

10A.9 AUXILIARY STEAM SYSTEM

The Auxiliary Steam System is routed in various areas in the Auxiliary Building and is the steam supply to the waste evaporators (Retired in place) which are located on Elevations 45'0" and 69'0". Normal auxiliary steam pressure is reduced from 195 psia and 320°F to a pressure of 70 psia and 302°F by means of a pressure-reducing station located in the Turbine Building. A full-sized safety relief valve is provided downstream of the pressure reducing station to prevent overpressurization in the event of a failure of the station.

10A.9.1 PIPE WHIP

Since the pressure in the steam lines to the waste evaporators (Retired in place) is below 275 psig, there is not sufficient energy to cause a pipe whip following a crack break.

10A.9.2 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.9.3 PIPE BREAK ORIENTATION

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

10A.9.4 SUMMARY OF DYNAMIC ANALYSIS

Not applicable (Section 10A.9.1).

10A.9.5 PROTECTION AGAINST PIPE WHIP, JET BLOWDOWN, AND REACTIVE FORCES

10A.9.5.1 Pipe Whip Restraints

Not applicable (Section 10A.9.1).

10A.9.5.2 Jet Forces

The jet force from a critical crack is 100 lbs. A force of this magnitude will have a negligible effect on the massive structural components.

10A.9.6 EVALUATION OF SEISMIC CATEGORY I STRUCTURES

Category I structures were evaluated for structure adequacy following a postulated rupture using the design bases shown in Appendix 5A. Design stresses are such that the combined stresses are within the limits established in Appendix 5A. Load factors and load combinations are also discussed in Appendix 5A.

10A.9.7 STRUCTURAL DESIGN LOAD

The design loads, such as dead load, live load, pipe load, jet impingement and pressurization, are used to evaluate the adequacy of Category I structures following a postulated rupture. A detailed discussion of these loads is given in Section 10A.1.7.

10A.9.8 REVERSAL OF LOADS ON STRUCTURE

There will be no reversal of loads on the structure due to an auxiliary steam line break.

10A.9.9 STRUCTURAL EFFECT OF OPENINGS ADDED TO THE STRUCTURE

No openings are required to vent the structure due to auxiliary steam line break.

10A.9.10 VERIFICATION THAT ANY STRUCTURAL FAILURE WILL NOT AFFECT OTHER STRUCTURES REQUIRED FOR SAFETY

There will be no failure of a structure due to a postulated break in the auxiliary steam line.

10A.9.11 VERIFICATION THAT PIPE RUPTURE WILL NOT AFFECT SAFETY

The "Ram's Heads" of the Saltwater System are located in the Turbine Building. Due to the size and location of the "Ram's Heads" with respect to the Auxiliary Steam Line, damage caused by rupture and whipping of this line and by impingement is not considered credible.

A portion of the auxiliary steam piping is located near the K-line in the Unit 1 Turbine Building on the 12' Elevation in the area of the safety-related main steam drains 5 and 6. Although only cracks are postulated (see Section 10A.9.20), it has been shown that even if this caused a full rupture of both of these small drain lines, safe shutdown of the plant could be achieved with no increase in consequences over those previously obtained for other breaks in the Turbine Building. Therefore, no barriers are required to protect this safety-related main steam piping from a jet impingement by this auxiliary steam piping.

The effect on safety from a pipe rupture is discussed in Section 10A.9.20.

10A.9.12 EFFECT ON CONTROL ROOM

An auxiliary steam line rupture will not affect the Control Room.

10A.9.13 ENVIRONMENTAL QUALIFICATION OF AFFECTED REQUIRED EQUIPMENT

Tables 10A-5 and 10A-6 shows the equipment and instrumentation required to place the plant in a safe shutdown condition. As indicated by these tables, there is no vital equipment or instruments exposed to steam environment due to a pipe rupture in the Auxiliary Steam System (Section 10A.9.20).

10A.9.14 DESIGN DIAGRAMS AND DRAWINGS

Figures 10A.9-1, 10A.9-2, and 10A.9-3 show auxiliary steam to the waste evaporators (Retired in place).

10A.9.15 FLOODING

No flooding of the ESF equipment will occur as a result of a crack in the auxiliary steam line due to the appreciably small amount of mass released.

10A.9.16 QUALITY CONTROL AND INSPECTION

The quality control and inspection programs are presented in Section 10A.1.16.

10A.9.17 LEAK DETECTION

Temperature switches are located in various compartments along the steam line to give an indication in the Control Room if a crack should occur in the auxiliary steam line. No credit is taken for these switches, however.

10A.9.18 EMERGENCY PROCEDURE

Emergency procedures for this system are similar to those outlined in Section 10A.1.18.

10A.9.19 SEISMIC AND QUALITY CLASSIFICATION

The auxiliary steam line is designed and constructed in accordance with ANSI B31.1.

10A.9.20 DESCRIPTION OF ASSUMPTIONS, METHOD AND RESULTS OF ANALYSIS FOR PRESSURE AND TEMPERATURE TRANSIENTS IN COMPARTMENTS

In accordance with the pipe break location criteria presented in Section 10A.9.2, circumferential or longitudinal breaks are not credible accidents for this system and, therefore, will not cause a pressure or temperature problem. Critical cracks, however, are postulated to occur anywhere and the pressure and temperature consequences have been studied. Because of the low system pressure and the small size of a critical crack, the mass release rate will not cause a pressurization problem.

Pressure reducing and safety relief valves limit the system pressure to 70 psig inside the Auxiliary Building. A critical crack of the largest auxiliary steam line (12" line) in the Auxiliary Building has an area of 1.17 in². The maximum steam released from this rupture will be only 3.25 lbm/sec. Local pressure increases will be undetectable and local temperatures will not exceed 160°F.

10A.9.21 DESCRIPTION OF ASSUMPTIONS, METHODS AND RESULTS OF ANALYSIS FOR EFFECT ON PRIMARY OR SECONDARY CONTAINMENT STRUCTURE DUE TO PIPE RUPTURE OUTSIDE

A crack in the auxiliary steam line will not affect the Containment Structure.