

CHAPTER 4 – REACTOR COOLANT SYSTEM

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>
4.0	REACTOR COOLANT SYSTEM
4.1	DESIGN BASES
4.1.1	PERFORMANCE OBJECTIVES
4.1.1.1	STEAM OUTPUT
4.1.1.2	TRANSIENT PERFORMANCE
4.1.1.3	PARTIAL LOOP OPERATION
4.1.2	DESIGN CONDITIONS
4.1.2.1	PRESSURE
4.1.2.2	TEMPERATURE
4.1.2.3	REACTION LOADS
4.1.2.4	CYCLIC LOADS
4.1.2.5	SEISMIC LOADS AND LOSS OF COOLANT LOADS
4.1.2.6	SERVICE LIFETIME
4.1.2.7	WATER CHEMISTRY
4.1.2.8	VESSEL RADIATION EXPOSURE
4.1.3	CODES AND CLASSIFICATIONS
4.1.3.1	VESSELS
4.1.3.2	PIPING
4.1.3.3	REACTOR COOLANT PUMPS
4.1.3.4	RELIEF VALVES
4.1.3.5	ATTACHMENTS TO LOOP
4.1.3.6	WELDING
4.2	SYSTEM DESCRIPTION AND OPERATION
4.2.1	GENERAL
4.2.1.1	SYSTEM
4.2.1.2	SYSTEM PROTECTION
4.2.1.3	SYSTEM ARRANGEMENT
4.2.2	MAJOR COMPONENTS
4.2.2.1	REACTOR VESSEL
4.2.2.2	STEAM GENERATOR
4.2.2.3	PRESSURIZER
4.2.2.4	REACTOR COOLANT PIPING
4.2.2.5	REACTOR COOLANT PUMPS
4.2.2.6	REACTOR COOLANT PUMP MOTOR FLYWHEEL
4.2.2.7	REACTOR COOLANT EQUIPMENT INSULATION
4.2.2.8	VALVES
4.2.3	SYSTEM PARAMETERS
4.2.3.1	FLOW
4.2.3.2	TEMPERATURES
4.2.3.3	HEATUP
4.2.3.4	COOLDOWN

TMI-1 UFSAR

TABLE OF CONTENTS (cont'd)

<u>SECTION</u>	<u>TITLE</u>
4.2.3.5	VOLUME CONTROL
4.2.3.6	CHEMICAL CONTROL
4.2.3.7	FLOW MEASUREMENT
4.2.3.8	LEAK DETECTION
4.2.3.9	REACTOR COOLANT SYSTEM VENTING
4.2.3.10	REACTOR COOLANT SYSTEM DRAINS
4.2.4	PRESSURE CONTROL AND PROTECTION
4.2.4.1	PRESSURIZER CODE SAFETY VALVES
4.2.4.2	PILOT (ELECTROMATIC) OPERATED RELIEF VALVE (PORV)
4.2.4.3	PRESSURIZER SPRAY
4.2.4.4	PRESSURIZER HEATERS
4.2.4.5	RELIEF VALVE EFFLUENT
4.2.4.6	COOLDOWN
4.2.4.7	SAMPLING
4.2.5	INTERCONNECTED SYSTEMS
4.2.5.1	DECAY HEAT REMOVAL
4.2.5.2	MAKEUP AND PURIFICATION
4.2.5.3	CORE FLOODING SYSTEM
4.2.5.4	SECONDARY SYSTEM
4.2.6	COMPONENT FOUNDATIONS AND SUPPORT
4.2.6.1	REACTOR VESSEL
4.2.6.2	PRESSURIZER
4.2.6.3	STEAM GENERATOR
4.2.6.4	PIPING
4.2.6.5	PUMP AND MOTOR
4.2.6.6	LOCA LOAD EFFECTS
4.2.7	MISSILE PROTECTION
4.3	RCS STRUCTURAL DESIGN EVALUATION
4.3.1	FUNCTIONAL DESIGN BASES
4.3.2	MATERIAL SELECTION
4.3.3	REACTOR VESSEL
4.3.4	STEAM GENERATORS
4.3.5	RELIANCE ON INTERCONNECTED SYSTEMS
4.3.6	SYSTEM INTEGRITY
4.3.7	OVERPRESSURE PROTECTION
4.3.8	SYSTEM INCIDENT POTENTIAL
4.3.9	REDUNDANCY
4.3.10	SAFETY LIMITS AND CONDITIONS
4.3.10.1	MAXIMUM PRESSURE
4.3.10.2	MAXIMUM REACTOR COOLANT ACTIVITY
4.3.10.3	LEAKAGE
4.3.10.4	SYSTEM MINIMUM OPERATIONAL COMPONENTS
4.3.11	QUALITY ASSURANCE
4.3.11.1	STRESS ANALYSES
4.3.11.2	SHOP INSPECTION

TMI-1 UFSAR

TABLE OF CONTENTS (cont'd)

<u>SECTION</u>	<u>TITLE</u>
4.3.11.3	FIELD INSPECTION
4.3.11.4	TESTING
4.4	TESTS AND INSPECTIONS
4.4.1	INSERVICE INSPECTION OF THE REACTOR COOLANT SYSTEM
4.4.1.1	REACTOR VESSEL
4.4.1.2	PRESSURIZER
4.4.1.3	STEAM GENERATOR
4.4.1.4	REACTOR COOLANT PUMPS
4.4.1.5	PIPING
4.4.1.6	DISSIMILAR METAL WELDS
4.4.1.7	CONTAINMENT
4.4.2	CONSTRUCTION INSPECTION
4.4.3	INSTALLATION TESTING
4.4.4	FUNCTIONAL TESTING
4.4.5	MATERIAL IRRADIATION SURVEILLANCE
4.5	<u>REFERENCES</u>

TMI-1 UFSAR

CHAPTER 4 – REACTOR COOLANT SYSTEM

LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>
4.1-1	TRANSIENT CYCLES
4.1-2	REACTOR COOLANT SYSTEM COMPONENT CODES
4.2-1	REACTOR VESSEL DESIGN DATA
4.2-2	STEAM GENERATOR DESIGN DATA
4.2-3	PRESSURIZER DESIGN DATA
4.2-4	REACTOR COOLANT PIPING DESIGN DATA
4.2-5	REACTOR COOLANT PUMPS DESIGN DATA
4.2-6	MATERIALS OF CONSTRUCTION
4.2-7	FABRICATION INSPECTIONS
4.2-8	REACTOR COOLANT SYSTEM PRESSURE SETTINGS
4.3-0	MITIGATION OF ALLOY 600 MATERIALS
4.3-1	SUMMARY OF PRIMARY PLUS SECONDARY STRESS FOR COMPONENTS OF THE REACTOR VESSEL
4.3-2	SUMMARY OF CUMULATIVE FATIGUE USAGE FACTORS FOR COMPONENTS OF THE REACTOR VESSEL
4.3-3	REACTOR VESSEL METAL PHYSICAL PROPERTIES
4.3-4	REACTOR VESSEL CHEMICAL PROPERTIES
4.3-5	REFERENCES FOR FIGURE 4.3-1 – INCREASE IN TRANSITION TEMPERATURE DUE TO IRRADIATION EFFECTS FOR A302B STEEL
4.3-6	STRESSES DUE TO A MAXIMUM DESIGN STEAM GENERATOR TUBE SHEET PRESSURE DIFFERENTIAL OF 2,500 PSIG AT 650F
4.3-7	RATIO OF ALLOWABLE STRESSES TO COMPUTED STRESSES FOR A STEAM GENERATOR TUBE SHEET PRESSURE DIFFERENTIAL OF 2,500 PSIG
4.3-8	DELETED

4.3-9 DELETED

TMI-1 UFSAR

CHAPTER 4 – REACTOR COOLANT SYSTEM

LIST OF FIGURES

<u>FIGURE</u>	<u>TITLE</u>
4.2-1	DELETED
4.2-2	REACTOR COOLANT SYSTEM ARRANGEMENT-ELEVATION
4.2-3	REACTOR COOLANT SYSTEM ARRANGEMENT -PLAN
4.2-4	REACTOR VESSEL OUTLINE
4.2-5	STEAM GENERATOR OUTLINE
4.2-6	DELETED
4.2-7	PRESSURIZER OUTLINE
4.2-8	REACTOR COOLANT PUMP
4.2-9	REACTOR COOLANT PUMPS ESTIMATED PERFORMANCE CHARACTERISTICS
4.2-10	SYSTEMS TEMPERATURE VS LOAD
4.3-1	PREDICTED NDTT SHIFT VS REACTOR VESSEL IRRADIATION
4.3-2	NDTT VS INTEGRATED NEUTRON EXPOSURE FOR A302B STEEL
4.3-3	DELETED
4.3-4	DELETED
4.3-5	DELETED