ICS 27.120.20 SLOVENSKÁ TECHNICKÁ NORMA Jún 2017

STN	**Jadrové elektrárne. Dozorne. Pomocné dozorne umožňujúce odstavenie reaktora bez prístupu do hlavnej dozorne.**	**STN EN 60965** 35 6613

Nuclear power plants - Control rooms - Supplementary control room for reactor shutdown without access to the main control room

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 05/17

Obsahuje: EN 60965:2016, IEC 60965:2016

Oznámením tejto normy sa od 18.07.2019 ruší
STN EN 60965 (35 6613) z mája 2012

124854

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60965

September 2016

ICS 27.120.20

Supersedes EN 60965:2011

English Version

Nuclear power plants - Control rooms - Supplementary control room for reactor shutdown without access to the main control room (IEC 60965:2016)

Centrales nucléaires de puissance - Salles de commande - Salle de commande supplémentaire pour l'arrêt des réacteurs sans accès à la salle de commande principale (IEC 60965:2016)

Kernkraftwerke - Warten - Notsteuerstelle für das Abfahren des Reaktors ohne Verbindung zur Hauptwarte (IEC 60965:2016)

This European Standard was approved by CENELEC on 2016-07-18. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 60965:2016 E

EN 60965:2016

European foreword

This document (EN 60965:2016) consists of the text of IEC 60965:2016 prepared by SC 45A “Instrumentation, control and electrical systems of nuclear facilities” of IEC/TC 45 “Nuclear instrumentation".

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-07-18
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-07-18

This document supersedes EN 60965:2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

As stated in the nuclear safety directive 2009/71/EURATOM, Chapter 1, Article 2, item 2, Member States are not prevented from taking more stringent safety measures in the subject-matter covered by the Directive, in compliance with Community law. In a similar manner, this European standard does not prevent Member States from taking more stringent nuclear safety measures in the subject-matter covered by this standard.

Endorsement notice

The text of the International Standard IEC 60965:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60880	NOTE	Harmonized as EN 60880.
IEC 61227	NOTE	Harmonized as EN 61227.
IEC 61508-1	NOTE	Harmonized as EN 61508-1.
IEC 61508-2	NOTE	Harmonized as EN 61508-2.
IEC 61508-3	NOTE	Harmonized as EN 61508-3.
IEC 61508-4	NOTE	Harmonized as EN 61508-4.
IEC 61772	NOTE	Harmonized as EN 61772.
IEC 61839	NOTE	Harmonized as EN 61839.
IEC 62138	NOTE	Harmonized as EN 62138.
IEC 62241	NOTE	Harmonized as EN 62241.
IEC 9241 Series	NOTE	Harmonized as EN ISO 9241 Series.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60709	-	Nuclear power plants - Instrumentation and control systems important to safety - Separation	EN 60709	-
IEC 60964	2009	Nuclear power plants - Control rooms - Design	EN 60964	2010
IEC 61226	-	Nuclear power plants - Instrumentation and control important to safety - Classification of instrumentation and control functions	EN 61226	-
IEC 61513	-	Nuclear power plants - Instrumentation and control important to safety - General requirement for systems	EN 61513	-
IEC 61771	-	Nuclear power plants - Main control-room - Verification and validation of design	-	-
IEC 62646	-	Nuclear power plants - Control rooms - Computer based procedures	-	-
ISO 11064	Series	Ergonomic design of control centres	EN ISO 11064	Series
ISO 11064-1	-	Ergonomic design of control centres - Part 1: Principles for the design of control centres	EN ISO 11064-1	-
ISO 11064-3	-	Ergonomic design of control centres - Part 3: Control room layout	EN ISO 11064-3	-
ISO 11064-6	-	Ergonomic design of control centres - Part 6: Environmental requirements for control centres	EN ISO 11064-6	-
IAEA SSR-2/1	2012	Safety of nuclear power plants: Design		
IAEA NS-G-1.3	2002	Instrumentation and Control Systems Important to Safety in Nuclear Power Plants (to be replaced by SSG-39)		

IEC 60965

Edition 3.0 2016-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Nuclear power plants – Control rooms – Supplementary control room for reactor shutdown without access to the main control room

Centrales nucléaires de puissance – Salles de commande – Salle de commande supplémentaire pour l'arrêt des réacteurs sans accès à la salle de commande principale

IEC 60965:2016-02(en-fr)

IEC 60965

Edition 3.0 2016-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Nuclear power plants – Control rooms – Supplementary control room for reactor shutdown without access to the main control room

Centrales nucléaires de puissance – Salles de commande – Salle de commande supplémentaire pour l'arrêt des réacteurs sans accès à la salle de commande principale

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.120.20

ISBN 978-2-8322-3203-3

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

NUCLEAR POWER PLANTS – CONTROL ROOMS – SUPPLEMENTARY CONTROL ROOM FOR REACTOR SHUTDOWN WITHOUT ACCESS TO THE MAIN CONTROL ROOM

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60965 has been prepared by subcommittee 45A: Instrumentation, control and electrical systems of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) requirements associated with regular testing of the supplementary control room (SCR);
b) requirements to assess the time available during which the reactor will be safe but unattended, in order to move from the main control room (MCR) to the SCR and for the SCR to become operational;
c) reference to SSR-2/1 which includes the following new requirements:

1) the SCR should be functionally (as well as physically and electrically) separate from the MCR,
2) consideration shall be given to the provision of shielding against radioactivity on the access paths to the SCR;

d) reference to DS431, the revision of NS-G-1.3, including the following new requirements:
1) to implement at least two diverse methods for communication with a set of predefined locations,
2) to implement features to support monitoring of trends in key plant parameters;

e) requirements for the role, functional capability and robustness of the SCR in design extension conditions;

The text of this standard is based on the following documents:

FDIS	Report on voting
45A/1060/FDIS	45A/1078/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

a) Technical background, main issues and organization of the standard

IEC 60965:1989 was developed to provide requirements relevant to the design of NPP supplementary control points for reactor shutdown without access to the main control room. The first edition of IEC 60965 has been used extensively within the nuclear industry. It was however recognized in 2007 that technical developments especially those which were based on software technology should be incorporated. It was also recognized that the relationships with the standard for the main control room (i.e. IEC 60964) and the derivative standards to that standard (i.e. IEC 61227, IEC 61771, IEC 61772, IEC 61839, and IEC 62241) should be clarified and conditioned. In 2009 the second edition of IEC 60965 was published.

In June 2013, during the Moscow meeting, WG A8 experts recommended a limited revision be launched to take into account the lessons learned from TEPCO Fukushima Daiichi accident and some comments formulated during the circulation of the FDIS of the published second edition. In the course of development of this revision, the title of the standard was amended to refer to Supplementary Control ‘Room’ for consistency with IAEA SSR-2/1.

This IEC standard specifically focuses on the functional design process of the supplementary control room of an NPP. It is intended that the standard be used by NPP designers, design authorities, vendors, utilities, and by licensors.

b) Situation of the current standard in the structure of the IEC SC 45A standard series

IEC 60965 is the third level IEC SC 45A document tackling the issue of the design of a supplementary control room.

IEC 60965 is to be read in association with IEC 60964 for the design of the main control room (including the derivative standards mentioned above) which is the appropriate IEC SC 45A document providing guidance on operator controls, verification and validation of design, application of visual display units, functional analysis and assignment, and alarm functions and presentation.

For more details on the structure of the IEC SC 45A standard series, see item d) of this introduction.

c) Recommendations and limitations regarding the application of this Standard

The purpose of this standard is to provide functional design requirements to be used in the design of the supplementary control room of a nuclear power plant to meet safety requirements.

This standard is intended for application to a supplementary control room whose conceptual design is initiated after the publication of this standard. The recommendations of the standard may be used for refits, upgrades and modifications.

Aspects for which special recommendations have been provided in this Standard, in accordance with IAEA safety standards, are:

– definition of the MCR and plant design bases for which the supplementary control room are to be used;

– access by station staff to the supplementary control room in such emergencies;

– assurance for the station staff that the environment in the supplementary control room is safe when it is to be used;

– provision of information in the supplementary control room on the state of the reactor critical functions;

– transfer of control and indication functions from the main control room to the supplementary control room in emergencies;

– independence and separation of the cabling used by the supplementary control room from that used by the main control room;

– assurance that a safe state has been reached using the supplementary control room;

– communication facilities between the supplementary control room and to the station management.

To ensure that the Standard will continue to be relevant in future years, the emphasis has been placed on issues of principle, rather than specific technologies.

d) Description of the structure of the IEC SC 45A standard series and relationships with other IEC documents and other bodies documents (IAEA, ISO)

The top-level document of the IEC SC 45A standard series is IEC 61513. It provides general requirements for I&C systems and equipment that are used to perform functions important to safety in NPPs. IEC 61513 structures the IEC SC 45A standard series.

IEC 61513 refers directly to other IEC SC 45A standards for general topics related to categorization of functions and classification of systems, qualification, separation of systems, defence against common cause failure, software aspects of computer-based systems, hardware aspects of computer-based systems, and control room design. The standards referenced directly at this second level should be considered together with IEC 61513 as a consistent document set.

At a third level, IEC SC 45A standards not directly referenced by IEC 61513 are standards related to specific equipment, technical methods, or specific activities. Usually these documents, which make reference to second-level documents for general topics, can be used on their own.

A fourth level extending the IEC SC 45A standard series corresponds to the Technical Reports which are not normative.

IEC 61513 has adopted a presentation format similar to the basic safety publication IEC 61508 with an overall safety life-cycle framework and a system life-cycle framework. Regarding nuclear safety, it provides the interpretation of the general requirements of IEC 61508-1, IEC 61508-2 and IEC 61508-4, for the nuclear application sector, regarding nuclear safety. In this framework IEC 60880 and IEC 62138 correspond to IEC 61508-3 for the nuclear application sector. IEC 61513 refers to ISO as well as to IAEA GS-R-3, IAEA GS-G-3.1 and IAEA GS-G-3.5 for topics related to quality assurance (QA).

The IEC SC 45A standards series consistently implements and details the principles and basic safety aspects provided in the IAEA code on the safety of NPPs and in the IAEA safety series, in particular the Requirements SSR-2/1, establishing safety requirements related to the design of Nuclear Power Plants, and the Safety Guide NS-G-1.3 dealing with instrumentation and control systems important to safety in Nuclear Power Plants. The terminology and definitions used by SC 45A standards are consistent with those used by the IAEA.

NOTE It is assumed that for the design of I&C systems in NPPs that implement conventional safety functions (e.g. to address worker safety, asset protection, chemical hazards, process energy hazards) international or national standards would be applied, that are based on the requirements of a standard such as IEC 61508.

NUCLEAR POWER PLANTS – CONTROL ROOMS – SUPPLEMENTARY CONTROL ROOM FOR REACTOR SHUTDOWN WITHOUT ACCESS TO THE MAIN CONTROL ROOM

1 Scope

This International Standard establishes requirements for the Supplementary Control Room provided to enable the operating staff of nuclear power plants to shut down the reactor, where previously operating, and maintain the plant in a safe shut-down state in the event that control of the safety functions can no longer be exercised from the Main Control Room, due to unavailability of the Main Control Room or its facilities. The design has to ensure that the Supplementary Control Room is protected against the hazards, including any localised extreme hazards, leading to the unavailability of the Main Control Room.

The standard also establishes requirements for the selection of functions, the design and organisation of the human-machine interface, and the procedures which shall be used systematically to verify and validate the functional design of the supplementary control room.

It is assumed that supplementary control room provided for shutdown operations from outside the main control room would be unattended during normal plant conditions other than for periodic testing. The requirements reflect the application of human engineering principles as they apply to the human-machine interface during such periodic testing and during abnormal plant conditions.

This standard does not cover special emergency response facilities (e.g. a technical support centre) or facilities provided for radioactive waste handling. Detailed equipment design is also outside the scope of the standard.

This standard follows the principles of IAEA Specific Safety Requirements SSR-2/1 and IAEA Safety Guide NS-G-1.3.

The purpose of this standard is to provide functional design requirements to be used in the design of the supplementary control room of a nuclear power plant to meet safety requirements.

This standard is intended for application to a supplementary control room whose conceptual design is initiated after the publication of this standard. If it is desired to apply it to existing plants or designs, special care must be taken to ensure a consistent design basis. This relates, for example, to factors such as the consistency between the supplementary control room and the main control room, the ergonomic approach, the automation level and the information technology, and the extent of modifications to be implemented in I&C systems.

2 Normative references

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

IEC 60709, *Nuclear power plants – Instrumentation and control systems important to safety – Separation*

IEC 60964:2009, *Nuclear power plants – Control rooms – Design*

IEC 61226, *Nuclear power plants – Instrumentation and control important to safety – Classification of instrumentation and control functions*

IEC 61513, *Nuclear power plants – Instrumentation and control important to safety – General requirements for systems*

IEC 61771, *Nuclear power plants – Main control-room – Verification and validation of design*

IEC 62646, *Nuclear power plants – Control rooms – Computer based procedures*

ISO 11064 (all parts), *Ergonomic design of control centres*

ISO 11064-1, *Ergonomic design of control centres – Part 1: Principles for the design of control centres*

ISO 11064-3, *Ergonomic design of control centres – Part 3: Control room layout*

ISO 11064-6, *Ergonomic design of control centres – Part 6: Environmental requirements for control centres*

IAEA SSR-2/1:2012, *Safety of nuclear power plants: Design*

IAEA NS-G-1.3:2002, *Instrumentation and Control Systems Important to Safety in Nuclear Power Plants (to be replaced by SSG-39)*