Department of Energy
Washington, D.C. 20545

Docket No. 50-537
HQ:S:82:163

DEC 23 1982

Mr. Paul S. Check, Director
CRBR Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Check:

INSTRUMENTATION (CHAPTER 7) WORKING MEETINGS - ADDITIONAL INFORMATION FOR THE CLINCH RIVER BREEDER REACTOR PLANT

References: 1) Letter HQ:S:82:095, J. R. Longenecker to P. S. Check, "Meeting Summary for Instrumentation (Chapter 7)," dated September 24, 1982

2) Letter HQ:S:82:126, J. R. Longenecker to P. S. Check, "Meeting Summary for Instrumentation (Chapter 7) Working Meeting, November 18 and 19, 1982," dated November 29, 1982

Enclosed is the remaining information requested during the subject meetings. The amended Preliminary Safety Analysis Report (PSAR) pages will be incorporated into Amendment 75 of the PSAR scheduled for submittal in January 1983.

Item 77 of reference 1 stated that detailed information about Sodium Water Reaction Pressure Relief System (SWRPRS) interlocks would be provided. PSAR section 7.5.6.1.3 provides preliminary information about those interlocks. As the SWRPRS instrumentation and control system is still being designed, more detailed information cannot be provided at this time. More information about SWRPRS interlocks will be provided in the Final Safety Analysis Report along with justification as to whether or not the interlocks need to be Safety Classification 1E. The current design has no requirements for Safety Classification 1E SWRPRS interlocks.

Any questions regarding the information provided or further activities can be addressed to Mr. R. Rosecky (FTS 626-6149) or Mr. A. Meller (FTS 626-6355) of the Project Office Oak Ridge staff.

Sincerely,

John R. Longenecker

John R. Longenecker
Acting Director, Office of
Breeder Demonstration Projects
Office of Nuclear Energy

Enclosure

cc: Service List
Standard Distribution
Licensing Distribution

D001
1/40

September Item 54, November item 4
Auxiliary Feedwater System

NRC CONCERN

Amend the Q421.4 response to provide a description rationale defining why the AFWS valves have nc realistic common mode failures, discuss over voltage and under voltage conditions and alarms. Consider a steam or feedline break in one loop. Provide valve qualification and design details. The concern is failure of valves in the same power division to assume their deenergized position when required.

Reference and confirm PSAR Section 5.6.1.2.3.4.e which refers to "normally open electro-hydraulic control valves".

Resolution

Discussion of the AFW valve failure modes is provided in the revised response to question CS421.4.

QUESTION CS421.4

The applicant should formally submit a diagram of the auxiliary feedwater system showing the division assignments for all valves and safety grade instrumentation and controls. A discussion should be included to indicate the normal position and position upon loss of power of each valve. In your presentation, and in Section 7.4.1.1.6, credit is taken for the feedwater isolation valve to fail-safe in the open position upon loss of electrical power. Justify this fail-safe analysis for all incidents (i.e., hot shorts, power supply overvoltage, etc.) that could prevent operation of this isolation valve.

Response

Figures 5.1-5 and 5.1-5a of the PSAR (attached) have been marked-up (Figure QCS421.4-1, 2) to show the power division assignments for all valves and safety grade instrumentation of the auxiliary feedwater system. The controls for the devices are not shown. However, the power assignment is the same as that of the valves, louvers, and fan blade pitch control being actuated. The normal position and failure position of the valves are shown in Figures 5.1-5 and 5.1-5a.

As shown in Figure 5.1-5 there are six isolation valves, two in parallel to each steam drum. One valve supplies water from the electric driven pumps, the other from the turbine drive pump, each capable of supplying 100 percent water flow to the steam drum. These two valves are supplied with power from separate Class 1E power divisions. The failure of one valve to open on demand would not result in the loss of water to a steam drum, as the required water would be supplied by the parallel line.

The isolation valves (52AFV103A-F) are closed in normal operation. They open automatically on SGAHRS trip or when the steam drum level drops to 8" below normal water level (NWL). Automatic closing occurs when the steam drum level rises to 8" above NWL for the motor driven pump AFW supply and 12" above normal water level for the turbine driven pump AFW supply.

Each isolation valve is supplied from a regulated 480 VAC power supply and is designed to operate within the over voltage tolerance allowed for that power supply.

In addition, Figure 5.1-5 shows that there are flow control valves in series with these isolation valves. Each of the flow control valves is supplied with power from a Class 1E power division different from the Class 1E power division supplied to the isolation valve in the same line.

The flow control valves (52AFV104A-F) are open during normal plant operation. They modulate to control the auxiliary feedwater flow to maintain steam drum level.

Each flow control valve is supplied from a 135 VDC power supply and is designed to operate with the voltage tolerances allowed for that power supply.

The design provides for failure of the control power to result in a "fail-safe" position (open) for the isolation valve, and an "as-is" position for the flow control valve; therefore, the capability to maintain the AFW supply has been assured.

The wiring and controls for the isolation or flow control valves in the line supplying water to any steam drum are in separate Class 1E power divisions and separation is provided in accordance with IEEE-383. Hot shorts between the two valves supplying the same steam drum will not occur. The only hot short which could occur would be within the same power division between the valve and control circuits. This could result in two of the six isolation valves not opening when called upon. The two valves that fail being in the same power division supply separate steam drums. Since there is a 100 percent redundant water supply to each steam drum, a failure of two of the six isolation valves would not result in the loss of water to any of the three steam drums. A short between two Class 1E power divisions is not a credible event because of the separation between divisions.

Any hot short within a given division in the local panel will not affect the control elements in the main control room area, and vice versa, because isolators are located between them. Shorts or voltage spikes might cause circuit current to exceed the current limitations of the control circuit fuse and consequently the failed (open circuited) power supply would result in a "fail-safe" (open) position of the AFW isolation valve. The flow control valve in the same power division would fail as-is (open) at this time because of the failure in the control circuit.

Upon the loss of power the isolation valves are driven to their fail-safe de-energized positions by accumulator pressure, which is released and applied to the bottom of the actuator cylinder. The flow control valves fail in the as-is position. In the unlikely event of a valve, or the even more unlikely event of all valves, in a power division failing to assume their de-energized positions, the operator can manually operate these valves to accomplish a safe shutdown under any set of conditions.

The above has discussed the ability to provide water to the steam drums with the loss of a division of power; however, if there is a break in the feedwater line to a steam generator or a steam line in a steam generator loop, the operator has the capability to remotely close the flow control valve in series with the isolation valve that failed in the open position. In addition, the operator could also manually operate the valves to isolate the AFW supply from the pipe break.

INSERT A →

INSERT A

If there is a break in the auxiliary feedwater line to one steam generator and a failure in the division of power that does not feed the affected loop, the loop would isolate the break. The other loops would continue to supply feedwater to the steam drums as the isolation valve affected by the power failure would go to its failure position (open) and the affected flow control valve would remain in its normal position (open). If the power failure is such that it prevents an isolation valve from obtaining its failure position, the affected flow control valve on the parallel line would remain in its normal position (open), and flow would be controlled by the opening and closing of the isolation valve on the other division of power. The flow would be maintained to the steam drum by either the motor driven or turbine driven pumps.

The AFWS valves are safety-related and are qualified to perform their function in the worst accident environmental condition they are expected to experience. The isolation valves and the flow control valves are provided by different suppliers and use different types of actuators. The isolation valves are gate valves with electro-hydraulic actuators that have internal accumulators to provide the reserve energy to take the valves to their failure position. The flow control valves have internal trim designed to permit throttling the flow as well as providing shutoff capability. These valves have an electro-hydraulic actuator that permits modulation of the valve position and fails in position. Because of the different valve suppliers and the different type of actuators, no common failure mode is anticipated.

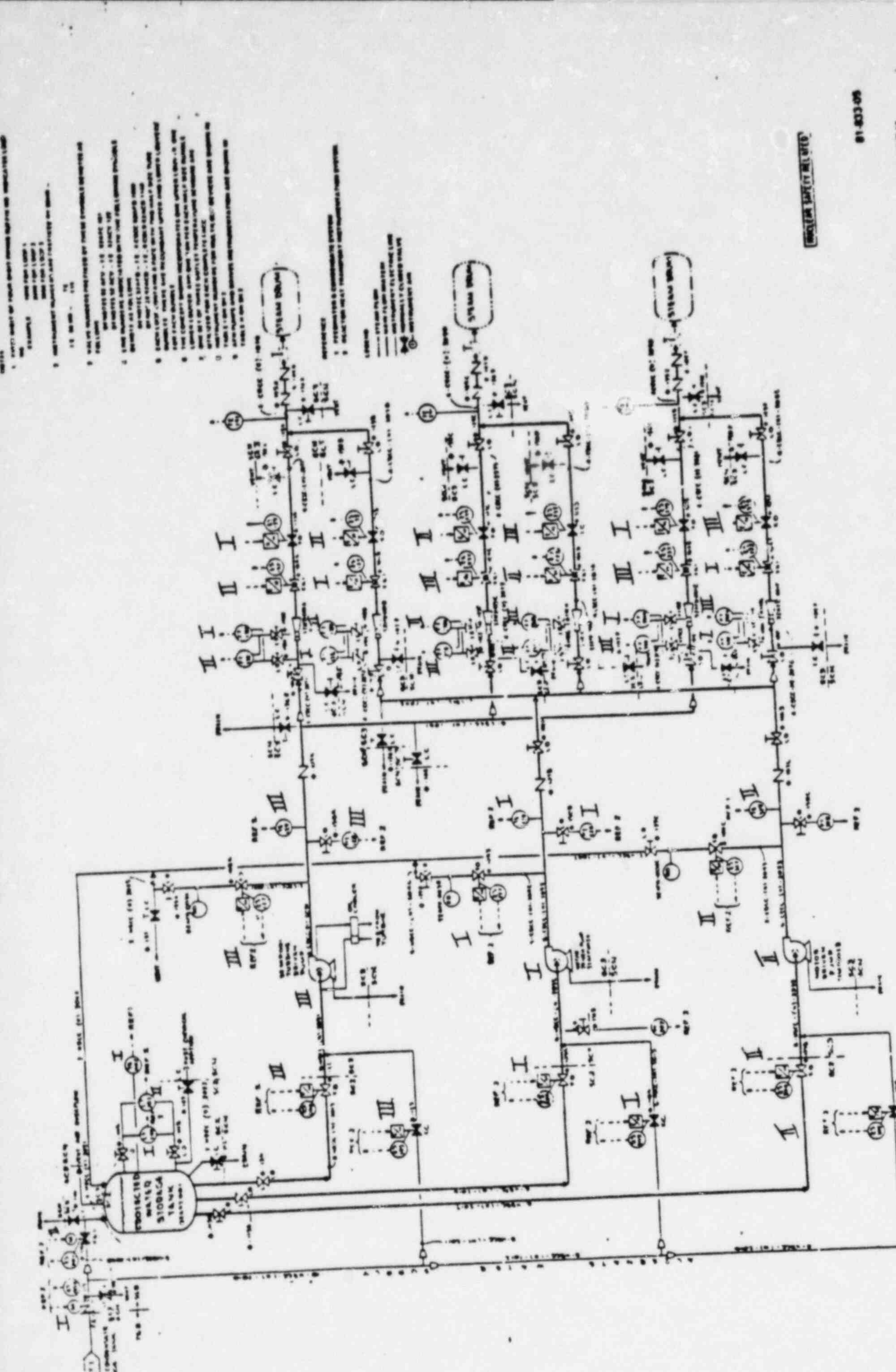
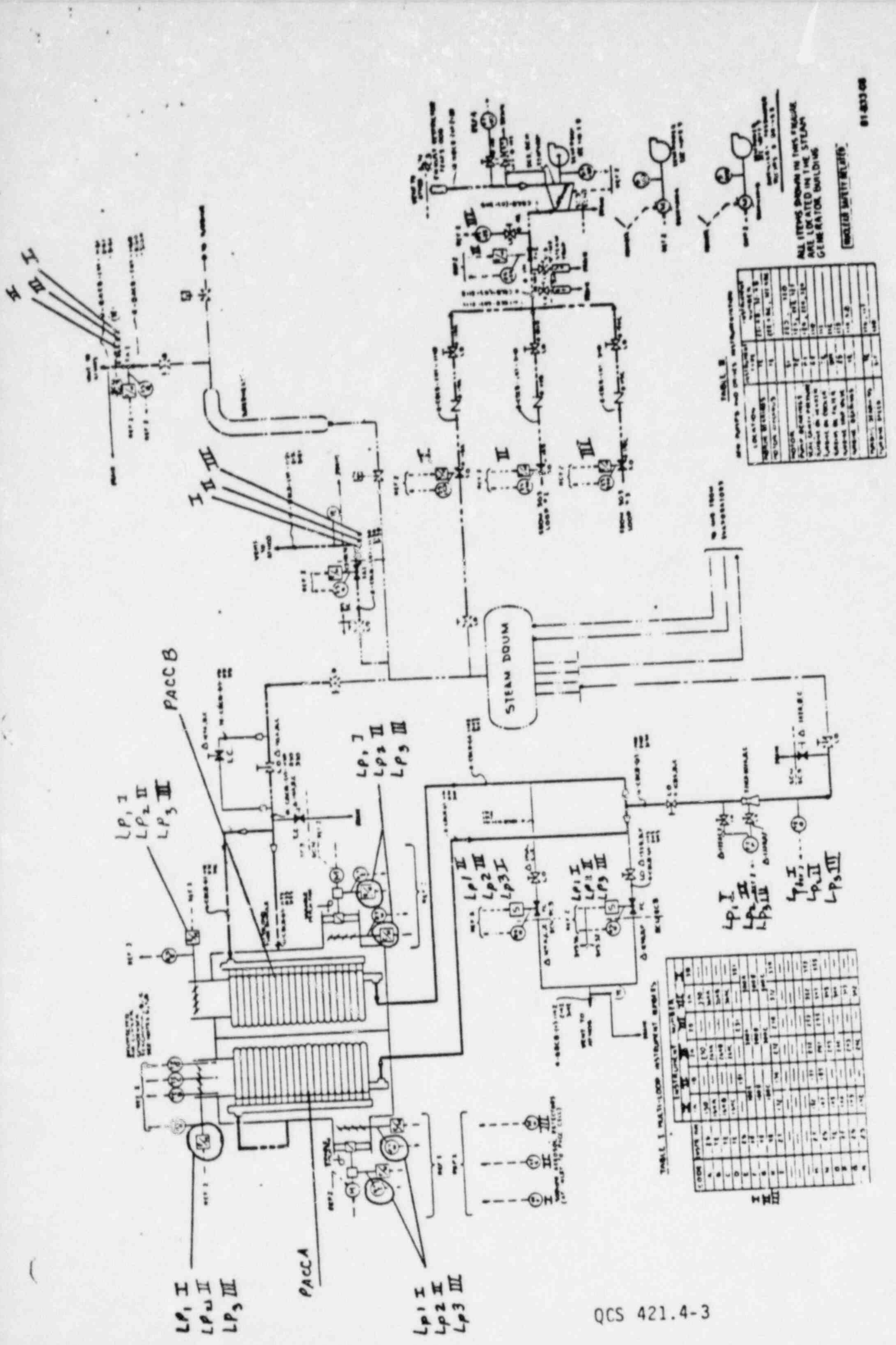


Figure QCS421.4-1 STEAM GENERATOR AUXILIARY HEAT REMOVAL SYSTEM PIPING AND INSTRUMENTATION DIAGRAM (SHEET 1 OF 2)

Amend 69
July 1982



STEAM GENERATOR AUXILIARY HEAT REMOVAL SYSTEM PIPING AND INSTRUMENTATION DIAGRAM (SHEET 2 OF 2)

Figure QCS421.4-2