TABLE OF CONTENTS

Section	Title	Page
CHAPTER 6	ENGINEERED SAFETY FEATURES	6.0-1
6.0	Engineered Safety Features	6.0-1
6.1	Engineered Safety Features Materials	6.1-1
6.1.1	Metallic Materials	6.1-1
6.1.1.1	Specifications for Principal Pressure-Retaining Materials	6.1-1
6.1.1.2	Fabrication Requirements	6.1-2
6.1.1.3	Specifications for Nonpressure-Retaining Materials	6.1-3
6.1.1.4	Material Compatibility with Reactor Coolant System Coolant and Engineered Safety Features Fluids	6.1-3
6.1.1.5	Integrity of Safety-Related Components	6.1-4
6.1.1.6	Thermal Insulation	6.1-4
6.1.1.7	Component and System Cleaning	6.1-4
6.1.2	Organic Materials	6.1-5
6.1.2.1	Protective Coatings	6.1-5
6.1.2.2	Other Organic Materials	6.1-11
6.1.3	Combined License Information Items	6.1-11
6.1.3.1	Procedure Review	6.1-11
6.1.3.2	Coating Program	6.1-11
6.1.4	References	6.1-11
6.2	Containment Systems	6.2-1
6.2.1	Containment Functional Design	6.2-1
6.2.1.1	Containment Structure	6.2-1
6.2.1.2	Containment Subcompartments	6.2-4
6.2.1.3	Mass and Energy Release Analyses for Postulated Pipe Ruptures	6.2-7
6.2.1.4	Mass and Energy Release Analysis for Postulated Secondary-System Pipe Rupture Inside Containment	6.2-11
6.2.1.5	Minimum Containment Pressure Analysis for Performance Capability Studies of Emergency Core Cooling System (PWR)	6.2-17
6.2.1.6	Testing and Inspection	6.2-18
6.2.1.7	Instrumentation Requirements	6.2-19
6.2.2	Passive Containment Cooling System	6.2-19
6.2.2.1	Safety Design Basis	6.2-20
6.2.2.2	System Design	6.2-20
6.2.2.3	Safety Evaluation	6.2-26
6.2.2.4	Testing and Inspection	6.2-27
6.2.2.5	Instrumentation Requirements	6.2-29
6.2.3	Containment Isolation System	6.2-29
6.2.3.1	Design Basis	6.2-30
6.2.3.2	System Description	6.2-33
6.2.3.3	Design Evaluation	6.2-35

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	6.2.3.4 Tests and Inspections	6.2-38
	6.2.3.5 Instrumentation and Control Application	6.2-39
	6.2.4 Containment Hydrogen Control System	6.2-39
	6.2.4.1 Design Basis	6.2-40
	6.2.4.2 System Design	6.2-43
	6.2.4.3 Design Evaluation (Design-Basis Accident)	6.2-49
	6.2.4.4 Design Evaluation (Severe Accident)	6.2-53
	6.2.4.5 Tests and Inspections	6.2-53
	6.2.4.6 Combined License Information	6.2-55
	6.2.5 Containment Leak Rate Test System	6.2-56
	6.2.5.1 Design Basis	6.2-56
	6.2.5.2 System Description	6.2-57
	6.2.5.3 Safety Evaluation	6.2-62
	6.2.5.4 Inservice Inspection/Inservice Testing	6.2-62
	6.2.6 Combined License Information for Containment Leak Rate Testing	6.2-62
	6.2.7 References	6.2-62
6.3	Passive Core Cooling System	6.3-1
	6.3.1 Design Basis	6.3-2
	6.3.1.1 Safety Design Basis	6.3-2
	6.3.1.2 Power Generation Design Basis	6.3-5
	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	6.3-12
	6.3.2.3 Applicable Codes and Classifications	6.3-27
	6.3.2.4 Material Specifications and Compatibility	6.3-28
	6.3.2.5 System Reliability	6.3-28
	6.3.2.6 Protection Provisions	6.3-32
	6.3.2.7 Provisions for Performance Testing	6.3-32
	6.3.2.8 Manual Actions	6.3-32
	6.3.3 Performance Evaluation	6.3-33
	6.3.3.1 Increase in Heat Removal by the Secondary System	6.3-35
	6.3.3.2 Decrease in Heat Removal by the Secondary System	6.3-37
	6.3.3.3 Decrease in Reactor Coolant System Inventory	6.3-38
	6.3.3.4 Shutdown Events	6.3-41
	6.3.4 Post-72 Hour Actions	6.3-45
	6.3.5 Limits on System Parameters	6.3-46
	6.3.6 Inspection and Testing Requirements	6.3-46
	6.3.6.1 Preoperational Inspection and Testing	6.3-46
	6.3.6.2 Inservice Testing and Inspection	6.3-48

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	6.3.7 Instrumentation Requirements	6.3-48
	6.3.7.1 Pressure Indication	6.3-49
	6.3.7.2 Temperature Indication	6.3-49
	6.3.7.3 Passive Residual Heat Removal Heat Exchanger Outlet Flow Indication	6.3-50
	6.3.7.4 Level Indication	6.3-50
	6.3.7.5 Containment Radiation Level	6.3-51
	6.3.7.6 Valve Position Indication and Control	6.3-51
	6.3.7.7 Automatic Depressurization System Actuation at 24 Hours	6.3-53
	6.3.8 Combined License Information	6.3-53
	6.3.8.1 Containment Cleanliness Program	6.3-53
	6.3.9 References	6.3-53
6.4	Habitability Systems	6.4-1
	6.4.1 Safety Design Basis	6.4-1
	6.4.1.1 Main Control Room Design Basis	6.4-1
	6.4.1.2 Instrumentation and Control Room/DC Equipment Rooms Design Basis	6.4-2
	6.4.2 System Description	6.4-2
	6.4.2.1 Definition of the Main Control Room Pressure Boundary	6.4-2
	6.4.2.2 General Description	6.4-3
	6.4.2.3 Component Description	6.4-4
	6.4.2.4 Leaktightness	6.4-6
	6.4.2.5 Interaction with Other Zones and Pressurized Equipment	6.4-7
	6.4.2.6 Shielding Design	6.4-7
	6.4.3 System Operation	6.4-7
	6.4.3.1 Normal Mode	6.4-7
	6.4.3.2 Emergency Mode	6.4-7
	6.4.4 System Safety Evaluation	6.4-9
	6.4.5 Inservice Inspection/Inservice Testing	6.4-10
	6.4.5.1 Preoperational Inspection and Testing	6.4-10
	6.4.5.2 Inservice Testing	6.4-11
	6.4.5.3 Air Quality Testing	6.4-11
	6.4.5.4 Air Inleakage Testing	6.4-11
	6.4.6 Instrumentation Requirements	6.4-12
	6.4.7 Combined License Information	6.4-12
	6.4.8 References	6.4-12
6.5	Fission Product Removal and Control Systems	6.5-1
	6.5.1 Engineered Safety Feature (ESF) Filter Systems	6.5-1
	6.5.2 Containment Spray System	6.5-1
	6.5.2.1 System Description	6.5-1
	6.5.2.2 Design Evaluation	6.5-3

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	6.5.3 Fission Product Control Systems	6.5-5
	6.5.3.1 Primary Containment	6.5-6
	6.5.3.2 Secondary Containment	6.5-6
	6.5.4 Combined License Information	6.5-6
	6.5.5 References	6.5-6
6.6	Inservice Inspection of Class 2 and 3 Components	6.6-1
	6.6.1 Components Subject to Examination	6.6-1
	6.6.2 Accessibility	6.6-1
	6.6.3 Examination Techniques and Procedures	6.6-2
	6.6.4 Inspection Intervals	6.6-3
	6.6.5 Examination Categories and Requirements	6.6-3
	6.6.6 Evaluation of Examination Results	6.6-3
	6.6.7 System Pressure Tests	6.6-3
	6.6.8 Augmented Inservice Inspection to Protect against Postulated Piping Failures	6.6-3
	6.6.9 Combined License Information Items	6.6-4
	6.6.9.1 Inspection Programs	6.6-4
	6.6.9.2 Construction Activities	6.6-4
APPENDIX 6A	HYDROGEN AND FISSION PRODUCT DISTRIBUTION IN THE AP600 POST-DESIGN BASIS ACCIDENT CONTAINMENT ATMOSPHERE	6A-1
6A.1	Design Basis Sequence Assumptions	6A-1
	6A.1.1 Break Size and Fission Product Release Location in Containment	6A-2
	6A.1.2 Design-Basis Hydrogen Source Locations	6A-4
6A.2	Containment Natural Circulation and Mixing	6A-5
6A.3	Insights From the Passive Containment Cooling System Large Scale Test and AP600 Stratification Studies	6A-8
6A.4	Conclusions	6A-10
6A.5	References	6A-10

LIST OF TABLES

Table No.	Title	Page
6.1-1	Engineered Safety Features Pressure-Retaining Materials	6.1-12
6.1-2	AP600 Coated Surfaces, Containment Shell and Surfaces Inside Containment (Sheets 1 - 2)	6.1-13
6.2.1.1-1	Summary of Calculated Pressures and Temperatures	6.2-65
6.2.1.1-2	Initial Conditions	6.2-65
6.2.1.1-3	Results of Postulated Accidents	6.2-66
6.2.1.1-4	Deleted	
6.2.1.1-5	Deleted	
6.2.1.1-6	Deleted	
6.2.1.1-7	Deleted	
6.2.1.1-8	Physical Properties of Passive Heat Sinks	6.2-68
6.2.1.2-1	Listing of Lines Not LBB Qualified and the Calculated Maximum Differential Pressures (Sheets 1 - 6)	6.2-69
6.2.1.3-1	Short-term Mass and Energy Inputs	6.2-75
6.2.1.3-2	Short-term 3-Inch Cold-Leg Break Mass and Energy Releases	6.2-76
6.2.1.3-3	Short-term 3-Inch Hot-Leg Break Mass and Energy Releases	6.2-77
6.2.1.3-4	Main Steam Line Break Mass and Energy	6.2-78
6.2.1.3-5	4" SG Blowdown Line Mass and Energy Releases	6.2-79
6.2.1.3-6	Pressurizer Spray Line Break Releases	6.2-80
6.2.1.3-7	Short Term 3-Inch Single-Ended Cold-Leg Break Mass and Energy Releases	6.2-81
6.2.1.3-8	Basis for Long Term Analysis	6.2-82
6.2.1.3-9	Long-Term DECLG Break Post-Blowdown Mass and Enthalpy Releases (Sheets 1 - 5)	6.2-83
6.2.1.3-10	Long-Term DEHLG Break Blowdown Mass and Enthalpy Releases (Sheets 1 - 2)	6.2-88
6.2.1.4-1	Spectrum of Secondary System Pipe Ruptures Analyzed	6.2-90

LIST OF TABLES (Cont.)

Number	Title	Page
6.2.1.4-2	Mass and Enthalpy Release Data for the Case of Main Steam Line Full Double Ended Rupture from 30% Power Level with Faulted Loop Main Steam Line Isolation Valve Failure that Produces Highest Containment Pressure (Sheets 1 - 10)	6.2-91
6.2.1.4-3	Mass and Enthalpy Release Data for the Case of Main Steam Line Full Double Ended Rupture from 102% Power Level with Faulted Loop Main Steam Line Isolation Valve Failure that Produces Highest Containment Temperature (Sheets 1 - 8)	6.2-101
6.2.1.4-4	Plant Data Used for Mass and Energy Releases Determination	6.2-109
6.2.1.5-1	Minimum Containment Pressure Mass and Energy Releases (Sheets 1 - 2)	6.2-110
6.2.2-1	Passive Containment Cooling System Performance Parameters	6.2-112
6.2.2-2	Component Data - Passive Containment Cooling System (Nominal)	6.2-113
6.2.2-3	Failure Mode and Effects Analysis - Passive Containment Cooling System Active Components	6.2-114
6.2.3-1	Containment Mechanical Penetrations and Isolation Valves (Sheets 1 - 4)	6.2-115
6.2.4-1	Component Data - Hydrogen Sensors (Nominal)	6.2-123
6.2.4-2	Component Data - Hydrogen Recombiner (Nominal)	6.2-124
6.2.4-3	Component Data - Hydrogen Igniter (Nominal)	6.2-125
6.2.4-4	Assumptions Used to Calculate Hydrogen Production Following a Loss of Coolant Accident (Sheets 1 - 3)	6.2-126
6.2.4-5	Post-Accident Containment Temperature and Associated Corrosion Rates for Aluminum and Zinc	6.2-129
6.2.4-6	Igniter Location (Sheets 1 -3)	6.2-130
6.2.4-7	Subcompartment/Area Igniter Coverage	6.2-133
6.2.5-1	Deleted	
6.3-1	AP600 PXS Process Flow Table (Safety Injection) (Sheets 1 - 12)	6.3-54
6.3-2	AP600 PXS Process Flow Table (Decay Heat Removal) (Sheets 1 - 3)	6.3-66
6.3-3	Passive Core Cooling System - Remote Actuation Valves	6.3-70
6.3-4	Component Data - Passive Core Cooling System (Sheets 1 - 2)	6.3-71
6.3-5	Failure Mode and Effects Analysis - Passive Core Cooling System Active Components (Sheets 1 - 5)	6.3-73
6.4-1	Onsite Chemicals	6.4-13
6.4-2	Main Control Room Habitability Indications and Alarms	6.4-14
6.4-3	Loss of AC Power Heat Load Limits	6.4-15
6.5.3-1	Primary Containment Operation Following a Design Basis Accident	6.5-8

LIST OF FIGURES

Figure No.	Title	Page
6.2.1.1-1	MSLB Full DER 30% Power Case	6.2-135
6.2.1.1-2	MSLB Full DER 30% Power Case	6.2-136
6.2.1.1-3	MSLB Full DER 102% Power Case	6.2-137
6.2.1.1-4	MSLB Full DER 102% Power Case	6.2-138
6.2.1.1-5	DECLG LOCA Case for 24 Hours	6.2-139
6.2.1.1-6	DECLG LOCA Case for 24 Hours	6.2-140
6.2.1.1-7	DECLG LOCA Case for 3 Days	6.2-141
6.2.1.1-8	DECLG LOCA Case for 3 Days	6.2-142
6.2.1.1-9	DEHLG LOCA Case	6.2-143
6.2.1.1-10	DEHLG LOCA Case	6.2-144
6.2.1.1-11	External Pressure Analysis Containment Pressure vs. Time	6.2-145
6.2.1.3-1	Integrated Mass Released for DECLG Break	6.2-146
6.2.1.3-2	Integrated Energy Released for DECLG Break	6.2-147
6.2.1.3-3	Integrated Mass Released for DEHLG Break	6.2-148
6.2.1.3-4	Integrated Energy Released for DEHLG Break	6.2-149
6.2.1.5-1	WGOTHIC-Predicted AP600 Containment Response to DECL Breaks	6.2-150
6.2.2-1	Passive Containment Cooling System Piping and Instrumentation Diagram (Sheets 1 - 2)	6.2-151
6.2.2-2	Simplified Sketch of Passive Containment Cooling System	6.2-155
6.2.4-1	Hydrogen Concentration	6.2-156
6.2.4-2	Hydrogen Concentration in Containment	6.2-157
6.2.4-3	Hydrogen Production Rate	6.2-158
6.2.4-4	Hydrogen Production in Containment	6.2-159
6.2.4-5	Hydrogen Igniter Locations - Section View	6.2-160
6.2.4-6	Hydrogen Igniter Locations Plan View Elevation 82′-6″	6.2-161
6.2.4-7	Hydrogen Igniter Locations - Section View	6.2-162
6.2.4-8	Hydrogen Igniter Locations Plan View Elevation 96′-6″	6.2-163
6.2.4-9	Hydrogen Igniter Locations Plan View Elevation 100′ & 107′-2″	6.2-164
6.2.4-10	Hydrogen Igniter Locations Plan View Elevation 160′-6″ & 153′-0″	6.2-165
6.2.4-11	Hydrogen Igniter Locations Plan View Elevation 210′	6.2-166
6.2.4-12	Igniter Locations in the Upper Compartment at Elevations 210′ and 235′ - Sectional View	6.2-167
6.2.5-1	Containment Leak Rate Test System Piping and Instrumentation Diagram	6.2-169
6.3-1	Passive Core Cooling System Piping and Instrumentation Diagram (Sheet 1)	6.3-79
6.3-2	Passive Core Cooling System Piping and Instrumentation Diagram (Sheet 2)	6.3-81
6.3-3	Passive Safety Injection	6.3-83
6.3-4	Passive Decay Heat Removal	6.3-84
6.3-5	Passive Heat Removal Heat Exchanger	6.3-85

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
6.3-6	IRWST Screen Plan Location	6.3-86
6.3-7	IRWST Screen Section Location	6.3-87
6.3-8	Containment Recirculation Screen Plan Location	6.3-88
6.3-9	Containment Recirculation Screen Plan Location	6.3-89
6.4-1	Main Control Room Envelope	6.4-16
6.4-2	Main Control Room Habitability System Piping and Instrumentation Diagram (Sheets 1 - 2)	6.4-17
6.5-1	Containment Spray Coverage at the Operating Deck	6.5-9
6A-1	RCS Release Locations	6A-11
6A-2	Containment Natural Circulation	6A-12