10A.8 SAMPLING SYSTEM

Reactor Coolant Sampling: The reactor coolant sampling system for each unit includes piping, valves, sample bomb connections, instrumentation, and a cooler enclosed in a fume hood. The reactor coolant sample sink is located on the 45' Elevation of the Auxiliary Building. The fume hood is ventilated by a blower through a high efficiency filter. Interlocking high-density concrete block shielding is provided to protect personnel in the rest of the sample room. Additional equipment in the sample room includes the steam generator blowdown sample panel, the steam generator sampling system, and, in Unit 1 only, the radioactive miscellaneous sampling system.

The reactor coolant samples can be taken from three points: Reactor coolant system hot leg, pressurizer liquid, and pressurizer vapor. Remotely operated valves, controlled by handswitches located on the steam generator blowdown sample panel, may be used to select one of the three sample points. Another remotely operated valve, controlled by a handswitch in the Control Room, must be open before samples can be taken. All four of these remotely operated valves are closed by a Safety Injection Actuation Signal from the Engineered Safety Features Actuation System. Manual isolation (entry valves) is provided for each sample line.

A high temperature sample is cooled in a sample cooler supplied by component cooling water. Once cooled, the sample pressure is reduced and the sample is passed through a metering valve for flow control. Both routine and post-accident samples may be obtained by the reactor coolant sampling system. Samples are normally transported to a laboratory in the Auxiliary Building for analysis.

A radiation monitor is located near the reactor coolant sample sink. It provides continuous monitoring of radiation levels, a local alarm, and a remote alarm in the Control Room.

Steam Generator Blowdown Sampling: The steam generator blowdown sampling system for each unit consists of a sample conditioning rack, fume hood, and instrument panel. This system is located in the sample room on the 45' Elevation of the Auxiliary Building. The sample conditioning rack contains sample entry valves, piping, primary coolers, pressure reducers, and a chiller-cooled isothermal bath. The primary sample coolers and chiller for the isothermal bath are both cooled by component cooling water.

Each high pressure sample flows through its respective entry valve to a primary cooler, pressure reducer, isothermal bath, and is then routed to a fume hood. The fume hood contains grab sample valves, piping, flow indicators, pH and conductivity elements, temperature indicators, and cation columns. The fume hood is ventilated through a high efficiency filter by an individual blower. The Unit 1 steam generator blowdown sample fume hood also contains the Radioactive Miscellaneous Sample System.

The instrument panel houses the following equipment: pH and conductivity displays, alarm annunciators, chiller controls, and primary sample valve position indication and handswitches. The pH and conductivity samples are continuously monitored. Alarms are provided for high sample outlet temperature, high conductivity, and high or low pH. Any of these alarms will cause a common trouble alarm in the Control Room.

10A.8.1 PIPE WHIP

In accordance with the proposed AEC criteria, pipe breaks in lines under 1" nominal pipe size need not be considered. The primary sampling system line sizes are 1/2" and 3/4", and the secondary system lines are 1/4". Therefore, no pipe whip will occur.

10A.8.2 CRITERIA FOR PIPE BREAK LOCATIONS

A critical crack defined as one-half the pipe diameter in length and one-half the pipe wall thickness in width is postulated to occur at any location.

10A.8.3 CRITERIA FOR PIPE BREAK ORIENTATION

A critical crack is assumed to be oriented at any point around the pipe circumference.

10A.8.4 SUMMARY OF DYNAMIC ANALYSIS

Not applicable (Section 10A.8.1).

10A.8.5 PROTECTIVE MEASURES

Engineered Safety Feature Systems in the vicinity of high energy sampling system lines are protected by shielding, if necessary, to protect from damage as a result of jet impingement from a crack in these lines.

10A.8.6 EVALUATION OF SEISMIC CATEGORY I STRUCTURES

There will be no effect on Category I structures as a result of a crack in the sampling line.

10A.8.7 STRUCTURAL DESIGN LOADS

Structural design loads are discussed in Section 10A.1.7.

10A.8.8 LOAD REVERSAL ANALYSIS

There will be no reversal of loads on the structure due to a crack in the sampling line.

10A.8.9 EFFECTS OF NEW OPENINGS ON STRUCTURE

No new openings are required.

10A.8.10 VERIFICATION THAT ANY STRUCTURAL FAILURES WILL NOT AFFECT OTHER STRUCTURES REQUIRED FOR SAFETY

No structures will fail.

10A.8.11 VERIFICATION THAT PIPE RUPTURE WILL NOT AFFECT SAFETY

There will be no environmental consequences as a result of a crack in the sampling system piping.

The primary sampling system lines can be isolated by activating any or all of the three remotely-located hand switches, which will close the isolation valves inside the Containment on the three sample drawoff lines (two from the pressurizer and one from the hot leg). Accessibility to the hand switches will not be affected by a primary sampling system line crack.

The secondary sampling system lines can be isolated by manually closing any one of the three valves on the top and bottom steam generator blowdown sampling lines. A crack in these sampling lines will not hinder access to these valves.

10A.8.12 EFFECT ON CONTROL ROOM

A sample line crack will not affect the Control Room, since there is no direct access from the affected area to the Control Room.

10A.8.13 ENVIRONMENTAL QUALIFICATION OF AFFECTED REQUIRED EQUIPMENT

There will be no significant environmental effect on the ESF equipment as a result of a crack in the sampling system lines because of the small blowdown rate.

10A.8.14 DESIGN DRAWINGS

Figure 10A.8-1 is a drawing of the high energy portions of the primary and secondary sampling system lines. Figure 10A.8-2 shows the routing of the sampling system.

10A.8.15 FLOODING

No flooding of ESF equipment will occur as a result of a crack in the sampling system lines because of the small blowdown rate.

10A.8.16 QUALITY CONTROL AND INSPECTION PROGRAMS

The quality control and inspection programs for the lines outside the Containment are presented in Section 10A.1.16.

10A.8.17 LEAK DETECTION

A crack in the primary or secondary system lines would result in a loss of sample in the hot and cold labs.

10A.8.18 EMERGENCY PROCEDURES

Emergency procedures for the sampling system are outlined in Section 10A.1.18.

10A.8.19 SEISMIC AND QUALITY CLASSIFICATION

The sampling system lines are constructed to ANSI B31.7, Class I standards in the Auxiliary Building to the sampling rooms. They are designed to withstand a SSE in combination with normal design loads.

10A.8.20 DESCRIPTION OF ASSUMPTIONS, METHODS, AND RESULTS OF ANALYSIS FOR PRESSURE AND TEMPERATURE TRANSIENTS IN COMPARTMENTS

No applicable (Section 10A.8.13).

10A.8.21 DESCRIPTION OF ASSUMPTIONS, METHODS, AND RESULTS OF ANALYSIS FOR EFFECT ON PRIMARY OR SECONDARY CONTAINMENT STRUCTURES DUE TO PIPE RUPTURE OUTSIDE

There will be no effect on the Containment Structure as a result of forces from a crack in the sampling system.