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NLS8500119

May 31, 1985

Director of Nuclear Reactor Regulation
Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Vassallo:

Subject: Reactor Vessel Water Level Instrumentation in BWR's (Generic Letter 84-23) - Supplementary Response

Generic Letter 84-23 dated October 26, 1984, requested that the District submit plans and proposed schedules to implement improvements which will reduce level indication errors caused by high drywell temperature. These improvements could include prevention of reference leg overheating or reduction of the vertical drops in the drywell. The District's response of December 13, 1984, outlined our plans wherein a contractor was retained to evaluate the various methods of improvement. This evaluation has been completed and our plans and schedules for this modification are contained herein.

The District intends to perform one of two modifications to the cold reference leg to comply with Generic Letter 84-23. These modifications are (1) rerouting of the cold reference legs or (2) installation of a system to inject core spray make-up water into the reference legs. Additional details of these modifications are contained in Attachment 1 for staff review. Because this modification must be closely integrated with other NUREG 0737 Supplement I issues, (i.e., Regulatory Guide 1.97, CRDR, SPDS, and EOP's) the District intends to initiate detailed design efforts for one of these two modifications after approximately sixty (60) days. It is the District's understanding that Option 2 above (i.e., reference leg cooling with core spray injection) has been discussed with the staff, and that operator action to preclude this low probability event may be considered acceptable. For this reason, the District respectfully requests approval of this concept by the staff within approximately sixty (60) days. We will stay in contact with our NRC project manager in this regard.

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The schedule for completion of either of these modifications is the same schedule submitted in our December 13, 1984, response for installation of analog level transmitters. Specifically, these modifications are projected to be completed two refueling outages after the present outage. Generic Letter 84-23 states that the staff has concluded that changes identified in the Emergency Procedure Guidelines are adequate for the short-term; therefore, our proposed implementation schedule is considered appropriate.

If you have any questions relating to our proposed approachs, please contact me.

Sincerely,

Jeffrey D. Weaver for

Jay M. Pilant
Technical Staff Manager
Nuclear Power Group

JMP/jdw:rs24/3
Attachment

NPPD Cold Reference Leg
Modifications to Comply with
NRC Generic Letter 84-23

Numerous conceptual modifications of the Cooper Station reactor water level measurement system have been considered, which are consistent with Regulatory Guide 1.97 requirements. Two concepts considered best suited have been selected and evaluated as candidates to resolve the high drywell temperature concern. One of these two modifications is intended to be performed at CNS. These modifications are discussed below.

1. Rerouting of Cold Reference Legs

   Rerouting of the cold reference legs is illustrated in Figures 1 and 2.

2. System to Inject Makeup Water into the Reference Legs

   A conceptual arrangement of a system to eliminate flashing and boil-off of water from the reference legs by injecting water from the core spray system into the reference legs is illustrated in Figures 3 and 4.

   In this concept, injection of a flow rate of 0.2 gpm to 0.5 gpm into the cold reference legs that have been insulated is sufficient to assure that loss of water from the reference legs is prevented.

   Injection water to the reference leg connected to Condensing Chamber 3A is provided by connecting a ¼-inch line to an existing vent on Core Spray A close to penetration X16-A and routing the line over to the reference leg drywell exit at penetration X-28. This involves routing approximately 28 feet of ¼-inch between the vent and penetration and through one wall.

   Injection water to the reference leg connected to Condensing Chamber 3B is provided by connecting a ¼-inch line to an existing vent located approximately above MCC V on the Core Spray B line and routing approximately 20 feet of ¼-inch line from the vent over to reference leg drywell penetration X-29.

   As an alternative, if it can be demonstrated that the hydraulic resistance of the excess flow check valves at the penetrations is low, the injection water could be routed to the respective reactor water level instrument racks.

   The arrangement of valves and instrumentation for the reference leg injection lines is illustrated in Figure 4. The solenoid operated injection valve is actuated to the open position by a remote manual switch located in the control room. The valve is powered by emergency AC power and fails closed on loss of power. A differential pressure switch (DPS) is provided to prevent the valve from opening unless the pressure upstream of the injection valve is greater than the pressure downstream of the valve (i.e., in the reference leg). This assures that flow will be into the reference legs when the valve is opened. The valve automatically closes if this differential pressure permissive becomes unavailable (e.g., due to a trip of the core spray pump). The solenoid valve and differential pressure switch is located as close as practical

to the reference line containment penetration to minimize the added piping that could fail and result in drainage of the reference leg.

Two soft-seat spring loaded closed check valves, in series, prevent draining of the reference legs while the solenoid operated valve closes if a core spray pump trip occurs while injection is in process. The two series check valves also provide the isolation required by Paragraph NB3612.4 of the ASME Section III Code between piping systems that have different design pressure.

The restricting orifice is sized to limit flow to the required flow rate. The locally-mounted differential pressure indicator (DPI) is provided to verify flow capability during routine surveillance testing. The filter assures that injected water is free of particulate material.

The error resulting from injecting water into a reference legs is small because the only significant restriction in the reference legs is a ¼-inch restricting orifice inside the drywell (assuming the injection connection is made at the penetration upstream of the excess flow check valve). The restricting orifice would result in a maximum error of 2 inches of water with an injection rate of 0.5 gpm.

The core spray system is capable of providing flow into the reference legs at reactor pressure in excess of 300 psia. Therefore, flashing in the cold reference legs could be prevented with drywell temperatures as high as 417°F.

This alternative utilizing the core spray system to provide injection into the reference legs relys on operator action to manually initiate the cooling function. Operator action to initiate the cooling function is considered adequately reliable because:

A. Reliance on operator action is consistent with standard BWR control logic design practice. Standard practice provides automatic initiation of safety functions that are required in the short-term (i.e., 10 to 30 minutes) and operator manual control for long-term safety actions (i.e., initiation of containment spray).

B. The action to initiate the cooling function is relatively simple.

C. The operator can be required to initiate the cooling function whenever significantly high drywell temperatures exist (i.e., >212°F).

D. The operator would be provided with training that stresses the need to initiate the cooling function to prevent flashing.

E. The two events identified in SLI 8218 as significant contributors to core damage frequency due to failure of the operator to detect flashing (i.e., manual shutdown with loss of drywell coolers and small break LOCA) are relatively slow events that provide considerable time for the operator to initiate the cooling function.

F. During the one reported event at a BWR where high drywell temperatures resulted in flashing in the reference legs, the

operators were continuously alerted to the flashing condition by spurious, erratic high- and low-level alarms and trips from the Yarway heated reference leg water level system.

G. The Yarway heated reference legs will flash and provide spurious erratic high- and low-level alarms before the cold reference legs flash and thereby alert the operator to initiate the cooling function if the operator has failed to initiate the cooling function as required.

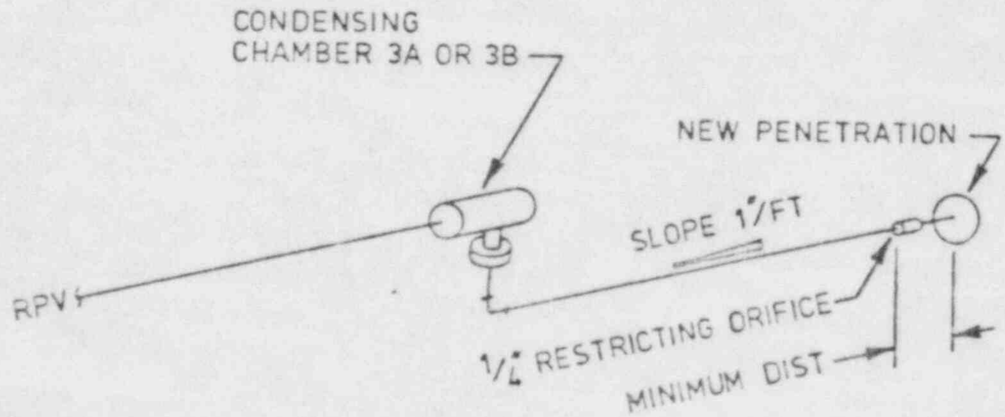

Figure 1. TYPICAL ARRANGEMENT OF REROUTED REFERENCE LEG

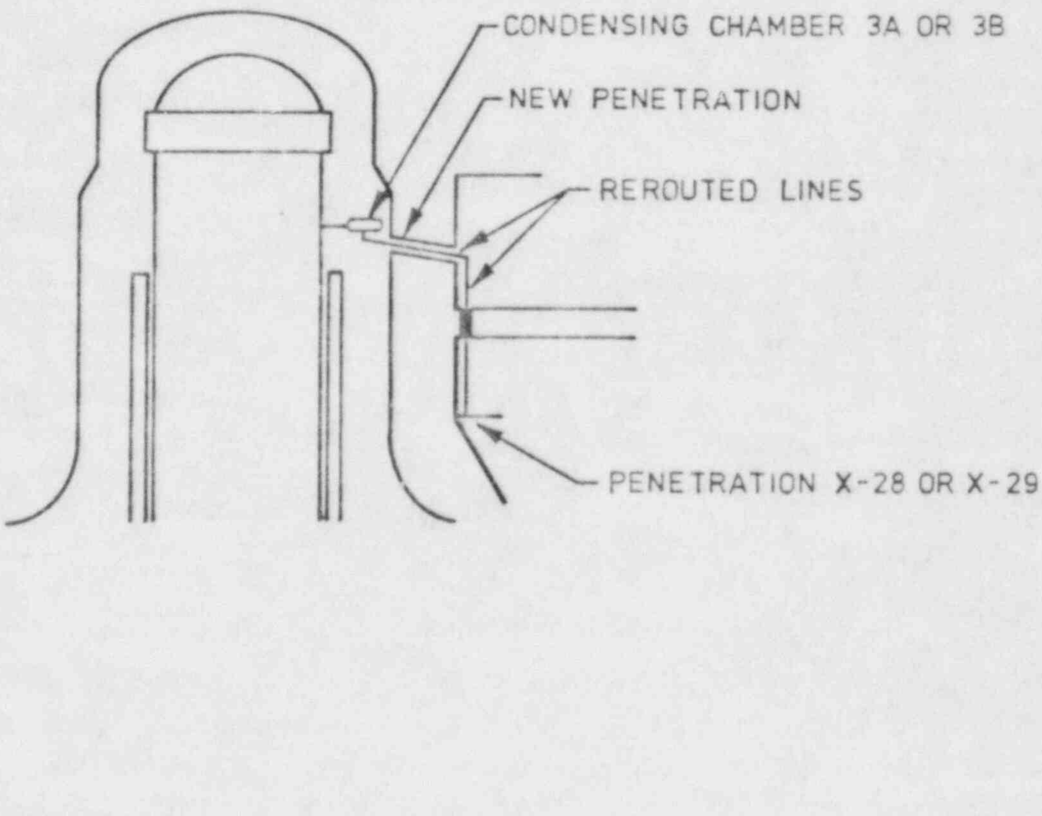

Figure 2. TYPICAL ARRANGEMENT OF REROUTED REFERENCE LEG

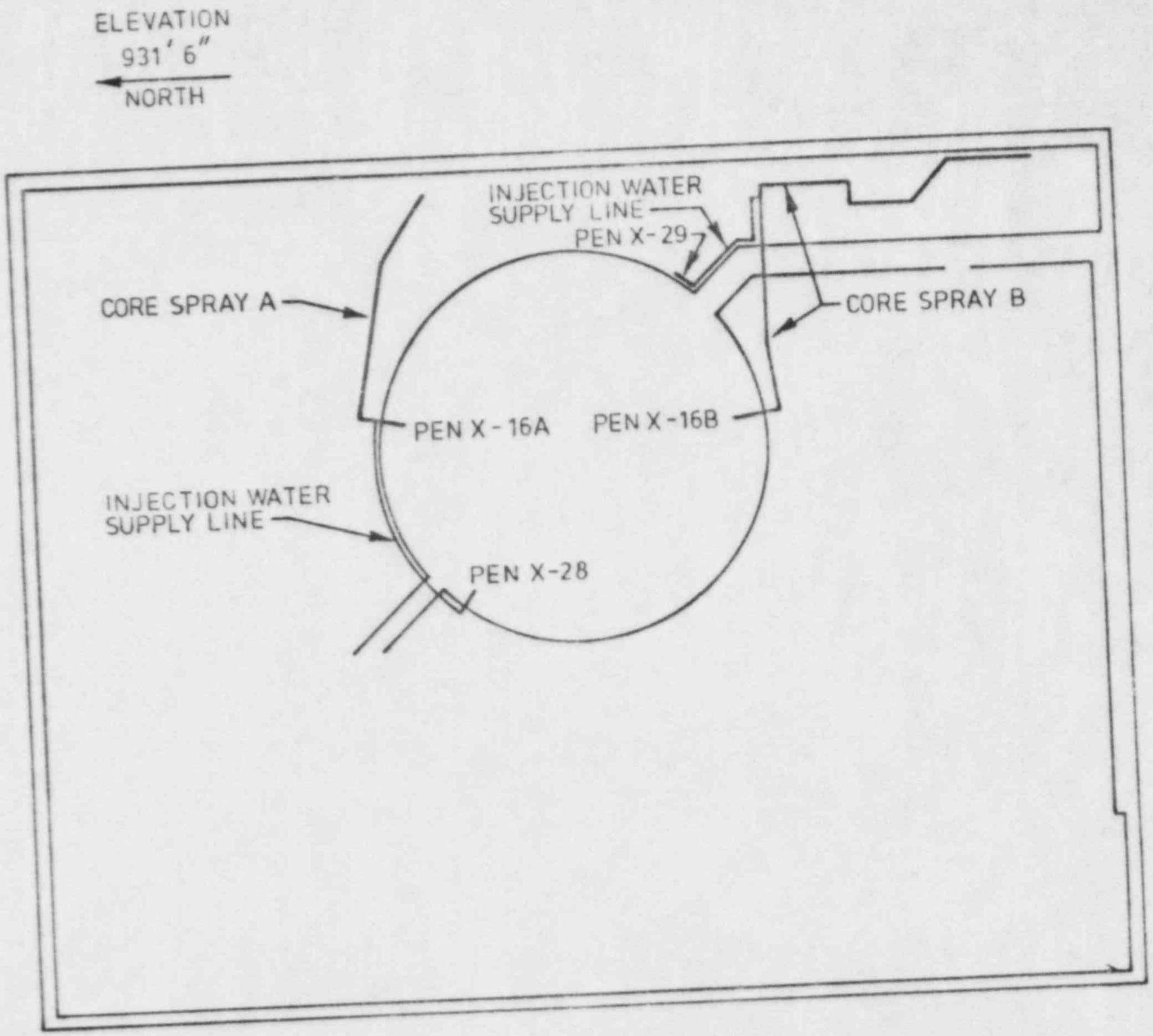

FIGURE 3. INJECTION WATER SUPPLY LINE ROUTING OUTSIDE DRYWELL

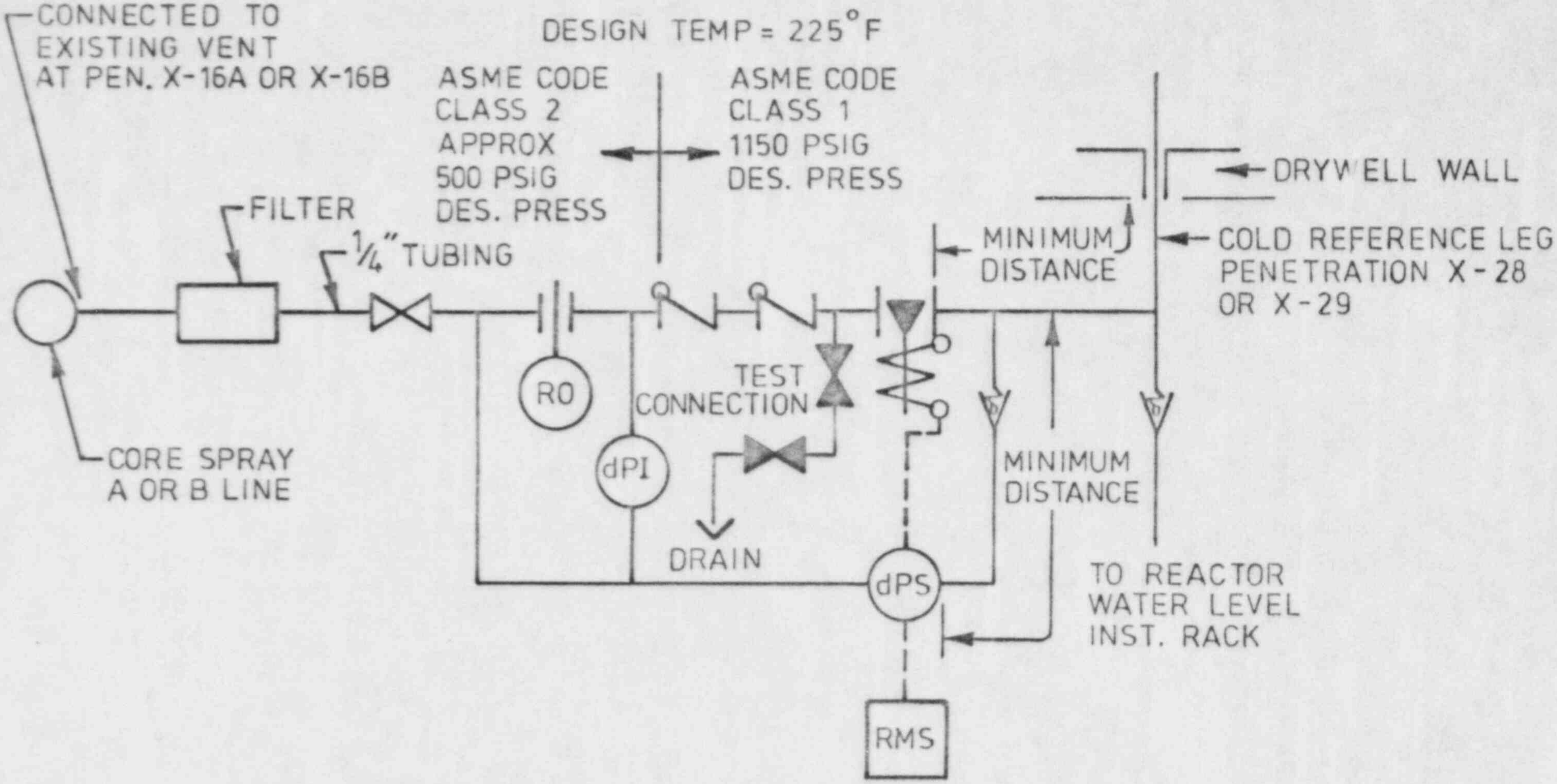

FIGURE 4. TYPICAL ARRANGEMENT OF PIPING, VALVES, INST. FOR CORE SPRAY INJECTION INTO REFERENCE LEGS