

# CHAPTER 6—ENGINEERED SAFETY FEATURES TABLE OF CONTENTS

6.0	ENGINEERED SAFETY FEATURES .....	6.1-1
6.1	Engineered Safety Features Materials .....	6.1-1
6.1.1	Metallic Materials.....	6.1-1
6.1.1.1	Materials Selection and Fabrication .....	6.1-2
6.1.1.2	ESF Fluids.....	6.1-4
6.1.1.3	Component and Systems Cleaning.....	6.1-5
6.1.1.4	Thermal Insulation.....	6.1-5
6.1.2	Organic Materials .....	6.1-6
6.1.2.1	Description of Protective Coatings .....	6.1-6
6.1.2.2	Safety Evaluation .....	6.1-13
6.1.2.3	Quality Assurance .....	6.1-14
6.1.2.4	Exceptions to Regulatory Guide 1.54, Revision 1 ...	6.1-16
6.1.3	References .....	6.1-17
6.2	Containment Systems .....	6.2-1
6.2.1	Containment Functional Design .....	6.2-1
6.2.1.1	Containment Structure .....	6.2-3
6.2.1.2	Containment Subcompartments.....	6.2-10
6.2.1.3	Mass and Energy Release Analyses for Postulated Loss of Coolant Accidents.....	6.2-13
6.2.1.4	Mass and Energy Release Analysis for Postulated Secondary Pipe Ruptures inside Containment.....	6.2-23
6.2.1.5	Minimum Containment Pressure Analysis for Performance Capability Studies on Emergency Core Cooling System .....	6.2-32
6.2.1.6	Tests and Inspections .....	6.2-34
6.2.1.7	Instrumentation Requirements .....	6.2-34
6.2.2	Containment Heat Removal Systems.....	6.2-239
6.2.2.1	Design Bases .....	6.2-239

---

6.2.2.2	System Design .....	6.2-239
6.2.2.3	Design Evaluation .....	6.2-241
6.2.2.4	Tests and Inspections .....	6.2-241
6.2.2.5	Instrumentation Requirements .....	6.2-241
6.2.3	Secondary Containment Functional Design .....	6.2-242
6.2.3.1	Design Bases .....	6.2-242
6.2.3.2	System Description .....	6.2-242
6.2.3.3	Safety Evaluation .....	6.2-247
6.2.3.4	Inspection and Testing Requirements.....	6.2-248
6.2.3.5	Instrumentation Requirements .....	6.2-249
6.2.4	Containment Isolation System.....	6.2-256
6.2.4.1	Design Bases .....	6.2-256
6.2.4.2	System Design .....	6.2-257
6.2.4.3	Design Evaluation .....	6.2-263
6.2.4.4	Inspection and Testing Requirements.....	6.2-264
6.2.4.5	Instrumentation Requirements .....	6.2-264
6.2.5	Combustible Gas Control in Containment .....	6.2-291
6.2.5.1	Design Bases .....	6.2-291
6.2.5.2	System Description .....	6.2-292
6.2.5.3	Safety Evaluation .....	6.2-296
6.2.5.4	Inspection and Testing Requirements.....	6.2-304
6.2.5.5	Instrumentation Requirements .....	6.2-304
6.2.6	Containment Leakage Testing.....	6.2-327
6.2.6.1	Containment Integrated Leakage Rate Test (Type A).....	6.2-327
6.2.6.2	Containment Penetration Leakage Rate Tests (Type B).....	6.2-330
6.2.6.3	Containment Isolation Valve Leakage Rate Test (Type C) .....	6.2-331
6.2.6.4	Scheduling and Reporting of Periodic Tests .....	6.2-331
6.2.6.5	Leak-off System .....	6.2-332
6.2.6.6	Special Testing Requirements and Bypass Leakage.....	6.2-332
6.2.7	Fracture Prevention of Containment Pressure Vessel .....	6.2-335

---

6.2.8	References .....	6.2-335
6.3	Emergency Core Cooling System .....	6.3-1
6.3.1	Design Bases .....	6.3-1
6.3.2	System Design .....	6.3-6
6.3.2.1	Schematic Piping and Instrumentation Diagrams .....	6.3-6
6.3.2.2	Equipment and Component Descriptions.....	6.3-7
6.3.2.3	Applicable Codes and Classifications .....	6.3-12
6.3.2.4	Material Specifications and Compatibility.....	6.3-13
6.3.2.5	System Reliability.....	6.3-13
6.3.2.6	Protection Provisions.....	6.3-15
6.3.2.7	Provisions for Performance Testing and Inspection .....	6.3-15
6.3.2.8	Manual Actions.....	6.3-16
6.3.3	Performance Evaluation .....	6.3-16
6.3.3.1	Small Break LOCA.....	6.3-17
6.3.3.2	Large Break LOCA.....	6.3-18
6.3.3.3	NPSH Evaluation.....	6.3-18
6.3.4	Tests and Inspections.....	6.3-22
6.3.5	Instrumentation Requirements .....	6.3-23
6.3.6	References .....	6.3-23
6.4	Habitability Systems .....	6.4-1
6.4.1	Design Basis.....	6.4-1
6.4.2	System Design .....	6.4-2
6.4.2.1	Definition of Control Room Envelope .....	6.4-2
6.4.2.2	Ventilation System Design .....	6.4-3
6.4.2.3	Leak-tightness.....	6.4-5
6.4.2.4	Interaction with Other Zones and Pressure- Containing Equipment.....	6.4-5
6.4.2.5	Shielding Design .....	6.4-6
6.4.3	System Operational Procedures.....	6.4-6
6.4.4	Design Evaluations.....	6.4-7
6.4.5	Testing and Inspection .....	6.4-7
6.4.6	Instrumentation Requirements .....	6.4-8
6.4.7	References .....	6.4-8

6.5	Fission Product Removal and Control Systems .....	6.5-1
6.5.1	ESF Filter Systems.....	6.5-1
6.5.1.1	Design Bases .....	6.5-1
6.5.1.2	System Design .....	6.5-2
6.5.1.3	Design Evaluation .....	6.5-5
6.5.1.4	Tests and Inspections .....	6.5-6
6.5.1.5	Instrumentation Requirements .....	6.5-7
6.5.1.6	Materials.....	6.5-7
6.5.2	Containment Spray Systems .....	6.5-7
6.5.3	Fission Product Control Systems .....	6.5-7
6.5.3.1	Primary Containment.....	6.5-7
6.5.3.2	Secondary Containment.....	6.5-8
6.5.4	References .....	6.5-9
6.6	Inservice Inspection of Class 2 and 3 Components .....	6.6-1
6.6.1	Components Subject to Examination .....	6.6-2
6.6.2	Accessibility.....	6.6-3
6.6.3	Examination Techniques and Procedures.....	6.6-4
6.6.4	Inspection Intervals.....	6.6-5
6.6.5	Examination Categories and Requirements .....	6.6-6
6.6.6	Evaluation of Examination Results .....	6.6-6
6.6.7	System Pressure Tests .....	6.6-7
6.6.8	Augmented ISI to Protect against Postulated Piping Failures ...	6.6-7
6.6.9	References .....	6.6-8
6.7	Main Steamline Isolation Valve Leakage Control Systems (BWRs) ....	6.7-1
6.8	Extra Borating System.....	6.8-1
6.8.1	Design Bases .....	6.8-1
6.8.2	System Description.....	6.8-1
6.8.2.1	System Operation.....	6.8-3
6.8.3	Safety Evaluation.....	6.8-3
6.8.4	Inspection and Testing Requirements .....	6.8-5
6.8.5	Instrumentation Requirements .....	6.8-5