



International Nuclear I&C and Electrical System Standards Tables with URLs

Version 1, May 2020

Cooperation in Reactor Design Evaluation and Licensing Working Group

This document brings together the nuclear power plant instrumentation & control and electrical system standards used by the Institute of Electrical and Electronics Engineers (IEEE) and International Electrotechnical Commission (IEC) communities. Both sets of standards are used in different parts of the world. This document is intended as a starting point for identifying similarities and conflicts between the two sets of standards to facilitate harmonization.

The base nuclear safety requirements in this area are given by the International Atomic Energy Agency (IAEA) on the IEC side and the US Nuclear Regulatory Commission (NRC) on the IEEE side. For the IEC the IAEA safety standards, most notably SSR-2/1, SSG-30, SSG 34, SSG 39 and SSG 51, lay out requirements and high-level recommendations that are used within the IEC domain. For IEEE, the NRC regulations given in 10 CFR 50 provide the main requirements, but NRC also promulgates standards in the form of Regulatory Guides that describe practices NRC considers acceptable. Often these Regulatory Guides qualify consensus standards with clarifications and modifications that NRC considers necessary. In addition, certain NRC “NUREG” documents, while they have no official regulatory function, act as de-facto standards.

IEC SC45A is the main IEC subcommittee responsible for nuclear facility standards, but the nuclear community also makes use of standards from IEC SC45B (Radiation Protection), TC65 (Industrial Process Measurement Control and Automation), and TC77 (Electromagnetic Compatibility).

The IEEE Nuclear Power Engineering Committee (NPEC) is the main committee responsible for IEEE nuclear facility standards, but a number of other entities participate. These include the IEEE Computer Society, the IEEE N42.18 Committee, IEEE Power and Energy Committee, IEEE Energy Development and Power Generation Committee, IEEE Switchgear Committee, IEEE Protective Relay Committee, IEEE Transformer Committee, IEEE High Voltage Surge Protection Device Committee, IEEE Stationary Batteries Committee, the International Society of Automation, the American Nuclear Society, the Health Physics Society, and the American Society of Mechanical Engineers.

This document consists of tables that show the IEC and IAEA electrical and I&C nuclear standards alongside the corresponding IEEE and NRC documents. The tables also show documents that have no equivalent.

The tables provide a basic view of the correspondence between related standards. They identify a relatively complete set of standards for electrical and I&C domains in the US. Such a listing is not thought to exist elsewhere.

Clicking in any box in the tables will take the user to further information given by the responsible standard organization. In the case of NRC, the user will be taken directly to the documents in question.

This document offers no further analysis or conclusions. Those steps are left to the reader. This document is a product of the CORDEL Digital Instrumentation & Control Task Force (DICTF) of the World Nuclear Association and it will be regularly revised following future evolutions and updates of the relevant I&C standards.

Errors and omissions should be sent to CORDEL@world-nuclear.org.

Acknowledgement

The CORDEL Secretariat of the World Nuclear Association would like to convey its gratitude to Gary Johnson [Independent Expert and ex-Senior Safety Officer at the IAEA] for collecting and providing the information in these comparison tables, to IEEE and IEC colleagues for agreeing to use the respective information for this publication, and also to colleague Richard Petrie for his assiduous work in designing this reference tool.

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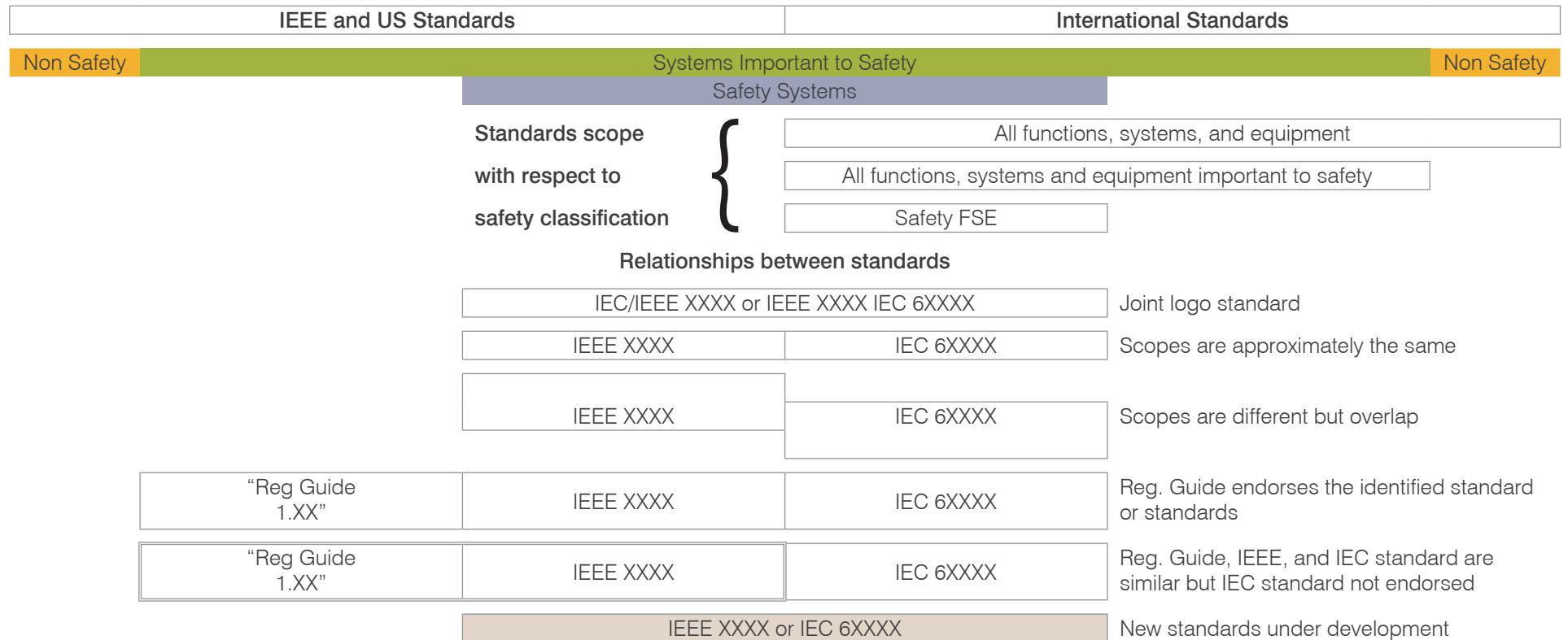
Area

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Key to Tables

Scope of Page



Notes

- 1 To allow for compact presentation of this material, the standard names given in this document are shortened by omitting the full name of the standards organization and safety classification.
- 2 The boxes generally include a URL in small text. These will take you to the standards organization website for the standard. For NRC documents the URL returns the actual document.
- 3 Blue text and outline indicates standards that were not developed by IEC SC45A, IEEE NPEC, NRC, or IAEA.
- 4 Reg Guides deal with safety systems. They are shown under the green bar for readability
- 5 This document gives an overview of where to find related standards. It is not designed to make a detailed comparison of each standard.
- 6 Errors and questions should be reported to CORDEL@world-nuclear.org — Your comments will be taken into account in the following revision of the document.

Overarching Documents



<u>USNRC 10 CFR 50</u> <u>Domestic licensing of production and utilization facilities</u>	<u>IAEA SSR 2/1 Rev. 2</u> <u>Safety of nuclear power plants: Design</u>
	<u>IAEA SSG 30</u> <u>Safety Classification of Structures, Systems and Components in Nuclear Power Plants</u>
	<u>IAEA SSG 34</u> <u>Design of electrical power systems for nuclear power plants</u>
	<u>IAEA SSG 39</u> <u>Design of instrumentation and control systems for nuclear power plants</u>
	<u>IAEA SSG 51</u> <u>Human factors engineering in the design of nuclear power plants</u>
	<u>National regulations</u>

<u>IEEE 603™-2018</u> <u>Standard criteria for safety systems</u>
<u>IEEE 279™-1971</u> <u>Criteria for protection systems</u>

<u>IEC 61508:2010</u> <u>Functional safety of electrical/electronic/programmable electronic safety-related systems</u>

<u>IEC 61513:2011</u> <u>Instrumentation and control important to safety - General requirements for systems</u>
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Notes

- 1 IEEE 603-1991, IEEE 279-1971 and IEEE 279-1968 are incorporated into the requirements of 10 CFR 50. Each plant must comply with one of these depending upon the date of the plants construction permit. For plants having construction permits issued before January 1, 1971 the requirements analogous to the IEEE-603 and IEEE-279 series are given in plant licensing documents.
- 2 The scopes of IAEA SSG 39 and IEC 61513 are quite different from IEEE 603™ but together they address most, if not all, of the requirements given in IEEE 603™
- 3 Within IEC, IEC 61513 is considered to be a nuclear specific implementation of IEC 61508
- 4 IEC 61508 has seven parts

Safety Methods

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

P61226 Categorization and classification of I&C and electrical systems		IEC 61226:2019 Classification of instrumentation and control functions
Reg guide 1.201 2006 Guidelines for categorizing systems, structures, and components according to safety significance	IEEE 1819™-2016 Risk-informed categorization of electrical and electronic equipment	IEC TR 61838:2009 Use of probabilistic safety assessment for the classification of functions
Reg Guide 1.75 2005 Criteria for independence of electrical safety systems	IEEE 384™-2018 Independence of 1E equipment and circuits	IEC 60709:2018 Separation
Reg Guide 1.53 2003 Application of the single-failure criterion	IEEE 379™-2014 Application of the single failure criterion	
Reg Guide 1.22 1972 Periodic testing of protection system actuation functions	IEEE 338™-2012 Criteria for periodic surveillance testing	IEC 60671:2007 Surveillance testing
Reg Guide 1.118 1995 Periodic testing of electric power and protection systems		
IEC 62340:2007 Requirements for coping with common cause failure		
IEC 63160 Common cause failure, system analysis and diversity		
Reg Guide 1.81 1975 Shared emergency and shutdown electric systems for multi-unit plants		

Notes

RG 1.81 is concerned with system interactions. Sharing of onsite power systems at multi-unit power plant sites generally results in a reduction in the number and capacity of the onsite power sources to levels below those required for the same number of units located at separate sites. The reduced capacity could cause undesirable interactions. Examples of such interactions are (1) the interconnection of engineered safety feature (ESF) control circuits of each unit such that failures and maintenance or testing operations in one unit affect the availability of ESF in other units, (2) coordination required between unit operators in order to cope with an accident in one unit and safe shutdown of the remaining unit(s), and (3) system overload conditions as a consequence of real accident in a unit coincident with a false or spurious accident signal in another unit.

Reliability and Hazards Analysis

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

IEEE 352™-2016
Principles of reliability analysis

IEC TR 62987:2015
Use of failure modes and effects analysis and related methods

IEEE 577™-2012
Reliability analysis in the design
and operation of safety systems

IEC TR 63192:2019
Hazards analysis: A review of current approaches

Human Factors Engineering

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

NUREG-0711 Rev 3
Human factors engineering program review model

IEEE 1786™-2011
Human factors applications of computerized operating procedure systems

IEC 62646:2016
Computer based procedures

IEEE 845™-1999
Evaluation of human-system performance

IEEE 1082™-2017, IEC/IEEE 63260:2019
Guide for incorporating human action reliability analysis into probabilistic risk assessments

IEEE 1707™-2015
Investigation of events

P2411
Validation of system designs and integrated system operations

P2421
Designing and developing computer-based displays for monitoring and control of nuclear facilities

Seismic Qualification

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

<p><u>Reg Guide 1.100 2009</u> <u>Seismic qualification</u> <u>of electrical and active</u> <u>mechanical equipment and</u> <u>functional qualification of active</u> <u>mechanical equipment</u></p>	<p>IEC/IEEE 60980-344 Seismic qualification of electrical equipment</p>
	<p><u>QME-1-2017</u> <u>Qualification of active</u> <u>mechanical equipment</u></p>
	<p><u>IEEE C37.81™-2017</u> <u>Seismic qualification of class</u> <u>1E metal-enclosed power</u> <u>switchgear assemblies</u></p>
<p><u>IEEE C37.98™-2013</u> <u>Seismic qualification testing of protective relays and auxiliaries</u></p>	
<p><u>IEEE C57.114™-1990</u> <u>Seismic guide for power transformers and reactors</u></p>	

Lightning Protection

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

Reg Guide 1.204 2005 Lightning protection	IEEE 665™-1995 Generating station grounding
	IEEE 1050™-2004 Instrument and control equipment grounding
	IEEE 666™-2007 Design guide for electric power service systems
	IEEE C62.23™-2017 Surge protection

Notes

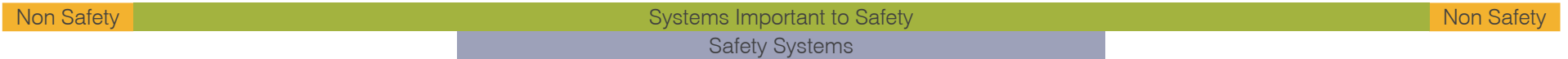
Lightning protection requirements apply to all systems - including non-safety systems

Reg Guide 1.204 endorses IEEE 666™-1991, IEEE 1051™-1996, and IEEE C62.23™-2001

IEEE 663 and IEEE 1050 are endorsed by both Reg Guide 1.180 and Reg Guide 1.204 hence they are shown twice in this document.

Reg Guide 1.204 extends the endorsement to include numerous other standards referenced in the four standards identified above

Environmental Qualification (Equipment that is typically in harsh environments)



<u>Reg Guide 1.89 1984</u> <u>Environmental qualification of electrical equipment</u>	<u>IEC/IEEE 60780-323:2016</u> <u>Electrical equipment important to safety_ qualification</u>
<u>Reg Guide 1.209 2007</u> <u>Qualification of safety-related computer-based I&C</u>	

<u>Reg Guide 1.211 2009</u> <u>Qualification of safety-related cables and field splices</u>	<u>IEEE 383™2015</u> <u>Qualifying electrical cables and splices</u>
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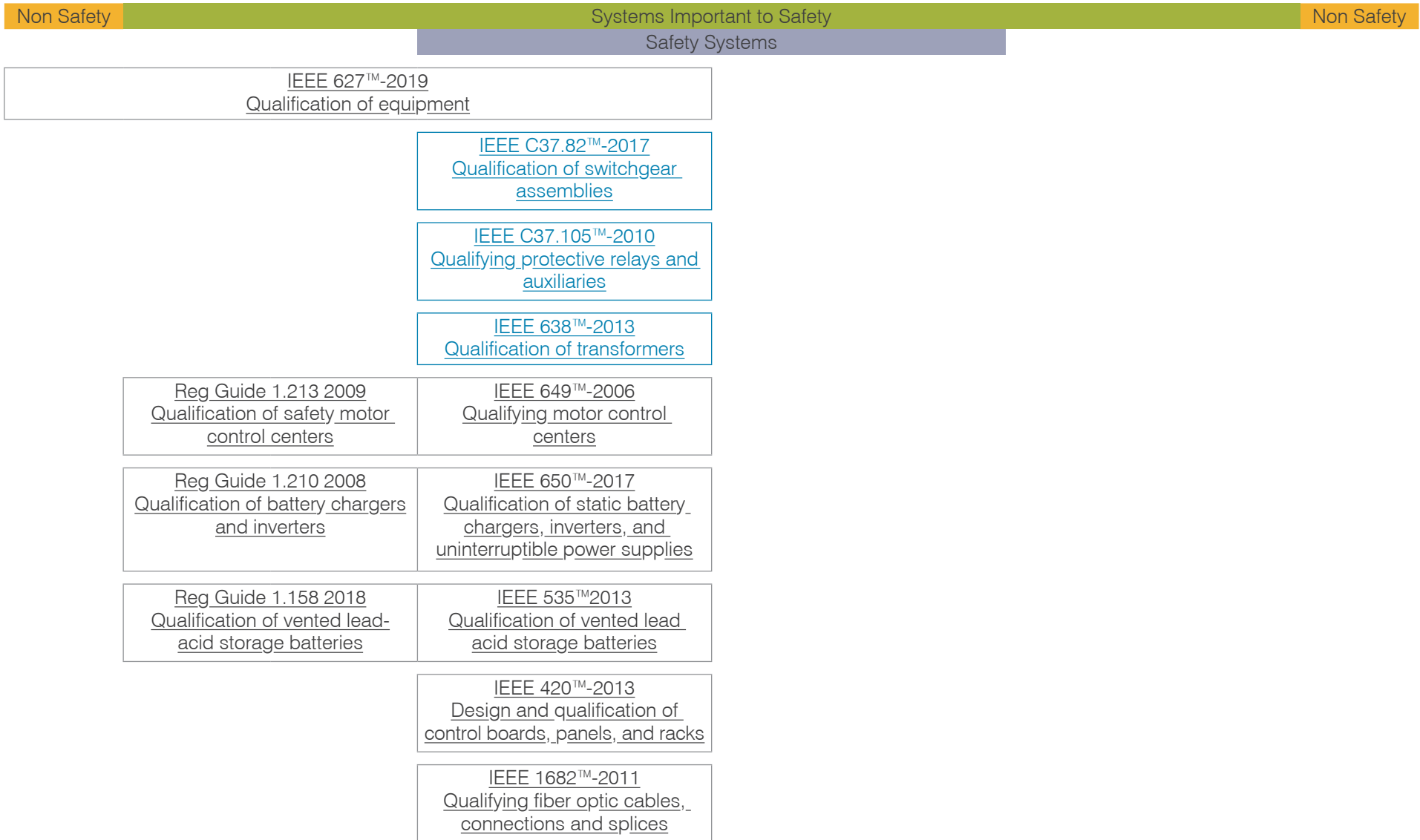
<u>Reg Guide 1.156 2017</u> <u>Qualification of connection assemblies</u>	<u>IEEE 572™-2019</u> <u>Qualification of 1E connection assemblies</u>
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<u>Reg Guide 1.40 2010</u> <u>Qualification of continuous duty safety related motors</u>	<u>IEEE 334™-2006</u> <u>Qualifying continuous duty 1E motors</u>
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<u>Reg Guide 1.73 2013</u> <u>Qualification tests for safety-related actuators</u>	<u>IEEE 382™-2019</u> <u>Qualification of safety-related actuators</u>
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Notes Reg Guides 1.89 and 1.209 endorse IEEE 323™-198., Reg Guide 1.211 endorses IEEE 383™-2003. Reg Guide endorses IEEE 572™-2006. Reg. Guide 1.49 endorses IEEE 334™-2006. Reg Guide endorses IEEE 382™-2006.

Equipment Qualification (Equipment that is typically in mild environments)



Notes Reg Guide 1.210 endorses IEEE 650-2006, Reg Guide 1.210 endorses IEEE 650-2006, Reg Guide 1.158 endorses IEEE 535-2013

Electromagnetic Interference

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

<p>Reg Guide 1.180 2019 Evaluating electromagnetic and radio frequency Interference in safety instrumentation and control systems</p>	<p>IEEE P2425 Electromagnetic compatibility testing of electrical, instrumentation, and control equipment</p>	<p>IEC 62003:2020 Requirements for electromagnetic compatibility testing</p>	
	<p>IEC 61000 Series Electromagnetic compatibility</p>		
	<p><u>MIL-STD-461G</u> <u>Control of electromagnetic interference</u> <u>characteristics of subsystems and equipment</u></p>		
	<p><u>IEEE C62.41™-1991</u> <u>Surge voltages in low-voltage AC power circuits</u></p>		
	<p><u>IEEE C62.45™-2002</u> <u>Surge testing for equipment connected to Low-</u> <u>Voltage AC Power Circuits</u></p>		
	<p><u>IEEE 1050™-2004</u> <u>Instrument and control equipment grounding</u></p>		
	<p><u>IEEE 473™-1985</u> <u>Electromagnetic site survey</u></p>		
	<p><u>IEEE 518™-1982</u> <u>Installation of electrical equipment to minimize</u> <u>noise inputs to controllers from external sources</u></p>		
	<p><u>IEC 665™-1995</u> <u>Generating station grounding</u></p>		

Notes

Reg Guide 1.180 endorses MIL-STD-461E, and IEEE 1050™-1996
 Although the Reg Guide title deals with safety systems, all plant EMI sources must be dealt with to protect against safety system failure
 The IEC 61000 series has 113 parts. Reg. Guide 1.180 and IEEE 62003 identify the specific parts to be considered
 IEEE 663 and IEEE 1050 are endorsed by both Reg Guide 1.180 and Reg Guide 1.204 hence they are shown twice in this document.

Control Rooms

Non Safety

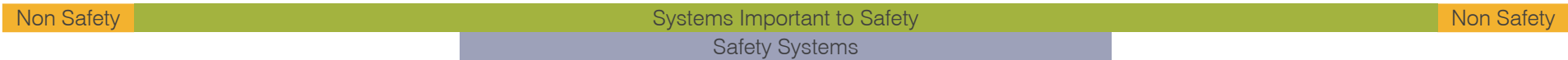
Systems Important to Safety

Non Safety

Safety Systems

<p><u>IEEE 1023™-2004</u> <u>Recommended Practice for the Application of Human Factors Engineering to Systems, Equipment, and Facilities</u></p>	<p><u>NUREG-0700</u> <u>R2 2002</u> <u>Human-System</u> <u>Interface</u> <u>Design</u> <u>Review</u> <u>Guidelines</u></p>	<p><u>IEC TR 63214:2019</u> <u>Control rooms - Human factors engineering</u></p>
<p><u>IEEE 567™-1980</u> <u>Trial-Use Standard Criteria for the Design of the Control Room Complex</u></p>		<p><u>IEC 61839:2000</u> <u>Design of control rooms - Functional analysis and assignment</u></p>
<p><u>IEEE 1289™-1998</u> <u>Guide for the Application of Human Factors Engineering in the Design of Computer-Based Monitoring and Control Displays</u></p>		<p><u>IEC 60964:2018</u> <u>Control rooms - Design</u></p>
		<p><u>IEC 61771:1995</u> <u>Main control-room - Verification and validation of design</u></p>
		<p><u>IEC 61772:2009</u> <u>Control rooms - Application of visual display units (VDUs)</u></p>
		<p><u>IEC 61227:2008</u> <u>Control rooms - Operator controls</u></p>
		<p><u>IEC 62241:2004</u> <u>Main control room - Alarm functions and presentation</u></p>

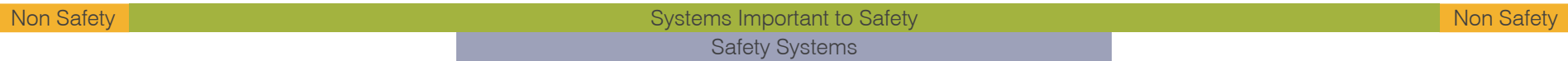
Electrical Systems



Reg Guide 1.93 2012 Availability of electric power sources		IEC XXXX Coordination and interaction with electric grid
Reg Guide 1.32 2004 Criteria for power systems	IEEE 308™-2012 Class 1E power systems	IEC 63046 Electrical power systems - General requirements
		IEC 62855:2016 Electrical power systems analysis
		IEC 61225:2019 Static uninterruptible DC and AC power supply systems
IEEE 765™-2012 Preferred power supply		IEC 63272 AC interruptible power supply systems
IEEE 1792™-2017 Preferred power supply reliability		
Reg Guide 1.155 1988 Station blackout		

Notes Reg Guide 1.32 endorses IEEE 308-2001

Electrical Supporting Systems



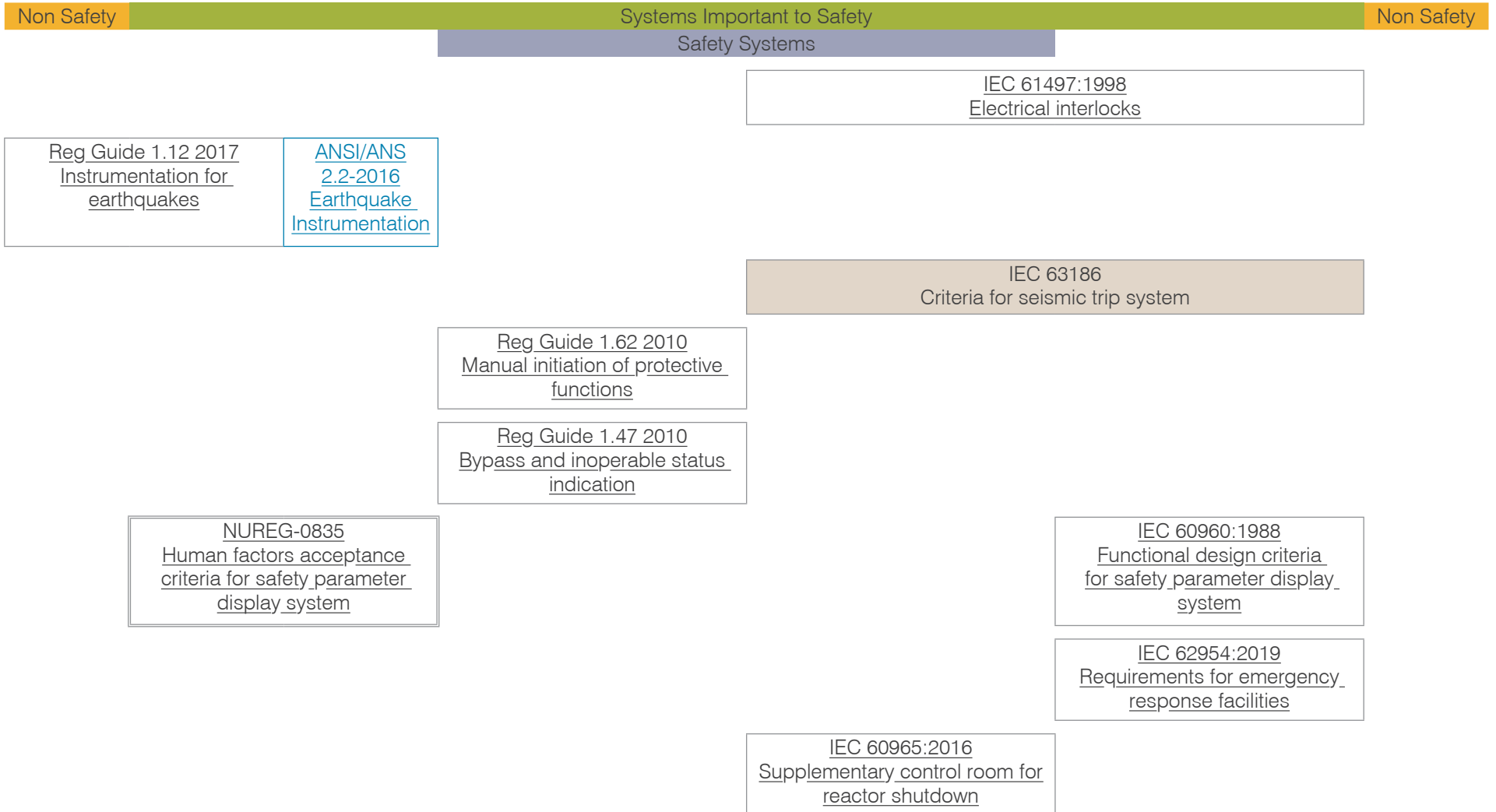
IEEE 628™-2011
Design, installation, and qualification of raceway systems

IEEE 690™-2018
Design and installation of cable systems

IEEE 741™-2017
Protection of power systems and equipment

IEEE 833™-2005
Protection of electric equipment from water hazards

I&C Systems Outside of Containment



In-Containment Monitoring

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

Reg Guide 1.133 1981
Loose-part detection program
for the primary system of LWRs

ANSI/ISA 67.03:1982
LWR coolant pressure boundary
leak detection

IEC 60988:2009
Acoustic monitoring systems
for detection of loose parts

IEC 61502:1999
PWR - Vibration monitoring of
internal structures

IEC 60910:1988
Containment monitoring
instrumentation for early detection
of developing deviations from
normal operation in LWR

IEC 60911:1987
Measurements for monitoring
adequate cooling within the
core of PWR

IEC 61343:1996
Measurements for monitoring
adequate cooling within BWR
cores

IEC 61250:1994
Detection of leakage in coolant
systems

IEC 62117:1999
PWR-Monitoring adequate
cooling within the core during
cold shutdown

Security

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

<p><u>Reg Guide 5.71 2010</u> <u>Cyber security programs for nuclear power reactors</u></p>	<p><u>IEC 62645:2019</u> <u>Cybersecurity Requirements</u></p> <p><u>IEC 63096</u> <u>Security Controls</u></p>
<p><u>Reg Guide 1.152</u> <u>Revision 3, Criteria for Use of Computers in Safety Systems of</u> <u>Nuclear Power Plants</u></p>	<p><u>IEC 62859:2016</u> <u>Requirements for coordinating safety and cybersecurity</u></p>

IEEE 692™-2013
Criteria for security systems

Accident Monitoring

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

Reg Guide 1.97
2019
Criteria for
accident
monitoring
instrumentation

IEC 497™-2016, IEC/IEEE 63147:2017
Criteria for accident monitoring instrumentation

IEC TR 63123:2017
Guidance for the application of IEC 63147:2017/IEEE 497™-2016
in the IAEA/IEC framework

Reg Guide 1.227
Wide-range
spent fuel
pool level
instrumentation

IEC/IEEE 63113
Spent fuel pool instrumentation

IEC 60951-1:2009
Radiation monitoring for accident and post-accident conditions -
Part 1: General requirements

IEC 60951-2:2009
Part 2: Equipment for continuous off-line monitoring of
radioactivity in gaseous effluents and ventilation air

IEC 60951-3:2009
Part 3: Equipment for continuous high range area gamma monitoring

IEC 60951-4:2009
Part 4: Equipment for continuous in-line or on-line monitoring of
radioactivity in process streams

ANSI Std. N320 1979
Performance specifications for reactor
emergency radiological monitoring
instrumentation

Electrical Equipment

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

<u>Reg Guide 1.63 1987</u> <u>Electrical penetration assemblies</u> <u>in containment structures</u>	<u>IEEE 317™-2013</u> <u>Electrical penetration assemblies</u> <u>in containment structures</u>	<u>IEC 60772:2018</u> <u>Electrical penetration assemblies</u> <u>in containment structures</u>
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<u>Reg Guide 1.9 2007</u> <u>Application and testing</u> <u>diesel generators</u>	<u>IEEE 387™-2017</u> <u>Criteria for diesel generating units applied as</u> <u>standby power supplies</u>
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P2420
Combustion turbine generator units applied as standby power supplies

<u>Reg Guide 1.128 2007</u> <u>Design and installation of</u> <u>vented lead-acid storage</u> <u>batteries</u>	<u>IEEE 484™-2002</u> <u>Design and installation of vented lead-acid</u> <u>Batteries</u>
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<u>Reg Guide 1.212 2015</u> <u>Sizing of lead-acid batteries</u>	<u>IEEE 485™-2010</u> <u>Sizing of lead acid batteries</u>
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<u>Reg Guide 1.129 2013</u> <u>Maintenance, testing and</u> <u>replacement of vented lead-</u> <u>acid batteries</u>	<u>IEEE 450™-2010</u> <u>Maintenance, testing, and replacement of vented</u> <u>lead-acid batteries</u>
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<u>IEEE 1106™-2015</u> <u>Installation, maintenance, testing and replacement of vented nickel-cadmium</u> <u>batteries</u>
--

<u>IEEE 1290™-2015</u> <u>Motor operated valve motor application, protection, control and testing</u>
--

<u>Reg Guide 1.106 2012</u> <u>Thermal overload protection for electric motors on-motor operated valves</u>
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Notes Reg Guide 1.9 endorses IEEE 387™-1995.
Reg Guide 1.128 endorses IEEE 484™-2002.
Reg Guide 1.63 also endorses IEEE 317™-1983 for
containment penetrations.
IEEE 387™ is under revision with the intent of
producing an IEEE/IEC dual logo standard.

I&C Components

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

IEC TR 62918:2014

Use and selection of wireless devices

IEC 62988:2018

Selection and use of wireless devices

IEC 60744:2018

Safety logic assemblies used in
systems performing category A
functions

IEC 62808:2015

Design and qualification of
isolation devices

Sensors

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

IEC 60515:2007
Radiation detectors - Characteristics and test methods

IEC 60568:2006
In-core instrumentation for neutron fluence rate (flux) -
measurements in power reactors

IEC 61468:2000
In-core instrumentation - Characteristics and test methods of
self-powered neutron detectors

IEC 61501:1998
Wide range neutron fluence rate meter - Mean square voltage method

IEC 60737:2010
Temperature sensors (in-core and primary coolant circuit) -
Characteristics and test methods

IEC 62397:2007
Resistance temperature detectors

IEC 62651:2013
Thermocouples: characteristics and test methods

IEC 61224:1993
Response time in resistance temperature detectors (RTD) -
In situ measurements

IEC 62887:2018
Pressure transmitters: Characteristics and test methods

Development of Digital Components and Systems

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

<u>Reg Guide 1.152 2011</u> <u>Use of computers in safety systems</u>	<u>IEEE 7-4.3.2™-2016</u> <u>Criteria for programmable digital devices in safety systems</u>	<u>IEC 60987:2007</u> <u>Hardware design requirements for computer based systems</u>	
		<u>IEC 61500:2018</u> <u>Data communication in systems performing category A functions</u>	
<u>Reg Guide 1.168 2013</u> <u>Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems</u>	<u>IEEE 1012™-2016</u> <u>System and Software Verification and Validation</u>	<u>IEC 60880:2006</u> <u>Software aspects for computer-based systems performing category A functions</u>	<u>IEC 62138:2018</u> <u>Software aspects for computer-based systems performing category B or C functions</u>
	<u>IEEE 1028™-2008</u> <u>Software reviews and audits</u>		
<u>Reg Guide 1.169 2013</u> <u>Configuration management plans for software used safety systems</u>	<u>IEEE 828™-2012</u> <u>Configuration management systems and software engineering</u>		
<u>Reg Guide 1.170 2013</u> <u>Test documentation for software used in safety systems</u>	<u>IEEE 829™-2008</u> <u>Software and system test documentation</u>		
<u>Reg Guide 1.171 2013</u> <u>Unit testing for software used in safety systems</u>	<u>IEEE 1008™-1987</u> <u>Software unit testing</u>		
<u>Reg Guide 1.172 2013</u> <u>Requirement specifications for software and complex electronics used in safety systems</u>	<u>IEEE 830™-1998</u> <u>Software requirements specifications</u>		
<u>Reg Guide 1.173 2013</u> <u>Developing software lifecycle processes for software used in safety systems</u>	<u>IEEE 1074™-2006</u> <u>Developing a software project lifecycle process</u>		

Notes

RG 1.168 endorses IEEE 1012™-2004
 RG 1.169 endorses IEEE 828™-2005
 RG 1.152 endorses IEEE 7-4 3.2™ 2003

The current version of 1012 is a significant departure from the 2004 version

Digital Platforms

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

IEC 62566-1:2012
Development of HDL
programmed integrated
circuits for systems performing
category A functions

IEC 62566-2
Development of HDL
programmed integrated
circuits for systems performing
category B or C functions

IEC TR 63084:2017
Platform qualification for
systems important to safety

IEEE 6891
Industrial digital devices

IEC 62671:2013
Selection and use of industrial
digital devices of limited
functionality

Radiation Monitoring - Systems and Effluents

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

IEC 62705:2014
Radiation monitoring systems

IEC 61504:2017
Centralized systems for continuous monitoring of radiation

IEC 60761-1:2002
Equipment for continuous monitoring of radiation in gaseous effluents - Part 1: General requirements

IEC 60751-2:2002
Requirements for radioactive aerosol monitors including transuranic aerosols

IEC 60761-3:2002
Requirements for radioactive noble gas monitors

IEC 60761-4:2002
Requirements for radioactive iodine monitors

IEC 60761-5:2002
Requirements for tritium monitors

IEC 60861:2006
Equipment for monitoring radionuclides in liquid effluents and surface waters

IEC 60768:2009
Equipment for continuous monitoring of radioactivity in process streams for normal and incident conditions

ANSI N42.18-2004
Specification and performance of on-site instrumentation for continuously monitoring radioactivity in effluents

Note. Radiation monitoring standards for accident and post accident conditions are listed on the accident monitoring sheet.

Radiation Area Monitoring

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

ANSI/ANS/HPSSC-6.8.1-1981
Location and Design Criteria for Area
Radiation Monitoring Systems for Light Water
Nuclear Reactors

IEC 60532:2010
Installed dose rate meters, warning
assemblies and monitors - X and gamma
radiation of energy between 50 keV and 7
MeV

IEC 61031:1990
Design, location and application criteria
for installed area gamma radiation dose
rate monitoring equipment for use during
normal operation and anticipated operational
occurrences

Equipment Installation

Non Safety

Systems Important to Safety

Non Safety

Safety Systems

ANSI/ISA-67.01.01-2019
Transducer and Transmitter Installation

Reg Guide 1.151 2010
Instrument sensing lines

ANSI/ISA-67.02.01-2014
Sensing line piping and tubing

IEEE 622™-1987
Design and installation of electric heat tracing systems

Reg Guide 1.11 2010
Instrument lines penetrating the
primary reactor containment

Reg Guide 1.30 1972
Quality assurance requirements
for the installation, inspection,
and testing of 1E power,
instrumentation, and electrical
equipment

IEEE 336™-2010
Installation, inspection,
and testing of 1E power,
instrumentation and control
equipment

Reg Guide 1.68-2 2010
Initial startup test program to
demonstrate remote shutdown
capability

Reg Guide 1.41 1973
Preoperational testing of
redundant onsite electric power
systems

IEC TR 62235:2005
Systems of interim storage and final repository of nuclear fuel
and waste

Notes

Reg Guide 1.151 endorses ISA-67.02.02 1999
Reg Guide 1.30 endorses ANSI/IEEE N45.2.4-1972 which has been
succeeded by IEEE 336-19

Operational Programs

Non Safety

Systems Important to Safety
Safety Systems

Non Safety

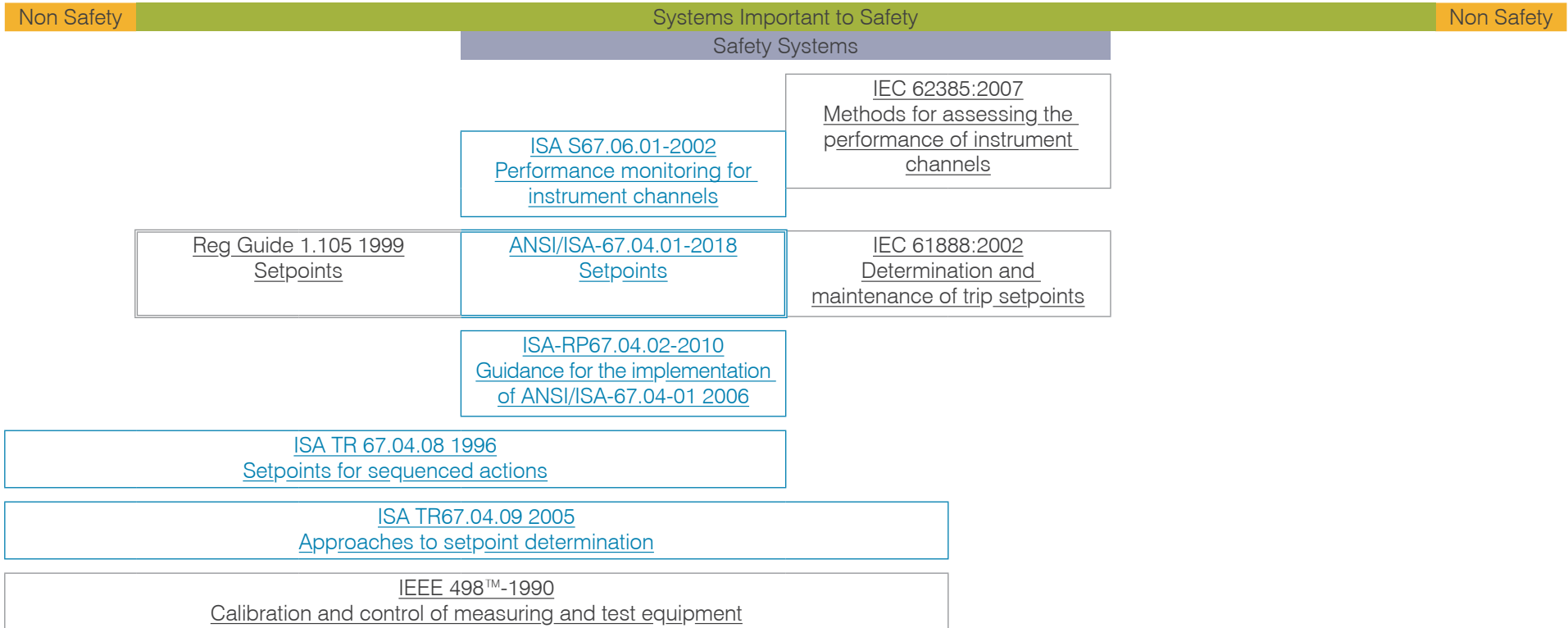
[IEEE 805™-1984](#)
[System identification](#)

[IEEE 933™-2013](#)
[Definition of reliability program plans](#)

[Reg Guide 1.23 2007](#)
[Meteorological monitoring programs](#)

[ISA-67.14.01-2000](#)
[Qualifications and certification of instrumentation and control technicians](#)

Instrument Performance and Setpoint Analysis



Notes Reg Guide 1.105 gives guidance on the use of ISA S67.04-1994

Aging Management and Modernization

Non Safety Systems Important to Safety Non Safety

Safety Systems

	<p>IEC TR 62096:2009 Guidance for the decision on modernization</p>
<p>IEEE 1205™-2014 Assessing monitoring, and mitigating aging effects on electrical equipment</p>	<p>IEC 62342:2007 Management of ageing</p>
	<p>IEC 62765-1:2015 Management of ageing: Pressure transmitters</p>
	<p>IEC 62675-2:2019 Management of ageing: Temperature sensors</p>
<p>Reg Guide 1.218 Condition-monitoring techniques for electric cables</p>	<p>IEC 62465:2010 Management of ageing of electrical cabling</p>
	<p>IEC/IEEE 62582-1:2011 Electrical equipment condition monitoring - Part 1:General</p>
	<p>IEC/IEEE 62582-2:2016 Electrical equipment condition monitoring - Part 2:Indenter modulus</p>
	<p>IEC/IEEE 62582-3:2012 Electrical equipment condition monitoring - Part 3:Elongation at break</p>
	<p>IEC/IEEE 62582-4:2011 Electrical equipment condition monitoring - Part 4:Oxidation induction techniques</p>
	<p>IEC/IEEE 62582-5:2015 Electrical equipment condition monitoring - Part 5:Optical time domain reflectometry</p>
	<p>IEC/IEEE 62582-6:2019 Electrical equipment condition monitoring - Part 6:Insulation resistance</p>

Notes. The IEC 62582 series may apply to any components that involve electrical insulation

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This document brings together the nuclear power plant instrumentation & control and electrical system standards used by the Institute of Electrical and Electronics Engineers (IEEE) and International Electrotechnical Commission (IEC) communities. Both sets of standards are used in different parts of the world. This document is intended as a starting point for identifying similarities and conflicts between the two sets of standards to facilitate harmonization.

This document consists of tables that show the IEC and IAEA electrical and I&C nuclear standards alongside the corresponding IEEE and NRC documents. The tables also show documents that have no equivalent.

The tables provide a basic view of the correspondence between related standards without offering further analysis or conclusions. Clicking in any box in the tables will take the user to further information given by the responsible standard organization. In the case of NRC, the user will be taken directly to the documents in question. This document will be regularly revised following future evolutions and updates of the relevant I&C standards.

The Cooperation in Reactor Design Evaluation and Licensing (CORDEL) Working Group promotes the development of a worldwide regulatory environment where internationally-accepted standardized reactor designs, certified and approved by a recognised competent authority in the country of origin, can be widely deployed without major design changes due to national regulations.