



U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

TABLE 7-1 REGULATORY REQUIREMENTS, ACCEPTANCE CRITERIA, AND GUIDELINES FOR INSTRUMENTATION AND CONTROL SYSTEMS IMPORTANT TO SAFETY

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of instrumentation and controls

Secondary - None

SRP Table 7-1 identifies the regulatory requirements (denoted by "R"), and SRP acceptance criteria (denoted by "A") and their applicability to the various sections of Chapter 7 of the safety analysis report (SAR).

Applicable requirements of 10 CFR Part 50, 10 CFR Part 52, 10 CFR Part 50 Appendix A General Design Criteria (GDC), IEEE Std 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," along with the correction sheet dated January 30, 1995, and IEEE Std 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," establish the NRC requirements for the instrumentation and control (I&C) systems important to safety.

The SRP Acceptance Criteria for implementation of these requirements are provided in the current versions of regulatory guides, the endorsed industry standards, Standard Review Plan (SRP) Chapter 7, and branch technical positions (BTPs). These guidelines are not mandatory

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USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The standard review plan sections are numbered in accordance with corresponding sections in Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of Regulatory Guide 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."

These documents are made available to the public as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to NRR_SRP@nrc.gov.

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but set forth acceptable methods of implementing the regulatory requirements. The BTPs listed in SRP Table 7-1 are contained in SRP Appendix 7-A. The BTPs are used when study of a particular design problem identified an acceptable solution. The guidance of BTPs also are not mandatory. In all cases, the primary basis for acceptance of the design is conformance to the regulatory requirements.

Industry standards that are not endorsed by regulatory guides, incorporated in regulations, referenced in BTPs, or that have not been previously used and accepted in the licensing process, must be reviewed before they can be accepted as a sole basis for approval of a design. They may be useful as guidance for identifying the subjects of importance to be considered in the review of the systems important to safety.

Three Mile Island (TMI) action plan requirements for I&C systems important to safety are imposed by 10 CFR 50.34(f) for applications pending as of February 16, 1982.¹ For operating reactors that had approved construction permits prior to February 16, 1982, the TMI action plan requirements were imposed by Orders that required conformance with NUREG-0718, "Licensing Requirements for Pending Applications for Construction Permits and Manufacturing License," NUREG-0737, "Clarification of TMI Action Plan Requirements," NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements - Requirements for Emergency Response Capability," and NUREG-0694, "TMI-Related Requirements for New Operating Reactor Licenses." Table 7.1 identifies both the CFR and TMI action plan reference numbers for the TMI action plan requirements relevant to Chapter 7 of the SAR. The action plan references are given in brackets under the reference to the equivalent requirement of 10 CFR 50.34(f). SRP Appendix 7.1-A presents specific acceptance criteria for TMI action plan items. However, important context information is found in the concepts contained in the referenced reports.

¹For Part 50 applications not listed in 10 CFR 50.34(f), the provisions of 50.34(f) will be made requirements during the licensing process.

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety**

Criteria	Title or Subject	Applicability to SAR, Chapter 7									Remarks
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
1. 10 CFR Parts 50 and 52											
a.	50.55a(a)(1)	Quality Standards for Systems Important to Safety	R	R	R	R	R	R	R	R	
b.	50.55a(h)(2)	Protection Systems (IEEE Std 603-1991 or IEEE Std 279-1971)	R	R	*	*	*	*	*	**	See SRP Appendix 7.1-C or Appendix 7.1-B
c.	50.55a(h)(3)	Safety Systems (IEEE Std 603-1991)			†	†	†	*	*	**	See SRP Appendix 7.1-C
d.	50.34(f)(2)(v) [II.D.3]	Bypass and Inoperable Status Indication	R	R		R	R			**	See NUREGs -0718, -0737, -0737 Supplement 1, and -0694
e.	50.34(f)(2)(xi) [II.D.3]	Direct Indication of Relief and Safety Valve Position				R					See NUREGs -0718, -0737, -0737 Supplement 1, and -0694
f.	50.34(f)(2)(xii) [II.E.1.2]	Auxiliary Feedwater System Automatic Initiation and Flow Indication		R		R					Applies only to PWRs. See NUREGs -0718, -0737, and -0694
g.	50.34(f)(2)(xvii) [II.F.1]	Accident Monitoring Instrumentation				R					See NUREGs -0718, -0737 Supplement 1, and -0694
h.	50.34(f)(2)(xviii) [II.F.2]	Instrumentation for the Detection of Inadequate Core Cooling				R					See NUREG-0694

* The IEEE Std 603-1991 requirement to provide adequate separation between protection and control functions (Clauses 5.6.3 and 6.3.1) apply to all instrumentation and control systems. The requirements for display of bypass and inoperable status indication (Clause 5.8.3) also apply to information systems important to safety (SRP Section 7.5). Although not required by NRC regulations, for non-safety systems, the other criteria of IEEE Std 603-1991 address considerations such as design bases, redundancy, independence, single failures, qualification, bypasses, status indication, and testing that are used as guidance, where appropriate, for systems addressed in these sections of the SRP.

** The data communication systems (DCS) addressed by SRP Section 7.9 are support systems for one or more of the systems addressed by SRP Section 7.2 through 7.8. Acceptance criteria for a specific DCS derive from the acceptance criteria for the systems supported by that DCS. The criteria marked as ** are likely to apply to the DCS in one or more possible DCS applications. SRP Section 7.9 provides more detailed guidance on the applicability of these criteria to specific DCS applications.

† The requirements of IEEE Std 603-1991 apply to the functions of these systems which are relied upon to remain functional during and following design basis events to ensure: (i) the integrity of the reactor coolant pressure boundary, (ii) the capability to shut down the reactor and maintain it in a safe shutdown condition, or (iii) the capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposures comparable to the 10 CFR Part 100 guidelines.

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria	Title or Subject	Applicability to SAR, Chapter 7								Remarks	
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
1. 10 CFR Parts 50 and 52 (cont.)											
i.	50.34(f)(2)(xiv) [II.E.4.2]	Containment Isolation Systems		R							See NUREG-0737
j.	50.34(f)(2)(xix) [II.F.3]	Instruments for Monitoring Plant Conditions Following Core Damage				R					See NUREG-0718
k.	50.34(f)(2)(xx) [II.G.1]	Power for Pressurizer Level Indication and Controls for Pressurizer Relief and Block Valves			R	R					Applies only to PWRs. See NUREG-0737
l.	50.34(f)(2)(xxii) [II.K.2.9]	Failure Mode and Effect Analysis of Integrated Control System						R			Applies only to B&W plants. See NUREGs -0718, -0737, and -0694
m.	50.34(f)(2)(xxiii)[II.K.2.10]	Anticipatory Trip on Loss of Main Feedwater or Turbine Trip	R								Applies only to B&W plants. See NUREGs -0737 and -0694
n.	50.34(f)(2)(xxiv) [II.K.3.23]	Central Reactor Vessel Water Level Recording				R					Applies only to BWRs. See NUREG-0718
o.	50.62	Requirements for Reduction of Risk from Anticipated Transients without Scram							R	**	
p.	52.47(b)(1)	ITAAC for Standard Design Certification	R	R	R	R	R	R	R	R	
q.	52.80(a)	ITAAC for Combined Licensee Applications	R	R	R	R	R	R	R	R	
2. 10 CFR Part 50, Appendix A General Design Criteria (GDC)											
a.	GDC 1	Quality Standards and Records	R	R	R	R	R	R	R	R	
b.	GDC 2	Design Bases for Protection Against Natural Phenomena	R	R	R	R	R			**	
c.	GDC 4	Environmental and Dynamic Effects Design Bases	R	R	R	R	R			**	
d.	GDC 10	Reactor Design	R	R			R	R			

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria	Title or Subject	Applicability to SAR, Chapter 7									Remarks	
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9			
2. 10 CFR Part 50, Appendix A GDC (cont.)												
e.	GDC 13	Instrumentation and Control	R	R	R	R	R	R	R	R	**	
f.	GDC 15	Reactor Coolant System Design	R	R			R	R				
g.	GDC 16	Containment Design		R			R					
h.	GDC 19	Control Room	R	R	R	R	R	R	R	R	**	
i.	GDC 20	Protection System Functions	R	R								
j.	GDC 21	Protection Systems Reliability and Testability	R	R							**	
k.	GDC 22	Protection System Independence	R	R							**	
l.	GDC 23	Protection System Failure Modes	R	R							**	
m.	GDC 24	Separation of Protection and Control Systems	R	R	R	R	R	R	R	R	R	
n.	GDC 25	Protection System Requirements for Reactivity Control Malfunctions	R				R					
o.	GDC 28	Reactivity Limits					R	R				
p.	GDC 29	Protection Against Anticipated Operational Occurrences	R	R				R			**	
q.	GDC 33	Reactor Coolant Makeup		R			R					
r.	GDC 34	Residual Heat Removal		R	R		R					
s.	GDC 35	Emergency Core Cooling		R	R		R					
t.	GDC 38	Containment Heat Removal		R	R		R					
u.	GDC 41	Containment Atmosphere Cleanup		R			R					
v.	GDC 44	Cooling Water		R			R	R				

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria	Title or Subject	Applicability to SAR, Chapter 7								Remarks	
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
3. Staff Requirements Memoranda											
a.	SRM to SECY 93-087 II.Q	Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems	A	A				A	A	**	See BTP 7-19
b.	SRM to SECY 93-087 II.T	Control Room Annunciator (Alarm) Reliability				A				**	Applies only to advanced light water reactors
4. Regulatory Guides											
a.	Regulatory Guide 1.22	Periodic Testing of Protection System Actuation Functions	A	A					A	**	See BTP 7-8
b.	Regulatory Guide 1.47	Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety System	A	A		A	A			**	
c.	Regulatory Guide 1.53	Application of the Single-Failure Criterion to Safety Systems	A	A	A	A	A			**	See IEEE Std 379-2000
d.	Regulatory Guide 1.62	Manual Initiation of Protection Actions	A	A					A		
e.	Regulatory Guide 1.75	Independence of Electrical Safety Systems	A	A	A	A	A	A	A	A	See IEEE Std 384-1992
f.	Regulatory Guide 1.97	Instrumentation for Light Water Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident and Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants				A					See IEEE Std 497-2002 and BTP 7-10
g.	Regulatory Guide 1.105	Setpoints for Safety-Related Instrumentation	A	A	A	A	A	A	A	A	See ISA Std S67.04-1994 Part I and BTP 7-12
h.	Regulatory Guide 1.118	Periodic Testing of Electric Power and Protection Systems	A	A	A	A	A		A	**	See IEEE Std 338-1987
i.	Regulatory Guide 1.151	Instrument Sensing Lines	A	A	A	A	A	A	A		See ISA-S67.02-1980

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Criteria	Title or Subject	Applicability to SAR, Chapter 7									Remarks
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
4. Regulatory Guides (cont.)											
j.	Regulatory Guide 1.152	Criteria for Use of Computers in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 7-4.3.2-2003 and Appendix 7.1-D
k.	Regulatory Guide 1.168	Verification, Validation, Reviews and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 1012-1998 and IEEE Std 1028-1997
l.	Regulatory Guide 1.169	Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 828-183 and IEEE Std 1042-1987
m.	Regulatory Guide 1.170	Software Test Documentation for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 829-1983
n.	Regulatory Guide 1.171	Software Unit Testing for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 1008-1987
o.	Regulatory Guide 1.172	Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 830-1993
p.	Regulatory Guide 1.173	Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants	A	A	A	A	A	A	A	A	See IEEE Std 1074-1995
q.	Regulatory Guide 1.174	An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis									See BTP 7-12 for applicability
r.	Regulatory Guide 1.177	An Approach for Plant-Specific Risk-Informed Decision Making: Technical Specifications									See BTP 7-12 for applicability

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria	Title or Subject	Applicability to SAR, Chapter 7									Remarks
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
4. Regulatory Guides (cont.)											
s.	Regulatory Guide 1.180	Guidelines for Evaluating Electromagnetic and Radio- Frequency Interference in Safety-Related Instrumentation and Control Systems	A	A	A	A	A	A	A	A	
t.	Regulatory Guide 1.189	Fire Protection for Operating Nuclear Power Plants			A						
u.	Regulatory Guide 1.200	An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities									See BTP 7-12 for applicability
v.	Regulatory Guide 1.204	Guidelines for Lightning Protection of Nuclear Power Plants	A	A	A	A	A	A	A	A	
5. Branch Technical Positions (BTP)											
a.	BTP 7-1	Guidance on Isolation of Low-Pressure Systems from the High-Pressure Reactor Coolant System					A				
b.	BTP 7-2	Guidance on Requirements on Motor-Operated Valves in the Emergency Core Cooling System Accumulator Lines					A				
c.	BTP 7-3	Guidance on Protection System Trip Point Changes for Operation with Reactor Coolant Pumps Out of Service	A	A							
d.	BTP 7-4	Guidance on Design Criteria for Auxiliary Feedwater Systems		A							
e.	BTP 7-5	Guidance on Spurious Withdrawals of Single Control Rods in Pressurized Water Reactors	A				A	A			

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria	Title or Subject	Applicability to SAR, Chapter 7								Remarks	
		7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9		
5. BTP (cont.)											
f.	BTP 7-6	Guidance on Design of Instrumentation and Controls Provided to Accomplish Changeover from Injection to Recirculation Mode		A							
g.	BTP 7-7	Not used									
h.	BTP 7-8	Guidance on Application of Regulatory Guide 1.22	A	A						**	
i.	BTP 7-9	Guidance on Requirements for Reactor Protection System Anticipatory Trips	A								
j.	BTP 7-10	Guidance on Application of Regulatory Guide 1.97				A					
k.	BTP 7-11	Guidance on Application and Qualification of Isolation Devices	A	A	A	A	A	A	A	**	
l.	BTP 7-12	Guidance on Establishing and Maintaining Instrument Setpoints	A	A	A	A	A	A	A	A	
m.	BTP 7-13	Guidance on Cross-Calibration of Protection System Resistance Temperature Detectors	A	A	A	A					
n.	BTP 7-14	Guidance on Software Reviews for Digital Computer-Based Instrumentation and Control Systems	A	A	A	A	A	A	A	A	
o.	BTP 7-15	Not used									
p.	BTP 7-16	Not used									
q.	BTP 7-17	Guidance on Self-Test and Surveillance Test Provisions	A	A	A	A	A	A	A	A	

**Table 7-1. Regulatory Requirements (R), and SRP Acceptance Criteria (A)
for Instrumentation and Control Systems Important to Safety (cont.)**

Criteria		Title or Subject	Applicability to SAR, Chapter 7								Remarks
			7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	
r.	BTP 7-18	Guidance on Use of Programmable Logic Controllers in Digital Computer-Based Instrumentation and Control Systems	A	A	A	A	A	A	A	A	
5. BTP (cont.)											
s.	BTP 7-19	Guidance on Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems	A	A				A	A	A	
t.	BTP 7-20	Not used									
u.	BTP 7-21	Guidance on Digital Computer Real-Time Performance	A	A	A	A	A	A	A	A	

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

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