SLOVENSKI STANDARD
SIST HD 462 S1:2003

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Process stream radiation monitoring equipment in light water nuclear reactors for normal operating and incident conditions

Process stream radiation monitoring equipment in light water nuclear reactors for normal operating and incident conditions

Meßeinrichtungen zur Strahlungsüberwachung von Prozeßkreisläufen in Leichtwasserreaktoren bei Normalbetrieb und unter Störfallbedingungen

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Equipement pour la surveillance des rayonnements des fluides de processus pour les conditions normales de fonctionnement et d'incidents des réacteurs nucléaires à eau légère

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- IEC 768 (1983) ed 1, not appended ; IEC/SC 45A

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The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text. The German translation is not yet available.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROCESS STREAM RADIATION MONITORING EQUIPMENT IN LIGHT WATER NUCLEAR REACTORS FOR NORMAL OPERATING AND INCIDENT CONDITIONS

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

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3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

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PREFACE

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This standard has been prepared by Sub-Committee 45A: Reactor Instrumentation, of IEC Technical Committee No.45: Nuclear Instrumentation.

A first draft was discussed at the meeting held in Tokyo in 1981. As a result of this meeting, a draft, Document 45A(Central Office)76 was submitted to the National Committees for approval under the Six Months' Rule in February 1982.

The National Committees of the following countries voted explicitly in favour of publication:

Australia
Austria
Belgium
Bulgaria
Canada
China
Egypt
Finland
France
German Democratic Republic
Germany
Netherlands
Poland
Spain
Sweden
Union of Soviet Socialist Republics
United States of America

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PROCESS STREAM RADIATION MONITORING EQUIPMENT IN LIGHT WATER NUCLEAR REACTORS FOR NORMAL OPERATING AND INCIDENT CONDITIONS

INTRODUCTION

Information regarding the levels of radioactive materials in defined process streams of light water reactors (water- and water/steam-loops) is necessary to evaluate plant performance, to provide at an early stage information on possible radioactive releases, and to allow plant operators to take actions as are necessary to control these radioactive releases.

This task will normally be carried out by installed process stream radiation monitors.

1. Scope

This standard is applicable to equipment for the monitoring of radioactive substances within plant process streams of stationary nuclear power plants with light-water reactors during specified normal operation (routine operation) and during anticipated operational occurrences (incidents).

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This standard provides criteria for the design, selection, functional location, testing, and calibration of stationary radiation equipment to be used for continuous monitoring of plant process streams.

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The following are not within the scope of this standard:

— process stream radiation monitoring equipment for accident conditions.

— monitoring equipment for liquid, gaseous and air-borne radioactive effluents or discharges during specified normal operation, anticipated operational occurrences and accidents.

2. Definitions

The following definitions apply for the purpose of this standard:

2.1 *Process streams*

Process streams are those closed cycle fluid systems utilized to cool nuclear power plant radioactive components or systems and which provide a barrier for release of radioactivity to the environment.

Examples of process streams are: primary coolant system, spent fuel cooling system, component cooling system, etc.

Monitoring of these closed cycle process streams for radioactivity provides information on the quality or integrity of the barrier and potential release to the environment.

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2.2 *Qualification test*

Tests performed on selected equipment to verify the adequacy of the design and that the equipment meets the specifications agreed upon between manufacturer and user under normal (operational) conditions and anticipated operational occurrences.

2.3 *Factory test*

Test performed on each equipment item during and after production to verify the correct functioning of the equipment as specified.

3. Design principles

Process stream radiation monitors are normally installed in areas where a variety of environmental conditions may be encountered. They shall be designed to withstand the nearby environmental conditions given by the design principles of the reactor systems and/or components. Special attention, where applicable, shall be given to temperature, its rate of change, vibration, humidity, pressure, and radiation level at the location of the monitoring equipment.

The measuring range and accuracy shall be suitable for the level of and the variation in radioactive concentration of the monitored plant process stream during specified normal operation and anticipated operational occurrences.

Process radiation monitors shall be designed to provide continuous display and/or recording of radioactive concentration, and to provide an alarm signal when the radioactive concentration exceeds predetermined levels. These functions shall be available at a remote location—usually the station control room or an associated area. The signals may also be used for control purposes and/or initiation of protective actions; in this case, they shall be provided in the control room.

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If the signals are used for initiating protective actions to mitigate the consequences of malfunction or failure of structures, systems or components, the equipment belongs to safety-related systems or the protection system. In this case, it shall meet the requirements of the respective systems.

4. Process streams monitored

Process streams, which may be monitored continuously for their level of radioactivity, include:

4.1 Primary reactor cooling loops (water and/or steam).

Information about primary cooling loop activity may also be obtained by taking samples at appropriate time intervals or by monitoring one of the associated systems, provided time delays and dilution are acceptable.

Associated systems are the primary coolant purification system or the off-gas-system of the gas stripper.

4.2 Secondary reactor cooling loop (steam or blow down system), if existing.

4.3 Closed cooling water system (BWR) or component cooling loops (PWR), if these systems or loops could be radioactively contaminated.