TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.0 REACTOR COOLANT SYSTEM

Learning Objectives:

1. Describe the arrangement of the reactor coolant system for the US-APWR design.

2. Describe the major differences between the reactor coolant system design of the US-APWR and those of currently operating PWRs.

3.1 System Description

The reactor coolant system (RCS) provides reactor cooling by transferring the heat from the core to the secondary system. The major components of the RCS consist of the reactor vessel (RV), the steam generators (SGs), the reactor coolant pumps (RCPs), the pressurizer, the pressurizer relief tank (PRT), and the reactor coolant pipes and valves. Design and operating parameters for the RCS are provided in Table 3-1. Figure 3-1 shows a simplified schematic diagram of the RCS.

The RCS, including connections to related auxiliary systems, constitutes the reactor coolant pressure boundary (RCPB).

The performance and safety design bases of the RCS and its major components are interrelated. The design bases are as follows:

- The RCS has the capability to transfer heat produced during power operation and when the reactor is subcritical, including the initial phase of plant cooldown, to the main steam supply system. The RCS heat removal capability during normal operation and during operational transients ensures no fuel damage within the operating bounds permitted by the reactor control and protection systems.

- The RCS has the capability to transfer the heat produced during the subsequent phase of plant cooldown and cold shutdown to the residual heat removal system (RHRS).

- The RCS provides the water used as the core neutron moderator and reflector, and as a solvent for the neutron absorber used in chemical shim reactivity control.

- The RCS maintains the homogeneity of the soluble neutron poison concentration and the rate of change of the coolant temperature so that uncontrolled reactivity changes do not occur.

- The RCS pressure boundary components are capable of accommodating the temperatures and pressures associated with operational transients.

- The pressurizer maintains the system pressure during operation and limits pressure transients. During the reduction or increase of plant load, the pressurizer accommodates volume changes in the reactor coolant.

- The RCPs supply the coolant flow necessary to remove heat from the reactor core and transfer it to the SGs.

- The SGs provide high quality steam to the turbine. The SG tubes and tubesheets are designed to prevent the transfer of radioactivity generated within the core to the secondary system.

- The RCS piping contains the coolant under operating temperature and pressure conditions, thereby limiting leakage (and activity release) to the containment atmosphere. The RCS piping contains demineralized, borated water that is circulated at the flow rate and temperature consistent with achieving the desired reactor core thermal and hydraulic performance.

- The RCS is monitored for loose parts.

- The RV is equipped with a connection for a head vent system that meets the requirements of 10 CFR 50.34 (f)(2)(vi) (Three Mile Island Action Item II.B.1).

- Each of the pressurizer spray lines interconnected to the RCS and the pressurizer surge line are instrumented with temperature detectors to detect low temperatures. A low temperature indicates insufficient flow through the pressurizer spray bypass lines, which may cause thermal shock to the spray nozzle when pressurizer spray valves open. Thermal shock is avoided by means of the pressurizer spray bypass lines, through normally open bypass valves, that provide constant small flows to maintain the pressurizer spray line temperatures.

As shown in Figures 3-2 and 3-3, the RCS consists of four identical heat transfer loops connected in parallel to the reactor pressure vessel. Each loop contains an SG, an RCP, and associated piping and valves. In addition, the system includes a pressurizer, PRT, valves such as pressurizer safety valves, interconnecting piping, and instrumentation. All of the above components are located in the containment vessel.

During operation, the RCS transfers the heat generated in the core to the SGs, where steam is produced to drive the turbine-generator. Borated, demineralized water is circulated in the RCS at a flow rate and temperature consistent with achieving the desired reactor core thermal-hydraulic performance.

The coolant also acts as a neutron moderator and reflector and as a solvent for the neutron absorber used in chemical shim control (boric acid). The RCPB provides a barrier against the release of radioactivity generated within the reactor and is designed to ensure a high degree of integrity throughout the life of the plant.

The RCS pressure is controlled by the pressurizer, where water and steam are maintained at saturation conditions by electrical heaters and water sprays. Steam can be formed (by the heaters) or condensed (by the pressurizer spray) to minimize pressure variations due to contraction and expansion of the reactor coolant. Spring-loaded safety valves connected to the pressurizer provide overpressure protection. Discharged steam is piped to the PRT, where the steam is condensed and cooled as it mixes with the water in the PRT.

3.2 Component Descriptions

3.2.1 Reactor Coolant System Piping

The reactor coolant piping consists of the pipes connecting the reactor pressure vessel, steam generators, reactor coolant pumps, and pressurizer, together with the various branches off the main piping up to the appropriate isolating valves. It also includes instrumentation connections to the reactor coolant system that provide for flow, temperature, pressure, chemical, and radiation monitoring. The RCS piping configuration is shown in Figure 3-4.

The reactor coolant pipes and fittings are made of austenitic stainless steel. Pipes and fittings are seamless and comply with the requirements of the ASME Code, Section II (Parts A and C), Section III, and Section IX. All smaller piping that is part of the reactor coolant system, such as the pressurizer surge line, spray and relief lines, loop drains, and connecting lines to other systems, are also austenitic stainless steel. All joints and connections are welded, except for the pressurizer safety valve and vessel head vent connections, where flanged joints are used.

The inside diameter of the cross-over legs (piping between the SGs and the pump suctions), the hot legs (piping between the RV and the SGs), and the cold legs (piping between the RCPs and the RV) is 31 in.

The reactor coolant piping is designed using the leak-before-break concept.

The piping connected to the reactor coolant piping and primary components includes following:

- The chemical and volume control system (CVCS) charging line from the designated check valve up to one reactor coolant cold leg,
- The CVCS letdown line and excess letdown line from the reactor coolant cross-over legs to the designated isolation valves,
- The pressurizer spray lines from the reactor coolant cold legs up to the spray nozzle on the pressurizer vessel,
- The RHRS pump suction lines from the reactor coolant hot legs up to the designated isolation valves,
- The RHRS discharge lines from the designated check valves to the reactor coolant cold legs,
- The accumulator lines from the designated check valves to the reactor coolant cold legs,
- The safety injection lines from the designated check valves to the reactor vessel nozzles.
- Drain, sample and instrument lines to the designated isolation valves,

- The pressurizer surge line from one reactor coolant hot leg to the pressurizer vessel surge nozzle,

- The pressurizer spray scoops, the reactor coolant temperature element installation bosses, and the temperature element wells themselves,

- All branch connection nozzles attached to the reactor coolant loops,

- The safety valve relief lines from the nozzles on the top of the pressurizer vessel up to and including the pressurizer safety valves,

- The safety depressurization lines from the nozzle on the top of the pressurizer vessel up to and including the pressurizer safety depressurization valves,

- The auxiliary spray line from the designated isolation valve up to the main pressurizer spray line, and

- The vent line from the reactor vessel head to the designated isolation valves.

Parts encroaching into the primary coolant loop flow paths are limited to the following:

- The spray line inlet nozzles, which extend into the reactor coolant cold legs in the form of scoops so that the velocity head of the reactor coolant loop flow adds to the spray driving force,

- The narrow-range and wide-range temperature detectors in resistance temperature detector wells that extend into the reactor coolant hot legs and cold legs, and

- The sample nozzles, which extend into reactor coolant hot legs to obtain representative samples of the reactor coolant.

The piping connections for auxiliary systems are above the horizontal centerlines of the reactor coolant loop piping, except for the following:

- The residual heat removal pump suction lines, which are 45° down from the horizontal centerlines,

- The loop drain lines, the CVCS letdown line, the CVCS excess letdown line, and the connection for temporary level measurement of water in the RCS during refueling and maintenance operation,

- The differential pressure taps (four low pressure taps and one high pressure tap) in each loop for coolant flow measurement, each of which is downstream of the SG at the first 90° elbow,

- Two of the three wells per loop for narrow-range hot-leg resistance temperature detectors, which are instrumented at locations 120° apart around the reactor coolant hot leg, with one located at the top of the hot leg, and

- The sample nozzles located at the horizontal centerlines of two reactor coolant hot legs.

3.2.2 Steam Generators

The design of the SGs for the US-APWR, Mitsubishi Heavy Industries Model 91TT-1 (Figure 3-5), has been improved to attain high efficiency and reliability. Major improvements from the conventional design are highly effective smaller-sized separators, which provide excellent moisture carry-over performance (< 0.1%), 3/4-in. outer diameter tubes made of thermally treated alloy 690, and 9 sets of antivibration bars. Owing to these features, the weight of a steam generator is reduced by more than 10% when compared to an SG design with 7/8-in. tubing. With the adoption of a tight triangular lattice for tube arrangement, the SGs for the US-APWR are designed to have 30% more heat transfer area and thus achieve a higher efficiency. As a result, the diameter of the SG body of the US-APWR is slightly smaller than that of the first APWR.

The steam generators are vertical-shell, U-tube evaporators with integral moisture separating equipment. In each SG, the reactor coolant enters the channel head via the hot-leg primary-coolant nozzle, flows through the inverted U-tubes, transferring heat from the primary side to the secondary side, and leaves from the channel head via the cold-leg primary-coolant nozzle. The channel head is divided into inlet and outlet chambers by a vertical partition plate extending from the apex of the head to the tube sheet.

The cladding on the primary side of the tube sheet is Ni-Cr-Fe alloy, and the cladding on the channel head is stainless steel. The tube material is alloy 690 with thermal treatment, which is widely used in SGs throughout the world. The tube material is selected for its superior corrosion resistance.

On the secondary side, feedwater enters the steam generator at an elevation above the top of the U-tubes through a feedwater nozzle. The feedwater enters a feedring and is distributed through nozzles attached to the top of the feedring; the potential for water hammer in the feedring is minimized because the feedring cannot drain and fill with steam. The perforated holes of the nozzles minimize the entry of foreign material into the SG. The nozzles and feedring are made from an alloy that is resistant to erosion and corrosion for the expected secondary water chemistry and flow rates through the nozzles and the feedring. After exiting the nozzles, the feedwater mixes with saturated water removed by the moisture separators. The flow then enters the downcomer annulus between the wrapper and the shell. Feedwater enters the secondary side of the tube bundle from the annulus.

In the tube bundle, tube support is provided by ferritic stainless steel support plates. The holes in the tube support plates are broached with flow areas around the tubes. Antivibration bars are installed in the U-bend portion of the tube bundle to minimize the potential for excessive tube vibration and wear.

As the feedwater passes through the tube bundle, it is converted into a steam-water mixture. The steam-water mixture then rises into the 22 primary (centrifugal) separators and then the secondary (chevron) separators. Figure 3-6 shows a high-performance primary separator. The primary and secondary separators generate a minimum steam exit quality of 99.9%. The dried steam exits the SG at the top of the vessel via the outlet nozzle, which is equipped with a seven-venturi flow restrictor. The flow restrictor limits the rate of energy release to containment during a postulated main steam line break.

3.2.3 Reactor Coolant Pumps

The reactor coolant pumps, shown in Figure 3-7, are vertical, single-stage, centrifugal, shaft-sealed units driven by three-phase induction motors. Each shaft is vertically oriented, with the motor mounted above the pump. A flywheel on the shaft above the motor provides additional inertia to extend pump coastdown. The flywheel consistes of two plates bolted together.

Each pump's motor has an antireverse rotation device, which consists of pawls mounted on the outside diameter of the flywheel and a serrated ratchet plate mounted on the motor frame. With the pump stopped, the pawls engage the ratchet plate, preventing rotation in the reverse direction.

The pump suction is located at the bottom, and the discharge is located on the side. The reactor coolant that enters from the bottom of the casing is accelerated by the impeller attached to the pump shaft's lower end. The imparted velocity head is transformed to pressure head as coolant passes through the diffuser; the coolant is then delivered through the discharge nozzle located on the casing side. The diffuser is located at the center of the casing in order to attain high hydraulic efficiency.

The improved impeller and diffuser configuration of the US-APWR reactor coolant pump (Type 100A) results in its large capacity and high efficiency. The impeller is shrunk to the shaft with a conically shaped interface. This shape is easy to maintain during assembly and disassembly. The diffuser has a flange on the upper side. The diffuser flange, main flange, and motor stand are jointly fitted to the casing with studs. The motor is installed on the top of the pump and is connected to the pump shaft by a rigid coupling.

Each pump and motor shaft is supported by three radial bearings located at the upper and lower ends of the motor as well as at an interior point in the pump. The bearing located in the pump is water lubricated and is cooled by component cooling water. The bearings located in the motor are oil lubricated.

Leakage along the reactor coolant pump shaft is normally controlled by three shaft seals. The No. 1 seal is a hydrostatic seal with significantly improved durability characteristics. The Nos. 2 and 3 seals are hydrodynamic seals, arranged in series so that any reactor coolant leakage to the containment is essentially zero.

High pressure seal water, supplied by the chemical and volume control system, is injected under each pump's No. 1 seal to prevent the high temperature reactor coolant from entering into the shaft seal. Some of this injected water flows upward through the controlled leakage seals; after passing through the seals most of it then leaves the pump assembly and returns to the CVCS. The remaining injected water, which cools the shaft and bearing, flows downward through the thermal barrier heat exchanger and into the RCS.

The No. 2 seal is provided as a backup for the No.1 seal. If one of these two seals fails, the other seal can fully perform the sealing function. In addition, the No. 3 seal prevents leakage through the No. 2 seal from being released into the containment environment; the containment environment is thus protected from contamination.

The shaft, seal housing, thermal barrier, main flange, and impeller of the RCP can be removed from the casing as a unit without disturbing the reactor coolant piping. All parts of the pump in contact with the reactor coolant are stainless steel except for the seals, bearings, and special parts.

3.2.4 Pressurizer

The pressurizer is the point in the reactor coolant system where liquid and vapor are maintained in equilibrium under saturated conditions for pressure control. The pressurizer, shown in Figure 3-8, is a vertical, cylindrical vessel with hemispherical top and bottom heads. It is constructed of low-alloy steel with austenitic stainless steel cladding on all surfaces exposed to the reactor coolant. Electrical immersion heaters are installed vertically through the bottom head of the vessel, while the spray nozzle and relief and safety valve connections are located in the top head of the vessel. A manway is also provided in the top head for access to the internal space for inspections and maintenance of the spray nozzle. The manway closure is a gasketed cover fixed with threaded fasteners.

The safety valve nozzles, spray nozzle, and safety depressurization valve nozzle are located on the top head. Spray flow is modulated by automatically controlled air-operated valves. The spray valves can also be operated manually from the main control room. Both the spray and the surge nozzles are provided with thermal sleeves for protection against thermal transients.

The pressurizer is sized to meet the following requirements:

- The combined saturated water volume and steam expansion volume is sufficient to provide the desired pressure response to system volume changes.

- The water volume is sufficient to prevent uncovering of the heaters following a reactor trip and turbine trip.

- The steam volume is large enough to accommodate the surge resulting from a step load reduction of 100% of full power without reactor trip, assuming automatic reactor control.

- The steam volume is large enough to prevent water relief through the safety valves following a feedwater line rupture.

- An emergency core cooling system actuation signal on low pressurizer pressure will not be activated as a result of a reactor trip and turbine trip.

The pressurizer is sized to have sufficient volume to accomplish the preceding requirements without the need of power-operated relief valves. The safety valves provide overpressure protection for the RCS.

The surge line, which is attached to the bottom of the pressurizer, connects to the hot leg of a reactor coolant loop. A screen above the surge line prevents the passage of foreign particles from the pressurizer to the reactor coolant system.

Baffles in the lower section of the pressurizer prevent an insurge of cold water from flowing directly to the steam/water interface and assist in mixing. The baffles also provide support to limit vibration of the heaters.

The pressurizer is supported by a skirt welded to the bottom head.

Each spray line is provided with a separate, automatically controlled, air-operated spray valve, with manual override and a spray block valve. A manual throttle valve is provided in parallel with each spray control valve. This throttle valve enables a small continuous flow to be maintained in the associated spray line when the spray valve is closed. An auxiliary spray line is provided from the chemical and volume control system to ensure that pressurizer spray is available to permit RCS pressure control during a reactor cooldown when reactor coolant pumps are not available.

During steady-state operation at 100% power, approximately 45% by volume of the pressurizer contents is water, and approximately 55% is steam. The pressurizer heaters keep the water at the saturation temperature for the system pressure (2235 psig). The proportional heaters are continuously on to compensate for the continuous introduction of cooler spray water via the spray valve bypass valves and for heat losses to ambient. When the pressure trends lower than setpoint, additional heaters are energized to boil some of the water and raise the pressure. When pressure trends higher than setpoint, the spray valves are modulated open to condense some of the steam and lower the pressure. Design pressure settings for RCS control and protection are listed in Table 3-2.

There are four spring-loaded safety relief valves (SRVs) positioned on separate relief lines from the pressurizer. Another relief line incorporates two motor-operated relief valves which are called safety depressurization valves (SDVs). The SDVs are built into parallel pipes with remotely controlled, motor-operated isolation valves, which allow isolation of a leaking SDV. All SRV and SDV relief lines direct discharge to the PRT. The mounting configuration of the relief valves is shown in Figure 3-9.

3.2.5 Relief Valves

The RCS pressure relief system has the following design features:

- Four spring-loaded SRVs installed on separate relief lines at the top of the pressurizer. The sizing of the SRVs is based on the analysis for a complete loss of steam flow to the turbine with the reactor operating at 102% of the design thermal power. In this analysis, feedwater flow is also assumed to be lost, and no credit is taken for operation of the pressurizer level control system, pressurizer spray system, rod control system, turbine bypass system, or main steam relief valves. The reactor is maintained at full power (no credit for reactor trip), and steam relief through the main steam safety valves is considered. The total SRV capacity is required to be at least as large as the maximum surge rate into the pressurizer during this transient. The resulting SRV capacity is sufficient to prevent exceeding 110% of system design pressure for the events listed above. Table 3-3 lists design data for the SRVs.

- RHRS self-actuated water relief valves, one in each of the four containment spray/ residual heat removal (CS/RHR) pump suction lines. When the RCS is at temperatures below approximately 350ºF, the RCS is aligned to the RHRS for residual heat removal from the core, for providing a path for letdown to the purification subsystem, and for controlling the RCS pressure when the pressurizer is water solid. The RHRS relief valves prevent overpressure in this relatively low-design-pressure system, caused either within the system itself or from transients transmitted from the RCS. The set pressure is the lower bound of the reactor vessel low-temperature pressure limit. The CS/RHR pump suction relief valves discharge to the refueling water storage pit in the containment.

Three additional relief paths from the top of the pressurizer are provided:

- Two parallel motor-operated SDVs piped to a common relief nozzle, and

- An additional relief line via two in-series operator-controlled severe-accident depressurization valves (DVs), used to prevent high pressure core ejection (HPME). The DV relief piping branches from one of the SDV relief lines.

The SDVs are used to cool the reactor core by feed-and-bleed operation when heat removal by the SGs is unavailable. The SDVs are motor-operated, remote-manual valves. SDV design parameters are shown in Table 3-4.

The SDV arrangement consists of two flow paths, with a motor-operated, remote-manual block valve located upstream of each SDV. A block valve is shut if its associated SDV is stuck open or leaks excessively. The SDVs and the block valves are controlled from the MCR. The block valves ensure that a single failure of a remotely operated valve, power supply, or control system does not prevent isolation of a relief flow path. Open and closed indications of the valves are provided and monitored in the MCR. The SDVs and the block valves are powered from independent Class 1E power supplies. These valves can also be powered from alternate AC power supplies, which are available under the station blackout condition. The valves are qualified to IEEE 344.

An overview of SDV operation is as follows:

- The operation is needed when heat removal from the SGs fails and SG water levels are very low. Monitoring of wide-range SG water levels is required.

- Core damage does not occur in the assumed conditions, and noncondensable gas bubbles are not generated in the RCS.

- The operation is started when decay heat is not removed from the core due to low SG water levels, but the core is still intact.

- Valve operation is initiated and terminated manually.

The DVs are used to prevent HPME at vessel failure and temperature-induced steam generator tube rupture by depressurizing the reactor coolant system. When the DVs are opened, noncondensable gases and/or steam are directly discharged to the containment atmosphere. The DV design parameters are shown in Table 3-5.

The DV arrangement consists of a flow path with two redundant motor-operated, remote-manual, normally closed valves connected in series. This arrangement minimizes the possibility of inadvertent actuation. The valves are controlled from the MCR. Open and closed indications for the valves are provided and monitored in the MCR. The valves are powered from independent Class 1E power supplies. These valves can also be powered from alternate AC power supplies. The valves are qualified to IEEE 344.

An overview of DV operation is as follows:

- The operation is needed after the onset of core damage, when the RCS pressure is higher than the pressure at which HPME occurs.

- The size of a noncondensable bubble is estimated from the reading of RV water level indication.

- The operation requires instrumentation which provides the dose rate in containment, core exit temperatures, and RCS pressure, and information on the success and failure of both vessel head vent valves and reactor core coolant injection.

- Valve operation is initiated and terminated manually.

3.2.6 Pressurizer Relief Tank

The steam and reactor-grade water discharged from the various safety and relief valves inside containment are routed to the PRT. Table 3-6 provides PRT design data. Table 3-7 provides an itemized list of the discharges to the PRT.

The PRT, shown in Figure 3-10, is a horizontal, cylindrical stainless steel vessel with elliptical heads. The PRT is protected from overpressure by rupture disks. The discharge piping connected to the PRT is also constructed of austenitic stainless steel. The flanged connection for the discharge line, the spray water supply connection, the drain connection, the gas vent connection, the nitrogen gas supply connection, and the vessel supports are shown in Figure 3-10.

A nitrogen gas blanket is used to control the atmosphere in the PRT and to allow room for the expansion of the initial water volume. The PRT gas volume is sized such that the pressure following a design-basis steam discharge does not exceed the rupture disks' release pressure.

The internal spray and bottom drain on the PRT function to cool the water when the temperature exceeds 120°F. The contents are cooled by a feed-and-bleed process, with cold primary makeup water entering the PRT through the spray water inlet and the warm mixture drained by the reactor coolant drain pump.

The PRT design, including the design volume, is based on the requirement to condense and cool a discharge of steam equivalent to 100% of the full-power pressurizer steam volume. The minimum volume of water in the PRT is determined by the energy content of the steam to be condensed and cooled, by the assumed initial temperature of the water, and by the desired final temperature of the water. The initial water temperature is assumed to be 120°F, which corresponds to the design maximum expected containment temperature for normal conditions. The expected final temperature, following a design discharge to the PRT, is 210°F.

Table 3-1 Reactor Coolant System Design and Operating Parameters (Sheet 1 of 2)

General	
Plant design life (years)	60
NSSS thermal output (MW)	4,466
Core thermal output (MW)	4,451
Nominal Operating Pressure (psig)	2,235
Number of heat transfer loops	4
Pipes	
Pipe inner diameter (in.)	31
Reactor Coolant Pumps	
Type of reactor coolant pumps	Vertical shaft, single-stage, mixed flow type
Number of reactor coolant pumps	4
Motor output (hp/unit)	8,200
Pressurizer	
Type of pressurizer	Vertical cylindrical type
Number of units	1
Total volume (ft^3)	2,900
Total spray flow rate (gpm)	800

Table 3-1 Reactor Coolant System Design and Operating Parameters (Sheet 2 of 2)

Steam Generators	
Type of Steam generators	Vertical U-tube heat exchanger (91TT-1)
Number of steam generators	4
Heat transfer rate (MW/unit)	1,116.5
Heat transfer area (ft^2/unit)	91,500 (without plug)
Secondary side design pressure (psig)	1,185
Zero load temperature (°F)	557.0
Feedwater temperature (°F)	456.7
Steam pressure at full power (psig)	957
Steam flow late per steam generator (lb/hr)	$5.0x10^6$
Total steam flow late (lb/hr)	$2.0x10^7$

Table 3-2 Reactor Coolant System Design Pressure Settings

Hydrostatic test pressure (psig)	3,106
Design pressure (psig)	2,485
Safety valves (psig)	2,485
High pressure reactor trip (psig)	2,385
Pressurizer spray valves (full open) (psig)	2,310
Pressurizer spray valves (begin to open) (psig)	2,260
Proportional heaters (begin to operate) (psig)	2,250
Operating pressure (psig)	2,235
Proportional heater (full operation) (psig)	2,220
Backup heaters on (psig)	2,210
Low pressure reactor trip (psig)	1,865

Table 3-3 Pressurizer Safety Valve Design Data

Number	4
Design pressure (psig)	2,485
Design temperature (°F)	680
Minimum required capacity per valve (lb/hr), at 3% accumulation of set pressure	432,000
Set pressure (psig)	2,485
Fluid	Saturated steam
Inlet and Outlet size (in.)	6
Inlet piping length (in.)	110
Environmental condition Ambient temperature (°F) Relative humidity (%)	 Up to 120 Up to 100

Table 3-4 Safety Depressurization Valve Design Parameters

Type	Motor operated valve
System design pressure (psig)	2,485
System design temperature (°F)	680
Number	2
Saturated steam discharging capacity at 2,335 psig (lb/h)	530,000

Table 3-5 Depressurization Valve Design Parameters

Type	Motor operated valve
System design pressure (psig)	2,485
System design temperature (°F)	680
Number	2
Saturated steam discharging capacity at 2335 psig (lb/h)	795,000

Table 3-6 Pressurizer Relief Tank Design Data

Number	1
Design pressure (internal/external) (psig)	200/15
Design temperature (°F)	400
Material	Stainless steel
Total volume (ft^3)	2,760
Normal water volume (ft^3)	1,920
Normal operating pressure (psig)	3
Initial operating water temperature (°F)	120
Expected final operating water temperature (°F)	210
Blanket gas	Nitrogen

Table 3-7 Discharges to the Pressurizer Relief Tank

RCS
Pressurizer safety valves
Safety depressurization valves
Reactor vessel head vent valves
CVCS
Seal water return line relief valve
Letdown line relief valve