DUKE POWER COMPANY
OCONEE NUCLEAR STATION
CONSEQUENCES OF MAIN STEAM & FEEDWATER PIPING RUPTURE
CURRENT STATUS OF DESIGN ENGINEERING REVIEW
12-29-72

1) INTRODUCTION

In response to the AEC/DOL's 12-15-72 letter and attached guidelines on the consequences of postulated Main Steam and Feedwater piping failures in structures other than the Reactor Building, Duke's current position is as outlined herein.

2) PROBABILITY OF FAILURE

Although Duke is continuing to review the consequences of postulated pipe ruptures, such ruptures are not considered credible for the Oconee Nuclear Station based on the following:

a. Oconee's Main Steam and Feedwater Systems are designed to preclude pipe ruptures based on conservative engineering practices.

b. The only basis for postulating a line rupture is stress criteria. The following describes representative stress conditions for the Main Steam and Main Feedwater Systems at Oconee.

Main Steam lines are 100 percent cold pulled so that as the line heats up, all thermal expansion stresses are essentially eliminated throughout the system. For example, at the Reactor Building penetration (terminal end), there is only 1100 psi maximum thermal stress during normal operation; this is only about 4 percent of the ANSI B31.1.0 (1967) Code allowable stress. This fact coupled with the safety factor built into Code allowable stress values indicates a tremendous amount of conservatism. The Main Feedwater System is not cold pulled since it operates at a lower temperature; however, similar to the Main Steam, there is only 3645 psi maximum thermal stress during normal operation at the Reactor Building penetration (terminal end). Again, this is only about 16 percent of the ANSI B31.1.0 (1967) Code allowable stress.

c. Overpressure capability of the piping based on wall thicknesses actually used is as follows. It should be noted that these figures are extremely conservative as they are based on ANSI B31.1.0 (1967) Code equations.

	Normal Operating Pressure	Actual Code Pressure Capability	Percent Margin
Main Steam:	910 psig	1093 psig	20
Feedwater:	1070 psig	1383 psig	29

d. The safety related portions of these systems are Duke Class F indicating that the materials of construction were procured fabricated, tested and documented similar to a nuclear system as can be denoted from the following:

i) Piping Materials----------Traceable
ii) Welding Filler Metal------Traceable
iii) NDE ----------100 percent X-ray
iv) Piping Materials QA-------Inspection at fabricators plant and site receiving inspection
v) Documentation ------------Required
vi) Support Design QA --------As outlined in FSAR 1C.3.4.5

3) POSTULATED RUPTURES REVIEWED TO DATE

By definition of the attached guidelines to the 12-15-72 AEC letter, Duke has reviewed double-ended ruptures of the two Main Steam and two Main Feedwater lines at the terminal ends of the Reactor Building penetration anchors. Other postulated rupture points are currently being defined; however, preliminary studies indicate that additional postulated break points will have very little effect on the ability to shut the unit down and maintain it in the safe shutdown condition.

4) CONSEQUENCES OF POSTULATED RUPTURES

a. West Steam Generator Main Steam Line. This line runs external to the Reactor and Auxiliary Buildings until it enters the Turbine Building and does not pass near any essential equipment necessary to shut down safely and maintain the reactor in a safe shutdown condition.

b. East Steam Generator Main Steam Line. This line leaves the Reactor Building wall and passes through one corner of the East Penetration Room as shown on attached Sketch PO-222. Postulated pipe whip, jet impingement or reaction forces resulting from failure of this line would not damage any equipment necessary to shut down safely and maintain the reactor in a safe shutdown condition. However, pressure effects and steam concentrations might possibly pose a problem in the penetration room.

c. East and West Main Feedwater Lines. These lines enter the Reactor Building through the East Penetration Room as shown on attached Sketch PO-222. Postulated failure of either of these lines could damage several auxiliary systems and related electrical components due to pipe whip, jet impingement and reaction forces. Feedwater for secondary side cooling is assured to the unaffected Steam Generator by either the steam-driven Emergency Feedwater System or the backup Auxiliary Service Water System. Pressure effects and steam concentrations could pose a problem in the penetration room. Since the postulated failure can occur on either the upstream or the downstream side of the Reactor Building isolation check valve, both cases are being analyzed.

d. Control Room Integrity. Review of the general arrangement of high energy systems relative to the control room indicates that pipe whip, jet impingement and reaction forces would not affect the integrity of the control room. A structural reinforced concrete wall is located between the control room and the penetration room.

5) POSSIBLE MODIFICATIONS TO THE STATION

At present, possible modifications to the station to reduce the effects of pressure and steam concentrations as described in 4)b. and 4)c. to acceptable limits are being analyzed.

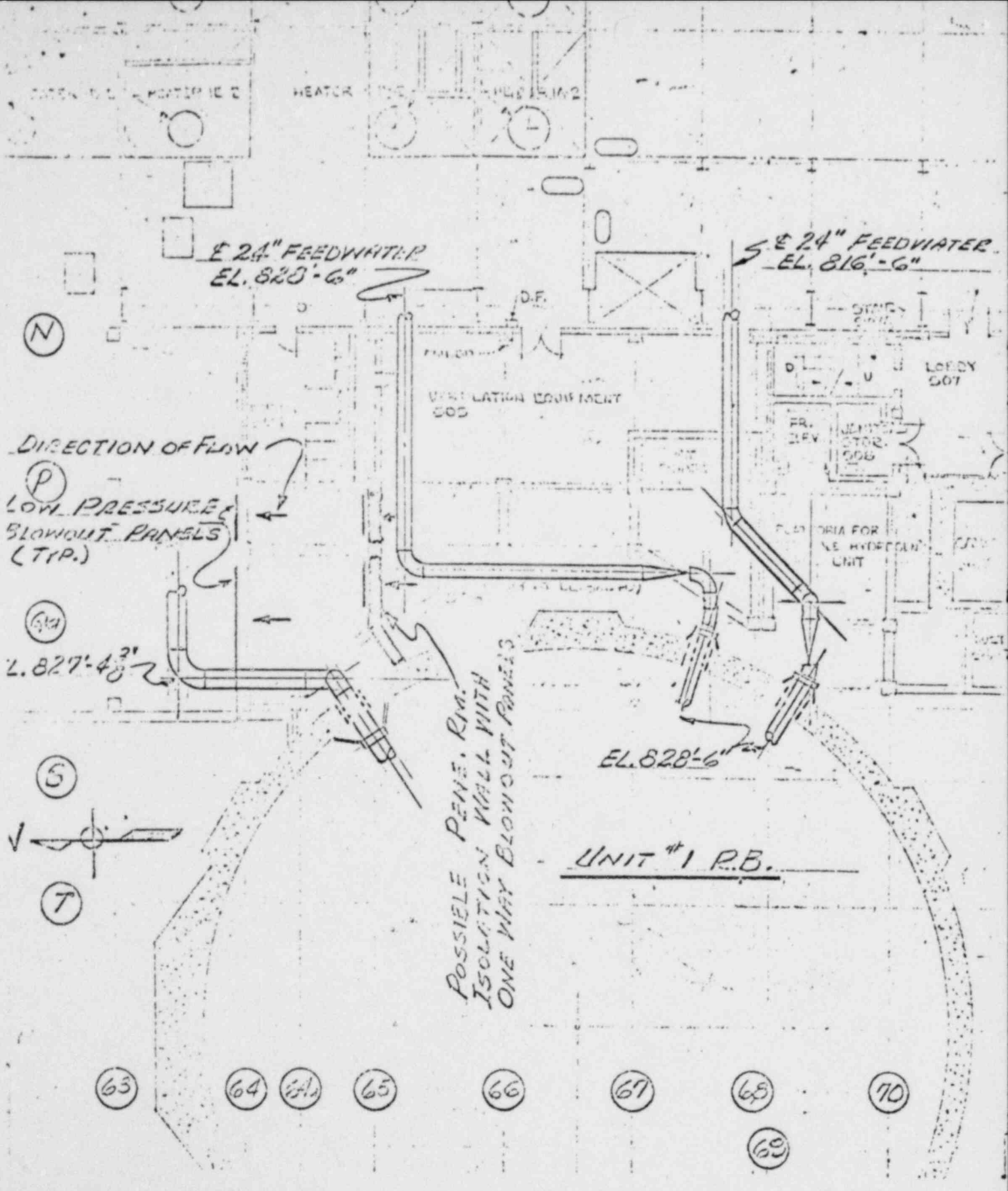
a. East Steam Generator Main Steam Line. As shown on the attached Sketch PO-222, the existing north penetration room wall may be modified to include low pressure blowout panels to relieve pressure and to provide a steam escape route for the postulated failure of this line. The addition of a new wall to remove the main steam line from the penetration room environment may be added along Column Line 65 as shown on Sketch PO-222.

b. East and West Main Feedwater Lines. One way low pressure blowout panels may be added to the new wall along Column Line 65 to relieve pressure and provide a steam escape route for the postulated failure of these lines.

6) CONCLUSIONS AND SCHEDULE

Based on preliminary studies and review of the postulated Main Steam and Main Feedwater line ruptures, Duke has confidence that the unit can be shut down safely and maintained in a safe shutdown condition indefinitely with possible minor changes in design. Standby core cooling is assured during the safe shutdown condition.

As discussed with Mr Al Schwencer and Mr Irv Peltier on December 29, 1972, Duke is performing a detailed review necessary to confirm the above preliminary information and establish possible needs for modifications. Duke will contact the AEC on 1-18-73 for another progress report on these matters. Firm commitments for an application amendment and proposed station modifications will be made as appropriate. Unless detailed studies indicate otherwise, changes are expected to be the same for all three units.



PRELIMINARY

OCONEE NUCLEAR STATION — UNIT #1
UNIT #2 & 3 SIMILAR

POSSIBLE MODIFICATIONS TO PENETRATION ROOM
12-29-72 PO-232