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February 7, 1991

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/91-03

Gentlemen:

Attached is Licensee Event Report 413/91-03, concerning TECHNICAL SPECIFICATION VIOLATION FOR EMERGENCY PERSONNEL HATCH BEING UNLATCHED DUE TO EQUIPMENT FAILURE/MALFUNCTION.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Station Manager

ken:LER-NRC.JWH

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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Catawba Nuclear Station, Unit 1 | 0 5 0 0 0 4 1 3 | 1 OF 0 5 |

TITLE (4) Technical Specification Violation for Emergency Personnel Hatch Being Unlatched Due to Equipment Failure/Malfunction

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S) |
| | | | | | | | | | N/A | 0 5 0 0 0 |
| 0 1 | 1 0 | 9 1 | 9 1 | — 0 0 3 | — 0 0 | 0 2 | 0 6 | 9 1 | | 0 5 0 0 0 |

| OPERATING MODE (9) | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11) | | | |
|---|---|---|---|---|
| 3 | 20.402(b) | 20.405(c) | 50.73(a)(2)(iv) | 73.71(b) |
| POWER LEVEL (10) | 20.405(a)(1)(i) | 50.36(c)(1) | 50.73(a)(2)(v) | 73.71(c) |
| 0 0 | 20.405(a)(1)(ii) | 50.36(c)(2) | 50.73(a)(2)(vii) | OTHER (Specify in Abstract below and in Text, NRC Form 366A) |
| | 20.405(a)(1)(iii) | X 50.73(a)(2)(i) | 50.73(a)(2)(viii)(A) | |
| | 20.405(a)(1)(iv) | 50.73(a)(2)(ii) | 50.73(a)(2)(viii)(B) | |
| | 20.405(a)(1)(v) | 50.73(a)(2)(iii) | 50.73(a)(2)(x) | |

LICENSEE CONTACT FOR THIS LER (12)

| NAME | TELEPHONE NUMBER |
|---|---|
| | AREA CODE |
| C. L. Hartzell, Compliance Manager | 8 0 3 — 3 6 6 5 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |

SUPPLEMENTAL REPORT EXPECTED (14)

| | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | X NO | | | | |

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)


On January 10, 1991, at 1530 hours, with Unit 1 in Mode 3, Hot Standby, the Emergency Personnel Hatch, also known as the Submarine Hatch, was found in the down or closed position but not latched. The tamper seal was in place around the handwheel and the hinge. The area in the immediate proximity of the hatch was highly traveled one week prior to finding the problem for work being conducted in the Lower Ice Condenser. The exact time the hatch became unlatched is unknown; however, the opportunity for the hatch to become unlatched was very high during Ice Condenser work activities. Constant stepping on and off the hatch causes the latching mechanisms to retract. This situation was also enhanced by one of the four latching mechanisms being out of adjustment. Technical Specification 3.6.5.5 requires this hatch to be operable and closed in Mode 1, Power Operation, Mode 2, Startup, Mode 3, Hot Standby, and Mode 4, Hot Shutdown. This incident is attributed to Equipment Failure/Malfunction. Corrective actions include modifying the hatch by installing a tab to match mark the correct closed position of the handwheel and to provide a closer and more secure position to install the tamper seal. The latching mechanisms will be adjusted such that all make simultaneous contact with the latching lip.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

BACKGROUND

The Emergency Personnel Hatch, also known as the Submarine Hatch, is used as an emergency egress for personnel between Lower and Upper Containment [EIIS:NH]. This hatch is required to be closed and latched in Mode 1, Power Operation, Mode 2, Startup, Mode 3, Hot Standby, and Mode 4, Hot Shutdown, per Technical Specification (T/S) 3.6.5.5. With a personnel hatch inoperable or open except for personnel transit entry the T/S requires the hatch to be restored to operable status within one hour or be in at least Hot Standby within the next six hours and in Cold Shutdown within the following 30 hours. Failure to close and latch this hatch during these modes provides an additional open area between the Upper and Lower Containment. Should a Loss of Coolant Accident (LOCA) occur in Lower Containment, some volume of steam would by-pass the Ice Condenser and travel directly into the Upper Containment; thereby, increasing pressure within the Reactor Building.

The hatch is operated by a handwheel/square cam arrangement activating four latching arms. Approximately 1/3 of a turn of the handwheel activates the latching arms from a fully open position to a fully closed position. Due to the design of the cam assembly, handwheel travel exceeding 1/3 of a turn will begin to retract the latching arms. The latching arm ends are beveled to facilitate starting the latching arms under the collar and gradually increasing force and resistance as they fully extend. Adjustment of the latching arms is crucial so that all arms contact the collar simultaneously. This ensures that all latching arms are making full contact with the collar.

The Ice Condenser [EIIS:BC] (NF) System's primary function is the absorption of thermal energy released abruptly in the event of a LOCA, for the purpose of limiting the initial peak pressure in the containment. A secondary function of the ice condenser is the further absorption of energy after the initial incident, causing the containment pressure to be reduced to and held at a lower level for a period of time. The sodium tetraborate solution produced by a partial melt-down of the ice absorbs and retains iodine released during the accident and serves as a heat transfer medium and neutron poison for cooling the reactor core following the postulated incident. Thus, the ice condenser plays no role in the normal operation of the plant, but serves only to mitigate the consequences of a very severe accident offering significant containment design advantages.

The major portion of the ice condenser is mass of sodium tetraborate ice stored in an annular chamber inside the Containment shell. The chamber is designed to provide a flow passage between the lower compartment holding the Reactor Coolant [EIIS:AB] (NC) System and the upper portion of the containment during accident conditions, and to act as a static, insulated cold storage compartment at all other times.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT DESCRIPTION

On January 4, 1991, a work activity commenced in the Lower Ice Condenser involving approximately fifty people rotating in three hour shifts. Personnel accessing the Lower Ice Condenser created a high level of traffic in the hatch area. The work was completed on January 9, 1991.

On January 10, 1991, at 1530 hours, during an Ice Condenser inspection by the NRC, with Unit 1 in Mode 3, Hot Standby, the Emergency Personnel Hatch was found in the closed or down position but not latched. The tamper proof seal installed on March 31, 1990, per Standing Work Request (SWR) 4582 and again verified on June 15, 1990, per the same SWR, was intact. The hatch is located in a confined area and is in a direct path to the Ice Condenser access door.

Operations immediately initiated an urgent work request to inspect the seal area and lock the hatch. This work was accomplished at 1700 hours. The Unit 2 hatch was also verified closed and latched.

Subsequent investigation included a review of personnel access into this area and a review of past inspections of the hatch. On January 14, 1991, personnel entered the area and replicated the postulated causal factor. They found that repeatedly stepping on and off the hatch would cause the latching arms to retract. During this investigation, the handwheel position to achieve full extension of the latching arms was marked. The handwheel was left in this position and the tamper seal was tightly placed.

Interviews with operators who perform weekly surveillances of this area did not uncover any recollection of unusual hatch position prior to the Ice Condenser work.

CONCLUSION

Although the precise time and cause of the hatch becoming unlatched could not be determined, it is postulated that this occurred during the high traffic period during Ice Condenser work from January 4 through January 9, 1991. The postulated mechanism was proven by demonstration to be the likely cause of the hatch coming unlatched. Based on the results of this investigation, it is concluded that the hatch was properly latched prior to January 4, 1991.

This incident is attributed to equipment failure/malfunction. One of the locking arms was incorrectly adjusted which permitted only one bearing surface to exist rather than four as designed. The contact point was also a beveled surface which tended to force the latching arm in an unlatched direction. Movement of the hatch caused by personnel stepping on and off eventually caused the latching arm to move backwards. Maintenance will adjust the latching arms such that they all activate simultaneously; thereby, ensuring all four points of contact exist. These adjustments will be made during a period when personnel can stay in the Lower Containment and visually confirm proper closure alignment. Proper adjustments are not possible from the Upper Containment.

The design characteristics in closing the hatch also play an important role ensuring proper locking. Only 1/3 of a turn on the handwheel will bring the latching arm from fully open to a fully closed position. The design of the cam and latching arms permit the operator to turn the handwheel more than 1/3 of a turn. When the handwheel exceeds 1/3 of a turn, the cam actually retracts the latching arms. To prevent this from occurring, Maintenance will modify the hatch by installing a match mark tab underneath the handwheel at its fully closed position. A small hole will be drilled though the handwheel and the tamper seal inserted through the hole and into the match mark tab. This will ensure the latching arms are fully extended and also provide a more positive and secure placement of the tamper seal. Maintenance will develop a procedure reflecting the hatch modifications and offering a clear understanding of correct closure.

At the time the hatch was found unlatched, the tamper seal was still intact. The placement of the seal around the handwheel to the hinge assembly allowed sufficient movement of the handwheel to occur without breaking. Only 1/3 of a turn is required to open the hatch. The corrective action stated above will eliminate this problem.

Operations personnel access the hatch area weekly during the Reactor Building rounds. The round sheet will be revised to verify tamper seal is intact in Modes 1, 2, 3, and 4.

A review of the OEP database for the past 24 months did not reveal any similar events to the one addressed within this report. This incident does not meet the Nuclear Safety Assurance definition as a recurring problem.

CORRECTIVE ACTION

SUBSEQUENT

1) Work Request 9077SWR initiated to close and lock hatch on Unit 1.

2) Work Request 4716SWR initiated to verify hatch on Unit 2 closed and locked.

3) Maintenance marked the hatch in the full closed position to ensure full engagement of all latching arms.

PLANNED

1) Adjust latching arms for proper hatch securement.

2) Modify hatch by installing match mark tab underneath handwheel. This tab will also serve as the location of the tamper seal.

3) A maintenance procedure will be developed to accompany the SWRs for proper hatch closure.

4) Operations will add a visual inspection of the hatch seal in Modes 1 through 4 to the Reactor Building Round Sheets.

SAFETY ANALYSIS

The prime safety concern with having the hatch open during plant operations is the additional open area presented for steam bypass flow. Should a break occur, some volume of steam which would normally pass through the Ice Condenser would proceed through the hatch area and increase pressure in upper containment. Initially, Westinghouse assumed 5 square feet of unidentified open area between upper and lower containment. The open hatch would add an additional 3.14 square feet to this area, for a total of 8.14 square feet. From the Final Safety Analysis Report (FSAR), page 6.2-10, the leakage coefficient is calculated to be 0.080 psi/square foot. Therefore;

$$8.14 \text{ sq. ft.} \times 0.08 \text{ psi/sq. ft.} = 0.65 \text{ psi}$$

So with a total of 8.14 sq. ft. of open area, the containment pressure would increase 0.65 psi above the calculated value.

During the time frame of interest, that is the initial blowdown through the Ice Condenser, the existing calculated peak containment pressure would be 7.57 psig (FSAR, page 6.2-8), including an increase of 0.4 psi assumed for the originally assumed 5 sq. ft. open area.

Therefore; the additional pressure increase would be 0.65 psi - 0.4 psi = 0.25 psi.

So, the total pressure increase that would be presented with the additional open area would be:

$$7.57 \text{ psig} + 0.25 \text{ psi} = 7.82 \text{ psig}$$

This value is well below the maximum pressure of 14.68 psi. Additionally, all calculations in the FSAR are during Mode 1, Power Operation, whereas, the incident in question, occurred during Modes 3 and 4 where significantly reduced heat input to Containment would result.

The health and safety of the public were not affected by this event.