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April 13, 1984
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Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Operating Reactors Branch No. 4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Environmental Qualification for Intermediate Building Flooding

In response to your letter of March 29,1984 enclosed please find our evaluation of flooding in the Intermediate Building following a Main Feedwater Line Break. This evaluation shows that there is reasonable assurance that the operator can terminate a MFLB in the Intermediate Building before EFW components not qualified for submergence would be adversely affected (5.5 minuites). The only EFW components that could become submerged are electrical cables for the EFW flow transmitters (note that all electrical terminations are above the flood level). The electrical cables (Boston Insulated Wire) performance for submergence has been demonstrated by prototypical testing (per ICEA standard - 14 day accellerated water absorption test). Therefore, further environmental qualification for EFW components for submergence is not required.

Sincerely,

H. D. Hukill
V.P. TMI-1

cc: J. Van Vliet
R. Conte

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INTERMEDIATE BUILDING FLOODING DUE TO MAIN FEEDWATER LINE BREAK (MFLB)

I. INTRODUCTION

As part of the original licensing effort of TMI-1, Met Ed was asked to assess the consequences of postulated pipe failures outside containment including failure of the main steam and feedwater lines [Ref. 5]. In April of 1973 Met Ed provided its response by Amendment 38 to the FSAR. In June 1973 the AEC issued a second letter on the subject [Ref. 6] and Met Ed provided revised amendments to the FSAR (Amend. 41 and 43). As part of the basis for flooding, Met Ed's architect engineer had contracted for a flooding analysis for the Intermediate Building [Ref. 1]. The analysis showed that the EFW pumps would start to flood in a about 8 minutes with no operator action. In addition, the original FSAR stated that"

> "The highest energy lines are located in the intermediate and turbine buildings. For major breaks in these lines, unit shutdown will be accomplished through utilization of the Emergency Feedwater System or the emergency core cooling systems and the reactor building cooling systems. For crack breaks, a normal unit shutdown will be achieved."

In the fall of 1979 the Main Feedwater Line Break was incorporated into the Restart Report as part of the review of plant accidents required by IEB 79-05 series, Lessons Learned Modifications, and the Shutdown Order. On April 3, 1981, TDR 250 was released which addressed this problem and indicated that 86 seconds was available before the EFW pumps would be effected. A modification was performed to allow flooding of the "alligator pit" which increased the time of flooding of the EFW pumps to 5.5 minutes. Additionally, TDR 250 recommended removal of certain stopwalls in the alligator pit to allow flooding of the tendon access gallery which would provide an additional 20 minutes. This TDR was subsequently revised on January 16, 1984 ([Ref. 3].

On August 23, 1983 GPUN submitted a system description of the modification to be performed in response to NUEG 0737 II.E.1.1 which addressed the above issues.

On January 20, 1984 UCS filed a 10CFR2.206 petition addressing the issue of flooding from the seismic perspective to which GPUN responded on February 24, 1984. More recently the issue was approached in regard to Environmental Qualification of Electrical Equipment in the EFW system on March 20 and 21. The issue at point concerned the operators ability to detect and mitigate the consequences of the worst case MFLB with consequential flooding. The accident with the greatest submergence potential is the MFLB.

The discussion, below, indicates that if a MFLB is postulated to occur in the Intermediate Building based on break location criteria given in W. F. Stolz's letter of March 29, 1984 (Ref. 4) there is sufficient indication of a significant nature for the operator to stop flow out of the break within 5 minutes. The necessary actions are covered by existing plant procedures as described in Section III, below.

II. DISCUSSION

As part of the original licensing basis, a review of piping system breaks outside containment based on "Giambusso criteria" (Ref. 5) was addressed in the TMI-1 FSAR Supplement 2, Part IX. The stress levels indicated by this review for the main feedwater piping were found to be lower than those of the AEC pipe rupture criteria. The stress analysis for the main feedwater line ("B" loop) routed from the Turbine Building to containment penetration (No. 103) via Intermediate Building indicates that the maximum stress levels from combined operating and seismic conditions are, at most, 46.5 percent of the limits designated as the potential pipe rupture stress level. (The "A" main feedwater line does not enter the Intermediate Building.) The results of these stress analyses show that the non-seismic portion of the main feedwater line inside the Intermediate Building has seismic resistance. Consequently, there is a low probability that a main feedwater line break would occur and thus cause flooding in the Intermediate Building following a seismic event.

In addition, the results of the stress analyses indicates that the highest stress point in the "B" loop main feedwater line is located inside the Turbine Building and the second highest stress point is located downstream of the feedwater flow nozzle (Tag No. FE-8B) located inside the Intermediate Building. By using the break locations postulated per "Giambusso criteria", the most likely feedwater line break should occur inside the Turbine Building. This break location would not result in flooding of the Intermediate Building. The next possible feedwater line break (i.e., next lower stress level) would occur in the Intermediate Building downstream of the feedwater flow nozzle FE-8B. A break at this location would result in a high flow indication in the Control Room. The analysis performed by Nuclear Services Corporation for the Intermediate Building flooding following a feedwater line break was based on a break at the inlet to the flow nozzle FE-8B; this was to maximize flooding volume.* This section of pipe is not a high stress point. Based on "Giambusso criteria" for the pipe break locations, if there is a feedwater line break inside the Intermediate Building, the break would occur downstream of flow nozzle FE-8B rather than upstream of the nozzle. High feedwater flow indications in the Control Room following a feedwater line break will result in the operator taking action to isolate feedwater flow as demonstrated below.

* Note that there is only approximately 10 feet of main feedwater pipe between the Intermediate Building wall and the flow nozzle.

Based on the above, the operator can take action within five (5) minutes to trip main feedwater pumps and to terminate the flow to the break point without jeopardizing the safety function of the EFW System.

IV. CONCLUSION

As part of the long term upgrade modification for the EFW System, the upper half of the western water stop wall in the alligator pit and entrances "A" and "B" from the alligator pit to the Tendon Access Gallery will be removed to provide more volume to accumulate flood water. The time required to jeopardize the EFW System will be increased from 5.5 minutes to approximately 25 minutes. In addition, an alligator pit flood detection alarm will be provided in the Control Room to indicate a possible main feedwater line break in the Intermediate Building.

Based on the results of piping stress analysis and pipe break locations postulated per "Giambusso criteria", there is a low probability of a feedwater line break that could cause a flooding problem in the Intermediate Building. Even if there is a feedwater line break inside the Intermediate Building, our current plant procedure (ATP-1210-1) and alarm response procedures will instruct operators to manually trip both main feedwater pumps and terminate the feedwater flow to the break location without jeopardizing the safety function of the EFW System. We, therefore, conclude that the operator action to terminate the feedwater line break is justified for Cycle 5 operation.

V. REFERENCES

1. Nuclear Services Corporation Report GIL-03-09 dated May 23, 1973, "Analysis of Intermediate Building Flooding Following Feedwater Line Break for TMI-1".

2. GPUNC TDR-250, Revision 1, "Review of Intermediate Building Flooding Following a Feedwater Line Break in the Intermediate Building of TMI Unit 1".

3. Licensee's Response to Union of Concerned Scientists' Petition for Show Cause Concerning TMI-1 Emergency Feedwater System" dated February 24, 1984.

4. USNRC letter from J. F. Stolz to H. D. Hukill dated March 29, 1984.

5. Atomic Energy Commission (AEC) Request, "General Information Required for Consideration of the Effects of a Piping System Break Outside Containment" dated December 15, 1972.

6. Atomic Energy Commission (AEC) Letter dated June 1, 1973.