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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards response to NRC request for addl info on hydrogen combustion & control program re ice condenser lower inlet door flow proportioning springs & shock absorber assemblies & dimensions & weight of intermediate deck doors.

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October 10, 1984

AEP:NRC:0500P

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
RESPONSES TO NRC STAFF QUESTIONS ON HYDROGEN CONTROL

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Denton:

This letter and its Attachment responds to your staff's recent verbal request for additional information on the Donald C. Cook Nuclear Plant hydrogen combustion and control program.

More specifically, your staff requested information with regard to the ice condenser lower inlet door flow proportioning springs and shock absorber assemblies, the dimensions and weight of the ice condenser intermediate deck doors, the ice condenser flow area, and the CLASIX computer code model for the air return/hydrogen skimmer system fans. The requested material is provided in the Attachment to this letter.

This document has been prepared following Corporate Procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

M. P. Alexich
Vice President

MPA/dam
Attachment

cc: (attached)

cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Charnoff
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ATTACHMENT TO AEP:NRC:0500P
RESPONSES TO NRC STAFF REQUEST FOR INFORMATION ON
HYDROGEN COMBUSTION AND CONTROL
DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2

Question 1:

Provide information with regard to the ice condenser lower inlet door flow proportioning springs. In particular, the value of the spring constant is desired.

Response to Question 1:

From the Donald C. Cook Nuclear Plant Updated Final Safety Analysis Report (FSAR), Volume XIV (Appendix M), page 6.9-7:

". . .Each [ice condenser lower inlet] door is provided with four, ASTM-A-313, Type 304 flow proportioning springs, with a spring constant, per spring, of 0.62 lb/in. One end of each spring is attached to the door panel and the other to a spring housing mounted on the door frame. These springs provide a door return torque proportional to the door opening angle and thus satisfy the requirement for flow proportioning. In addition, they assure that the doors will close in the event they are inadvertently opened during normal plant operations. . . ."

Question 2:

Provide information with regard to the ice condenser lower inlet door shock absorber assemblies.

Response to Question 2:

From the Donald C. Cook Nuclear Plant Updated FSAR, Volume XIV (Appendix M), page 6.9-8:

". . .In order to dissipate the large kinetic energies resulting from pressures acting on the [ice condenser lower inlet] doors during a LOCA, each door is provided with a shock absorber assembly. . . . The shock absorbing element is a wedge shaped foam plastic pad 89 in. high, 32 in. wide, and 28 in. thick at its maximum section. The pad is bonded to a base plate which is bolted to the ice condenser lower support structure. The front and sides of the pad are covered with 0.008 in. thick ASTM A240 (Type

304) stainless steel protective covers. The top cover is solid while the side covers are perforated with 0.020 in. diameter holes, 952 per $in.^2$, to allow air to be expelled from the pad during crushing. . . ."

". . .In operation, the door panel first contacts the shock absorber pad at an opening angle of 55^o and crushes to approximately 30% of its original thickness. Stopping forces are distributed evenly over the outer two-thirds of the door panel, centered about the door center of percussion. The foam material is selected to provide an essentially constant crushing force over its crushing distance with minimum elastic recovery. Thus forces and bending moments on the door are minimized and, once opened, there is a negligible tendency for the door to "bounce" closed again. . . ."

Question 3:

How was the CLASIX computer code intermediate deck flow area of 1326 ft^2 computed for the Donald C. Cook Nuclear Plant?

Response to Question 3:

A review of our records has indicated that this value first appeared in documentation supplied by Westinghouse Electric Corporation/Offshore Power Systems. Since Offshore Power Systems is no longer in business, it would be difficult to resurrect the basis for this number.

In lieu of a time consuming and extensive records search, it was decided to perform a recalculation of the flow area. The recalculation of the area just below the intermediate deck, using ice condenser dimensions of 113.0 ft O.D. and 91.0 ft I.D. (where allowance has been made for 1 ft of insulation on both the containment and crane walls), with a cross-section covering 288^o of arc, indicates that the maximum flow area is 2820 ft^2. From this maximum value the total cross sectional ice basket area of 1527 ft^2 (based on 1944 ice baskets, each of 1 ft diameter) is subtracted. This yields an unobstructed flow area through the ice condenser of 1293 ft^2, or about 2.5% less than the CLASIX code input value.

It is to be noted that the flow area computed above is the flow area just below the intermediate deck, rather than the actual deck area itself.

Question 4:

Provide information with regard to the dimensions, weight, and number of ice condenser intermediate deck doors.

Response to Question 4:

The Donald C. Cook Nuclear Plant Updated FSAR, Volume XIV (Appendix M), Table 6.12-3, states that the maximum dead weight for an ice condenser intermediate deck door panel is 5.5 lbs. per ft^2. Using the dimensions of the ice condenser intermediate deck door panels provided by Westinghouse, the following table has been generated:

Number of Doors	Dimensions of Door	Area of Door (ft^2)	Maximum Dead Weight (lb)
48	2' 8-1/4" x 4' 7-1/2"	12.43	68.4
48	2' 4-1/2" x 4' 11-1/4"	11.73	64.5
48	2' 1-1/2" x 5' 4-1/2"	11.42	62.8
48	2' 1-1/2" x 5' 6"	11.69	64.3

Question 5:

Provide additional detail with regard to the modeling of the air return/hydrogen skimmer system fans in the CLASIX computer code.

Response to Question 5:

The CLASIX computer code is capable of simulating up to nine fan flow paths within an ice condenser containment. For each fan flow path, the code user must specify the fan flow source and sink volumes, the fan start and stop times, and a fan flow multiplier. Each fan flow path is also assigned a fan head/flow table of values which is input to the code. Up to nine fan head/flow tables may be specified by the user.

The CLASIX code performs the required calculations for the fan flow paths during each time step. Reviewing one fan flow path at a time, the CLASIX code sets the fan flow to zero, then compares the actual accident time to the fan start and stop times. If the accident time is less than the start time, or greater than the stop time, the fan flow for that path remains zero.

If the fan is determined to be running, the CLASIX code computes a fan head in inches of water, based on the total pressures in the fan flow path source and sink volumes. The fan head/flow table of values for that flow path is then consulted in order to determine the associated flow rate in ft^3/min. The first flow value in the table is used if the actual head value is less than the first head value in the table. Likewise, the last flow value in the table is used for all head values greater than the last input head value. Intermediate values of flow are linearly interpolated from the table.

The computed flow rate along the fan flow path is then multiplied by the fan flow multiplier for that flow path. This yields a fan flow path flow rate which is later used in the computation of mass and energy transfers between containment subcompartments. This mass and energy transfer is assumed to take place in addition to those transfers caused by differential pressures across subcompartment boundaries.

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