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December 10, 1973

MIDLAND PLANT
Cadwelding
Docket Nos 50-329 and 50-330

Dr. Donald F. Knuth, Director
Directorate of Regulatory Operations
US Atomic Energy Commission
Washington, DC 20545

Dear Dr. Knuth:

During a Region III inspection on November 6-8, 1973, several deficiencies in the Cadwelding quality assurance program were identified by the inspectors. As a result of these deficiencies, Consumers Power Company shut down all Cadwelding at the site on November 9, 1973. This report is being submitted pursuant to 10 CFR § 50.55(e). The specific deficiencies are as follows along with corrective action taken:

- (1) There was a disagreement on installation procedure details between statements in the PSAR and the vendor's instruction manual.

Corrective action by the Contractor's Engineering Group consisted of contacting the vendor to discuss and resolve the differences. The installation instructions were clarified regarding the determination of proper temperature for moisture removal, cleaning, and removal of asbestos. Words were also added to provide guidance on material control. The Cadweld crews will be instructed in the modified procedures.

- (2) The inspection sign-off sheets for certain inspection functions were not in enough detail to show visibility for the inspection function.

Corrective action by the Contractor's Quality Control Group consisted of reorganizing and providing more detail on the inspection sign-off sheets. Inspection personnel are being instructed in use of the new sign-off sheets.

- (3) The inspection procedure being followed for measuring void areas needed clarification to prevent misinterpretation.

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Corrective action included contacting the vendor and a more explicit inspection procedure being written. In addition, inspection personnel are being instructed in the new measurement technique.

During the Cadwelding shutdown, Unit 1 and 2 Cadwelds were reinspected by personnel who had been instructed in reinspection procedures. The reinspection using more refined measurement techniques resulted in no void areas being greater than allowed in the specification. Two out of 320 Cadwelds were found to have porosity and these will be replaced.

As the unit is still in the construction phase, the porosity has no immediate safety implications. However, an analysis of the safety implications is as follows:

Cadwelds are traditionally used in nuclear power plant construction to splice large diameter reinforcing steel bars. Their use in lieu of lap splicing for these bars is required by the codes which govern the design of concrete structures.

The inability of a single Cadweld sleeve or a small number of Cadweld sleeves to carry their full design load will not render a Class I concrete structure incapable of safely withstanding its design loads and hence will have no long-term implication on safety because:

- (a) Reinforcement with more than 10 percent in excess of that amount calculated as required to withstand the most severe design loads is provided.
- (b) The reinforcement provided is designed to carry loads at stresses approximately 20 percent below its yield stress. The yield stress is defined as that stress at which a material starts to have a permanent deformation as against ultimate tensile stress which is defined as the stress at which a material starts to break or fail. For the reinforcement used (ASTM A-615 material), the minimum yield stress is 60 ksi, ultimate tensile stress is 90 ksi, and the maximum calculated design stress for the reactor building base slabs is only 48 ksi.
- (c) The ability of a concrete structure to redistribute its load carrying capacity away from the area of an under-strength Cadweld sleeve is a property inherent to reinforced concrete design.
- (d) The Cadweld may be located at a position along the reinforcing bar length not coincident with the maximum design stress for this reinforcing bar.

Yours very truly,

Stephen D. Dowell