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Nuclear facilities — Criteria for the design and the operation of containment and ventilation systems for nuclear reactors

National foreword

This British Standard is the UK implementation of ISO 26802:2010.

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Nuclear facilities — Criteria for the design and the operation of containment and ventilation systems for nuclear reactors

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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ISO 26802 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 2, *Radiological protection*.

Introduction

Containment and ventilation systems of nuclear power plants (NPPs) and research reactors ensure the security of such installations in order to protect the workers, the public and the environment from the dissemination of radioactive contamination originating from the operations of these installations.

This International Standard applies specifically to systems of confinement and ventilation systems for the confinement areas of reactors and their specialized buildings (such as command centres and particular areas for air purging and conditioning). This International Standard is complementary to ISO 17873, which applies mainly to nuclear fuel cycle installations (e.g. reprocessing plants, nuclear fuel fabrication and examination laboratories, plutonium handling facilities) and to radioactive waste storage, research facilities and auxiliary buildings of nuclear reactors.

INTERNATIONAL STANDARD ISO 26802:2010(E)

Nuclear facilities — Criteria for the design and the operation of containment and ventilation systems for nuclear reactors

1 Scope

This International Standard specifies the applicable requirements related to the design and the operation of containment and ventilation systems of nuclear power plants and research reactors, taking into account the following.

For nuclear power plants, this International Standard addresses only reactors that have a secondary confinement system based on International Atomic Energy Agency (IAEA) recommendations (see Reference [10]).

For research reactors, this International Standard applies specifically to reactors for which accidental situations can challenge the integrity or leak-tightness of the containment barrier, i.e. in which a high-pressure or high-temperature transient can occur and for which the isolation of the containment building and the shut-off of the associated ventilation systems of the containment building is required.

For research reactors in which the increase of pressure or temperature during accidental situations will not damage the ventilation systems, the requirements applicable for the design and the use of ventilation systems are given in ISO 17873. However, the requirements of this International Standard can also be applied.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10648-2, *Containment enclosures — Part 2: Classification according to leak tightness and associated checking methods*

ISO 17873, *Nuclear facilities — Criteria for the design and operation of ventilation systems for nuclear installations other than nuclear reactors*

ICRP 103, *The 2007 Recommendations of the International Commission on Radiological Protection,* ICRP Publication 103, Annals of the ICRP, 37 (2-4), Elsevier

3 Terms and definitions

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

3.1 Accident

3.1.1
design basis accident
DBA
accident conditions against which a facility is designed according to established design criteria, and for which the damage to the fuel and the release of radioactive material are kept within authorized limits

3.1.2
beyond-design basis accident
BDBA
accident conditions more severe than a design basis accident

3.1.3
severe accident
accident conditions more severe than a design basis accident and involving significant core degradation

3.2
aerosol
solid particles and liquid droplets of all dimensions in suspension in a gaseous fluid

3.3
air exchange rate
ratio between the ventilation air flow rate of a containment enclosure or a compartment, during normal operating conditions, and the volume of this containment enclosure or compartment

3.4
air conditioning
arrangements that allow sustaining a controlled atmosphere (temperature, humidity, pressure, dust levels, gas content, etc.) in a defined volume

3.5
balancing damper
control valve
adjustable device inserted in an aerodynamic duct allowing balancing of the fluid flow and/or the pressure of the fluid during plant operation

3.6
barrier
structural element that defines the physical limits of a volume with a particular radiological environment and that prevents or limits releases of radioactive substances from this volume

EXAMPLE Nuclear fuel cladding, primary circuit, containment building of a nuclear reactor, containment walls of auxiliary buildings, filters for some cases.

3.7
cell
shielded enclosure
shielding structure, of fairly large dimensions, possibly leak-tight

See **containment enclosure** (3.10).

NOTE It is often more practicable to limit the spread of a fire by using fire-resistant walls, and to prevent the spread of contamination in the adjacent volumes.

3.8
containment/confinement
arrangement allowing users to maintain separate environments inside and outside an enclosure, blocking the movement between them of process materials and substances resulting from physical and chemical reactions that are potentially harmful to workers, to the public, to the external environment, or for the handled products

3.9
containment compartment
CC
compartment of which the walls are able to contain radioactive substances that would be generated by any plausible fire that breaks out in one of the fire compartments included

NOTE It is often more practicable to limit the spread of a fire by using fire-resistant walls, and to prevent the spread of contamination in the adjacent volumes.

3.10
containment enclosure
enclosure designed to prevent either the leakage of products contained in the pertinent internal environment into the external environment, or the penetration of substances from the external environment into the internal environment, or both simultaneously

See **cell** (3.7).

NOTE This is a generic term used to designate all kinds of enclosures, including glove boxes, leak-tight enclosures and shielded cells equipped with remotely operated devices.

3.11
containment envelope
volume allowing the enclosure, and thus the isolation from the environment, of those structures, systems and components whose failure can lead to an unacceptable release of radionuclides

3.12
containment/confinement system
system constituted of a coherent set of physical barriers and/or dynamic systems intended to confine radioactive substances in order to ensure the safety of the workers and the public and the protection of the environment and to avoid releases of radioactive materials in the environment

NOTE According to IAEA definitions, a containment system concerns the containment structure and the associated systems with the functions of isolation, energy management, and control of radionuclides and combustible gases. This containment system also protects the reactor against external events and provides radiation shielding during operational states and accident conditions. These two last functions are not described in this International Standard, due to the absence of link with the ventilation systems.

3.13
contamination
presence of radioactive substances on or in a material or a human body or any place where they are undesirable or can be harmful

3.14
decontamination factor
measure of the efficiency achieved by a filtration system and corresponding to the ratio of the radiological contents of the inlet and outlet of the filtration system

3.15
discharge stack
duct (usually vertical) at the termination of a system, from which the air is discharged to the atmosphere after control