6.

Operations supervisor training shall be in addition to the identified training for operations staff and should be biased to the particular nuclear criticality safety issues associated with the process for which they have responsibilities.

4.6 Training of management

Management shall have an awareness of the severity of the consequences of nuclear criticality accidents and, hence, of the importance of a suitable nuclear criticality safety program.

Management have overall responsibility for the nuclear criticality safety of operations for a site, process or facility and define the nuclear criticality safety program. Management do not require detailed nuclear criticality safety training because they do not carry out operations and, therefore, rely on operations supervisors and operations staff to maintain day-to-day criticality safety.