REPORT NO. 17

TORUS COATING INSPECTION

ON THE

DRESDEN 2 REACTOR

May 9, 1972

Commonwealth Edison Company

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1. History

During the spring 1971 Unit 2 refueling outage, inspection of the Torus revealed some pinpoint rusting, blistering and delamination of the Phenoline 368 coating system above the water line. The Torus was then drained and similar areas of paint distress were revealed in the underwater portion. A detailed discussion of these problems and the action taken are presented in "Supplemental Information to Special Report #12 - Torus Paint Problems - Unit #2", transmitted in a letter from Byron Lee, Jr. to Dr. Morris, dated May 21, 1971.

2. Status as found during inspections in February and March of 1972.

The coating system above normal water level was found to be in good condition. However, the coating below normal water level showed continued deterioration. The general condition was similar to that found in the previous outage with some additional pinpoint rusting, due to primer damage from shot blasting during the previous repairs.

3. Current Program

It was decided to remove the present coating system from the torus shell and ring girders below the normal water line and replace it with an inorganic zinc coating (Carboline Carbo Zinc #11). The baffles will not be recoated but any distressed top coat material will be removed. At the present state of the art, we believe that the inorganic zinc coating has a better potential for trouble-free service. The primary reasons are:

a. Although the manufacturer has no long term case histories in demineralized water services, the coating has provided satisfactory protection in salt water and fresh water immersion, for periods of more than five years. The postulated service life in demineralized water is seven to eight years.

b. Carbo Zinc #11 is not a film forming polymer such as an epoxy resin. With this type coating it is physically impossible for a failure such that the coating is removed in sheets or pieces which might block the ECCS strainers. Should Carbo Zinc #11 fail, it will decompose into minute particles (micron size) of the size of finely ground zinc. In other words, should Carbo Zinc #11 fail, the particle size of the failed coating would be no larger than the rust particles from the uncoated steel piping system.

c. Should repairs become necessary, the system of one coat of Carbo Zinc #11 would be the easiest protective coating system to repair during a normal outage of a nuclear power plant.

d. Should the addition of inhibitors or pH control be desired, they will be compatible with the Carbo Zinc #11 system.

e. This coating is being utilized as the initial coating system in several plants presently under construction and is also being used to repair/replace previous coating systems at other installations.

4. On Going Program

Two programs have been initiated to monitor the performance of the coating:

a. A test sample program - 21 samples have been prepared to be as similar to the newly recoated torus shell as is possible. These will be placed in the torus and three will be removed for evaluation and testing each refueling outage.

b. A torus wall thickness monitoring program - thirty areas have been selected such that 25 are in areas of maximum coating deterioration and 5 are in areas of good coating performance. These areas will be monitored from the outside of the torus, utilizing ultrasonic testing equipment. This will provide a surveillance technique for monitoring coating loss of protection and subsequent corrosion of the torus shell. The system will detect a shell thickness reduction of approximately 3 mils or greater. Base line shell thickness readings were made at the thirty sample areas after removal of the old coating system.

5. Conclusions

Although extensive laboratory testing has been done in an effort to duplicate the failure of the phenoline 368 coating system, no conclusive results as to the cause of failure have been ascertained. Some specimens performed well and other failed as in the torus for no clearly detectable reason. The failure phenomena has been further studied through chemical analysis of failed coating specimens taken from the Unit 2 torus. The results of these analyses were also inconclusive in identifying the failure mechanism.

The phenoline 368 coating has proved satisfactory in the above water environment and will remain in place for further evaluation.

Below water level the phenoline 368 coating system has been replaced with Carbo-Zinc #11 as described above. The lack of success with the phenoline system below water and in identifying the failure mechanism was the motivation for changing to a completely different type of coating system. The advantages of the Carbo-Zinc #11 system selected are listed above.