NRC FORM 366
(7-77)

U. S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

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ATTACHMENT TO LER #065/01T-0

The following report is being submitted in accordance with the requirements of Technical Specification 6.9.1.8.i. This is the follow-up of the verbal report given to the NRC Duty Officer on December 24, 1979. Extension of submittal was requested on January 7, 1980 with permission for such extension granted by R. E. Masse.

CONTAINMENT AIR RECIRCULATION/HYDROGEN SKIMMER SYSTEM (CAR)

I. System Description

The CAR System is a safety-related ventilation system within the containment. This system starts only in the event of a hi-hi containment pressure signal. It consists of two redundant independent systems which include fans, back draft dampers, valves, piping and ductwork.

Both CAR System fans are located in the upper volume. The fans discharge, via the annular space between the crane wall and the Containment liner, into the lower compartment. The fans are provided with back draft dampers on the discharge to prevent backflow during the initial blowdown phase of the accident. The system includes provisions for providing both 1) general recirculation of containment atmosphere between the upper and lower compartments following a loss-of-coolant accident, and 2) preventing the improbable accumulation of hydrogen in restricted areas within the containment also following a loss-of-coolant accident.

The potential areas of hydrogen pocketing are the top of the containment dome, and the lower compartment enclosures which include the three rooms in the annular space between the crane wall and the liner, the steam generator enclosures, and the pressurizer enclosure. The CAR system is a closed loop system inside the containment building which essentially circulates the air between the upper and lower containment volumes. The recirculation fans start 10 minutes after the event. Detailed description of the system is given in FSAR, Chapter 5, Amendment 19.

II. Description of the Reportable Occurrence

The ducts of the hydrogen skimmer system between the suction points and the recirculation fans are classified as safety related. These ducts were originally fabricated using piping sections and installed and supported using alternate analysis procedures. Design modification to the fans made prior to the initial startup of Unit 2 required a verification analysis to assure that the change did not create any adverse seismic condition which would interfere with the fans performing their intended design function. This verification analysis of the system was done during early 1978. Some modifications were made to the pipe supports as a result of the analysis.

This piping system was inspected as a part of the 'as-built' inspection of safety related piping systems required by the NRC IE Bulletin 79-14. The 'as-built' condition of the duct was found to be in conformance with the design drawings and the inspection criteria and as such no significant non-conformance was identified.

However, during the in-house evaluation of the design drawings and the mathematical models, some discrepancies were noted between the input to the mathematical models and the design drawings. It was decided to do some reanalyses to evaluate the effect of these discrepancies.

Seismic analyses indicated some stresses in the ducts and/or supports were above the yield stress limits. Though this in itself did not indicate the loss of structural integrity of the system, because of the complexity of the duct system layout and uncertainty involved in arriving at a reasonable engineering judgment as to the operability of the system, it was decided to shut down Unit No. 1 which was operating at that time. Unit No. 2 was in a refueling outage.

This was reported to your office on December 24, 1979, as per Technical Specification 6.9.1.8.i. It was decided to hold both the Units in cold shutdown for corrective action.

III. Corrective Action Taken

The analyses were redone, incorporating the modifications to some of the existing supports and also considering additional supports. With these modifications, all the stresses in the pipe as well as in the supports are within the allowable limits. Detail designs of the modification to the existing supports and of the new supports were completed and have been implemented in both units as of January 14, 1980.

The number of modifications are as follows:

	Unit #1	Unit #2
1. Modification to existing supports	32	33
2. New supports added	7	6

IV. Safety Evaluation

The Containment Air Recirculation/Hydrogen Skimmer System (CAR) is a part of the containment ventilation system and is required to function only after a LOCA accident. The system is activated after 10 minutes of

the LOCA event happening. The CAR system is designed to operate independently from the other eight essentially independent systems which comprise the entire ventilation system. Each D. C. Cook Unit has two independent hydrogen skimmer systems, therefore the loss of either system or any component of either system will not impair the system operation.

The containment air recirculation hydrogen skimmer system (CARS) is required to perform its design basis function during approximately the first twenty-four hours after a large LOCA. The CARS assures adequate mixing of the post-accident containment atmosphere to preclude the potential formation of local hydrogen pockets within the lower volume of the containment. Once the electric hydrogen recombiners are activated the hydrogen generation rate would be decreased to the point where the potential for hydrogen pocketing would be virtually eliminated.

In evaluating the overall safety of seismic design it should be noted that only certain portions of the system were over stressed beyond the yield limit. This was based on an elastic analysis without taking into consideration the safety margins available in a limit analysis. Local yielding of the materials does not automatically mean loss of system operability as a whole. The criteria used in the D. C. Cook Plant is more conservative than today's design criteria in terms of the loading intensities, the allowable stress limits used and the damping factors used. Under these circumstances the possibility of losing the operational capability of the CAR system during the highly unlikely OBE and DBE events was very remote.

Therefore in the unlikely event of a OBE or DBE taking place, a best estimate engineering judgment supports the conviction that the operational capability of the containment Air Recirculation/Hydrogen skimmer system would not have been impaired to the point that the discrepancies found would have endangered the health and safety of the public.

After the modifications and corrective actions taken structural integrity of the hydrogen skimmer system is assured during DBE and during a design basis accident.