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NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

METROPOLITAN EDISON COMPANY

THREE MILE ISLAND, UNIT NO. 1

DOCKET NO. 50-289

UNDERGROUND PIPE CRACKS IN SEISMIC CATEGORY I PIPING

Introduction

By letters dated December 7, 1976 and March 10, 1977 Metropolitan Edison Company (the licensee) reported to the NRC the discovery of cracks in three underground pipes at Three Mile Island Unit No. 1 (TMI-1). The Office of Inspection and Enforcement (Region I) inspected the cracked pipe as part of an unannounced plant inspection on January 27-28, 1977 and issued a report on this matter on March 7, 1977 (Inspection Report 50-289/77-02). Hence, this report summarizes past efforts by the licensee and the NRC staff evaluation of this occurrence and corrective action taken.

NRC staff review of the corrective action taken by the licensee concludes that there is reasonable assurance that the underground Class I piping at TMI-1 will now and in the future remain functional following a safe shutdown earthquake.

Background

Various piping failures occurred on three underground pipes located between the intake pump/screen house north wall and the first elbow thrust blocks. These pipes are identified as:

- 20" RR - Reactor Building Emergency Cooling River Water
- 24" DR - Decay Heat River Water
- 30" NR - Nuclear Services River Water

The 20" RR line bell fitting at the wall joint was cracked, the 24" underground piping cracked outside the screen house wall joint, and the 30" NR pipe spigot's clamp bar weld at the wall joint was also cracked. Settlement had occurred at the thrust blocks of these lines. These apparent movements and/or improper alignment during installation appeared to have caused pipe stresses which resulted in the cracking. The length of underground pipe run from the north wall of the screen house to the elbow thrust block is approximately 35', 12' and 8' respectively. The 24" DR line is located between the other two lines--the adjacent 20" RR line on the west side of the adjacent 30" NR on the east side.

Evaluation

The following information submitted by the licensee was reviewed by the NRC staff and was found acceptable.

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1. Description of the underground piping installations in the vicinity of the screen house.
2. The original seismic design qualification and acceptance criteria.
3. Evaluation of cause of cracking.
4. Solution to problem and necessary repairs.
5. Testing and monitoring program.

The damaged portions of two lines were completely replaced and the third line that had minor damage was repaired. As a result of all of the repairs, the previous piping stresses on all of the lines were relieved. Additional corrective actions such as grouting beneath piping thrust blocks, and freeing the elbow joints from their encasement were also taken. Furthermore, the licensee is conducting a surveillance program to monitor any future settlements. This surveillance program as of now has revealed that settlement has been minor in nature and well within acceptable limits.

The licensee has concluded and we agree, that the pipe cracking was caused by an isolated case of settlement of the lines north of the screen house. It was found that the required soil compaction in this area did not exist. Test borings verified this point in that the required soil compaction did exist on the south side of the screen house. The subject underground piping runs from the screen house to the auxiliary building. Test borings to verify proper soil compaction were not taken along the entire length of these lines because the cracked pipe was considered to be an isolated case within the vicinity of the screen house which was the only area that required compaction. Furthermore, the major portion of the expected settlement occurs early in life and decreases rapidly thereafter. We find that there is reasonable assurance that similar failure will not occur in other areas along these lines in the future. In the unlikely event that a similar problem should reoccur, it is not expected that failure of both "A" and "B" trains would occur simultaneously. Furthermore, if both trains were to fail in the areas of the screen house or at the entrance of the auxiliary building, the plant can be brought to a safe shutdown condition using the cooling towers and emergency procedures are in place for such an unlikely eventuality. This matter was discussed and verified with the licensee.

#### Conclusion

We conclude that the failure was most probably local in nature and was due to inadequate soil compaction during the initial installation. The repairs performed are adequate to meet seismic Category I requirements and the new more flexible lines will provide an even greater resistance to damage resulting from possible future settlement. The current surveillance program will provide the necessary lead time for averting a similar problem in the future.

Dated: February 15, 1980