U.S. NUCLEAR REGULATORY COMMISSION

REGION II

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Licensee:	Duke Energy Corporation
Facility:	Catawba Nuclear Station, Units 1 and 2
Location:	422 South Church Street Charlotte, NC 28242
Dates:	August 7 through September 15, 1998
Inspectors:	S. Shaeffer, Senior Resident Inspector, McGuire (Lead Inspector) D. Roberts, Senior Resident Inspector, Catawba M. Giles, Resident Inspector, Catawba

Approved by: _____ 10/19/98

P. E. Fredrickson, Chief Date
Maintenance Branch
Division of Reactor Safety

Enclosure

Report Details

Summary of Plant Status

Unit 1 began the inspection period at approximately 100% power. On August 5, 1998, during the performance of on-line Unit 1 ice condenser Technical Specifications (T.S.) required flow passage inspections, the licensee identified evidence of flow blockage in Bay 5 and other bays. Based on a licensee determination of Bay 5 being in a degraded condition, the licensee declared the ice condenser inoperable on August 5 and entered a 48 hour shutdown action statement. On August 7, the licensee initiated a downpower to place the unit in cold shutdown (MODE 5) to correct the ice blockage condition. After satisfactory repairs were completed, on August 31, 1998, the unit was restarted and ended the inspection period at approximately 100% power.

Unit 2 operated at approximately 100% power during the entire period.

I. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments (62700)

During the inspection, the inspectors reviewed a variety of maintenance, surveillance, and engineering activities associated with maintaining the ice condenser and its associated sub-systems in an operable state. Following observations of licensee activities associated with the identification and resolution of problems identified with the Unit 1 ice condenser system during the forced outage the inspectors concluded that the appropriate attention was being applied to support the above activities.

However, throughout the forced outage, a weakness was identified with initial scoping of problems and thoroughness of licensee inspections completed during the outage related to flow channel blockage, foreign material exclusion (FME) control, and material condition of ice condenser baskets. Licensee management's failure to confirm the thoroughness of contractor personnel to provide a proper scoping of problems contributed to this weakness. After problems were identified by the NRC in each of these areas, licensee response to the problems were considered adequate.

M1.2 Unit 1 Ice Bed Flow Passage Degradation Causing Forced Unit 1 Shutdown

a. Inspection Scope (62707, 61726, 37551)

The inspector reviewed degraded ice condenser flow passages identified in the Unit 1 ice condenser system during T.S. required surveillance testing by walkdowns of certain portions of the ice condenser system. As-found conditions were evaluated with respect to the T.S., Updated Final Safety Analysis Report (UFSAR), design basis documents, and applicable licensee drawings and procedures. The degraded conditions were also evaluated for initial root cause determinations and licensee corrective actions.

b. Observations and Findings

b.1 Background

The inspector reviewed T.S. compliance as related to T.S. 4.6.5.1.b.3, which requires that at least once per nine months, a minimum of two flow passages per each of the ice condenser's 24 bays be visually inspected for blockage. With the frequency of the surveillance at nine months, two performances per operating cycle are typically required, one just prior to startup from a refueling outage and one at the nine-month interval, which has generally occurred with the unit at power. The maximum allowable accumulation of frost or ice on flow passages through the condenser is limited to 0.38 inch per T.S.. The T.S. surveillance activity has been performed in accordance with Procedure SM/A/8510/001, Rev. 1, Inspection of Ice Condenser Flow Passages, with the selection of flow passages for the T.S. surveillance conducted by the system engineer using a random number generator.

On August 5, 1998, during the performance of on-line Unit 1 ice condenser T.S.-required flow passage inspections, the licensee identified evidence of flow blockage in Bay 5 and other bays. Per the T.S., if one or more passages are found to have frost or ice in excess of 0.38 inch, 20 additional flow passages from the same bay shall be visually inspected. Upon the performance of additional inspections in Bay 5, the licensee identified evidence of a significant number of flow passages being blocked or partially blocked by ice and frost accumulation. Based on the identification of the Bay 5 degraded condition, the licensee declared the ice condenser inoperable on August 5, 1998 and entered a 48 hour shutdown action statement. Significant flow channel blockage outside of Bay 5 was not evident. The licensee

performed additional inspections and attempted to clean the identified blocked flow channels in Bay 5. However, portions of the ice condenser were considered inaccessible with the unit at power due to radiological dose concerns. Therefore, the licensee determined that the degraded condition could not be corrected within the T.S. limiting condition for operation and a unit shutdown was completed to facilitate more complete inspections and corrective actions.

b.2 Root Cause of Bay 5 Flow Blockage

Upon shutdown, more detailed inspections of Bay 5 and adjacent bays concluded that the significant ice blockage was limited to Bay 5 only. NRC and licensee review of previous outage activities concluded that the ice flow passage blockage was the result of a leaking block-ice processing machine which was utilized for the first time in July 1996 in Unit 1. The machine used borated water and ice to press preformed blocks for incorporation into the ice bed, and was developed exclusively for the licensee to decrease future ice condenser servicing intervals. The block ice machine had been located over Bay 5, in the intermediate deck door area, for the duration of the Unit 1, 1996 refueling outage and was noted to have had numerous leaks associated with the machine based on recollection of maintenance and engineering personnel involved with the outage. The machine was not used in Unit 2 or either of the McGuire ice condenser units. Leakage from the machine caused significant blockage of Bay 5 flow passages affecting more than half of the Bay 5 baskets, with the amount of blockage varying over the entire length of the baskets. There was also water seepage through the ice bed to the lower ice area, as evidenced by collection of ice on the lower turning vanes and floor.

b.3 Sequence of Events Relating to Flow Blockage

The inspectors developed the following sequence of events for review of the licensee's actions related to the development of the Bay 5 flow blockage problem as follows:

Date	Event Description
June 12, 1996	Unit 1 End of Cycle (EOC)-9 refueling outage begins
June 25, 1996	Block-ice machine installed in Unit 1 ice condenser
July 1996	Block-ice machine leakage occurs

August 7, 1996	Block-ice machine removed from Unit 1 ice condenser
August 8, 1996	Ice accumulation discovered in Bay 5, normal flow channel cleaning for all bays initiated to support final ice passage inspections. Problem identification process (PIP) report not initiated
August 12, 1996	System engineer acquired thermal drill from another utility to assist in cleaning Bay 5. Device was given to site ice condenser maintenance group
August 27, 1996	All flow channel cleaning in Bay 5 completed per maintenance. Engineering verification of as-left condition not conducted.
August 28, 1996	Nine-month interval T.S. surveillance 4.6.5.1.b.3 completed. Two random passages in Bay 5 were considered satisfactory. No flow passage problems identified.
October 4, 1996	Unit 1 starts up from EOC-9 refueling outage
April 28, 1997	Nine-month interval on-line performance of T.S. surveillance 4.6.5.1.b.3 completed. Two random passages in Bay 5 were considered satisfactory. No flow passage problems identified
November 28, 1997	Start of Unit 1 EOC-10 refueling outage
December 1997	Identified 24 ice baskets stuck in Bay 5, attributed to previous ice machine problem
December 21, 1997	Nine-month interval T.S. surveillance 4.6.5.1.b.3 completed at end of refueling outage. Two random passages in Bay 5 were considered satisfactory. No flow passage problems identified. 100 percent flow channel inspection completed per licensee's program (no specific procedure).
January 4, 1998	Unit 1 starts up from EOC-10 refueling outage

August 5, 1998 Nine-month interval on-line performance of T.S. surveillance 4.6.5.1.b.3 completed. Problems identified with Bay 5

August 7, 1998 Unit 1 shutdown to correct ice condenser deficiencies

b.4 Corrective Actions for Identified Flow Blockage

Throughout the forced shutdown, the licensee performed extensive cleaning in Bay 5 to remove or reduce the blockage from the flow passage areas. Not all of the blockage was able to be removed as a result of the Bay 5 leaking block-ice machine problem. Evaluation of the Bay 5 as-left condition is discussed in Section M1.2.b.7 below. All other Unit 1 ice condenser bays flow passages were inspected by the licensee several times and adequately cleaned. The inspectors performed a variety of final walkdowns to verify the as-left conditions. By the end of the outage, the licensee's ultimate sensitivity to cleaning flow passages was considered good.

The inspectors were also concerned with the use of a variety of sharpened cleaning tools utilized in the ice removal process, specifically, because of the potential for damage to the baskets or support lattice structures. After final flow channel cleaning was completed, the licensee and the inspectors performed inspections for potential damage. Aside from minor damage, no operability concerns were identified. This inspection was performed from both the top and bottom of the condenser; however, visibility past the first lattice support structure was limited. The licensee was unable to perform full length basket inspections, in light of limited space outside the ice baskets due to as-left blockage, further discussed in Section M1.2.b.7 below. The licensee stated that more detailed inspection of the Bay 5 baskets were planned to be conducted during the next scheduled refueling outage, in that inspection accessability would improve due to the emptying of numerous ice baskets in Bay 5 for servicing.

b.5 Regulatory Issues for Flow Blockage Degradation

Based on the above sequence of events, review of available documentation, and discussions with licensee personnel, the inspectors evaluated the Bay 5 flow channel degradation for compliance with regulatory requirements. The licensee is required by 10 CFR 50 Appendix B, Criterion XVI, to establish measures to ensure that conditions adverse to quality are promptly identified and corrected. In

this case, the licensee had several opportunities, including ice condenser servicing during a refueling outage and during the performance of T.S. required surveillances, to promptly identify, evaluate and implement corrective actions for the blocked flow passages which did not meet known T.S. surveillance requirements. This failure to promptly identify and correct flow channel degradation is identified as Apparent Violation EEI 50-413/98-13-01, Failure to Identify and Correct Significant Ice Condenser Flow Blockage. The inspector considered that the engineering oversight and problem resolution for this degraded condition in Bay five of the Unit 1 ice condenser was inadequate. This inadequacy led to a significant condition adverse to quality being left unidentified and uncorrected for an approximate two year period.

At the end of the inspection period, the licensee was in the process of completing a past operability review of the blocked ice condenser flow passages in Unit 1, Bay 5. Pending the licensee's completion of this review and NRC evaluation, this issue is identified as Unresolved Item 50-413/98-13-02, Past Ice Condenser Flow Blockage Operability Review.

b.6 Other Effects of Water Intrusion on Ice Bed Performance

In addition to the above issues, the inspectors reviewed the effect of the Bay 5 leaking ice machine problem on other aspects of the Unit 1 ice condenser system including basket maximum allowed weight, stored ice boron concentration, and any potential impact on T.S. requirements in this area.

The inspectors discussed with the licensee, controls for the water used in the block-ice machine and considered them adequate in providing proper boron concentration to the ice machine. For this reason, no T.S. minimum boron operability issue regarding the Bay 5 water intrusion was identified. The inspectors also reviewed ice weights taken before and after the block-ice machine leakage and identified baskets which gained a substantial amount of weight due to the addition of borated water. For example, Bay 5 ice basket 7-4 indicated a net gain of approximately 250 pounds. The inspectors also noted that during the Unit 1 1997 refueling outage, 24 Bay 5 baskets were identified as being stuck and therefore unweighable. The licensee's sublimation prediction program allows for stuck baskets not to be weighed/serviced (i.e. unloaded, inspected, refilled, and weighed) for one cycle of operation, if sublimation predictor values are acceptable. For this reason, system engineering determined that the 24 stuck baskets were operable after the 1997 refueling outage. The inspectors noted that evaluations were not

performed for the baskets that were weighed and indicated a substantial increase in mass. During a restart Plant Operations Review Committee meeting, the licensee addressed the concern for potentially exceeding maximum weights per basket and concluded that no design limits were exceeded.

The inspectors concluded that no known excessive ice weight operability issue existed due to the Bay 5 problem and that the more critical minimum ice mass requirements were met. The inspectors also concluded that the abnormal identification of many stuck baskets in Bay 5 and the mass increase of other baskets during the 1997 Unit 1 refueling outage were additional opportunities missed by engineering to identify and correct the known condition adverse to quality, further discussed in Section M1.2.b.5 above.

b.7 Technical Specification Flow Channel Interpretation

During the licensee's corrective actions for the flow passage blockage in Bay 5, the inspectors noted that the licensee was cleaning the blockage to a criteria which did not include the entire flow area between ice baskets. Instructions to maintenance personnel were to apply the T.S. requirement of less than 0.38-inch of ice to the diamond shaped areas formed by steel lattice support structures located between adjacent baskets. The inspectors estimated the flow areas outside of the diamond as approximately 50 percent of the total flow area. The licensee's interpretation of the terms "flow channel" or "flow passage" was defined via an internal engineering memorandum dated August 11, 1988, by engineer E. W. Fritz. With this interpretation, the licensee intended to meet the intent of T.S. 4.6.5.1 by cleaning inside the diamond area of the flow channel to the 0.38 inch criteria and leaving blockage outside of the diamond area. Flow passage cleaning outside the diamond area was to be performed to the extent practical; however, substantial blockage could remain. The inspectors questioned the basis for only applying the 0.38 inch T.S. criteria to the inside of the diamond area, in that, the diamond area was approximately one half of the total flow area and existed only at the lattice support structure locations. No other basis documentation was provided by the licensee or was identified in either available design basis documents or the UFSAR which could establish any basis for the licensee distinguishing between the inside or outside area of the diamond.

Prior to unit restart, a telecon was conducted between NRC Headquarters and Regional NRC management and the licensee to discuss their interpretation of the flow channel definition. The licensee stated that the intent of the T.S. requirement to maintain the ice build-up to less

than 0.38 inch was to provide a quantifiable means of evaluating blockage and not an operability limit. Based on a lack of specific information defining flow channels as they relate to the Catawba T.S., the NRC acknowledged that it was appropriate for the licensee to apply the 0.38 inch T.S. criteria to the inside of the diamond area, until further information was available to more completely evaluate the licensee's interpretation. The inspectors noted that with the exception of areas outside the diamond in Bay 5, inspections in all other bays identified no substantial ice buildup either inside or outside the flow channel diamond areas. Prior to restart, the licensee performed both substantial cleaning of the Bay 5 areas outside the diamond as well as complete cleaning of inside the diamond areas.

On September 4, 1998, the NRC received and reviewed information relative to the definition of flow channel areas for the Tennessee Valley Authority's (TVA) Watts Bar ice condenser facility. The inspectors reviewed the document, dated August 31, 1998, from the Westinghouse Electric Company to TVA and concluded that the Catawba interpretation of flow channel was not conservative. In light of this new information, the NRC requested that Duke Energy obtain and review the information to determine if their original flow passage definition for T.S. surveillance activities was valid. The licensee determined that the full area definition of a flow channel (provided in the Westinghouse document) placed the areas outside the diamond on Bay 5 in a degraded condition which needed to be evaluated for operability concerns. The Westinghouse document provided a means by which operability could be shown via an analytic analysis of the ice condenser by segmentized flow channel analysis. Specifically, with the ice condenser separated into six segments, if summation of all the known flow blockage in a given segment was less than 15 percent, each segment and hence the ice condenser system could be considered operable. The licensee performed additional inspections of the as-left blockage, performed the segment analysis, and concluded that the ice condenser was operable with areas outside the diamond in Bay 5 having residual blockage. The licensee conservatively estimated that the segment including Bay 5 had approximately 9 percent total blockage.

These findings were discussed during a subsequent NRC/licensee telecon on September 11, 1998. The NRC concluded that no current operability issue existed. The licensee informed the NRC that they planned to pursue changes to this and other ice condenser TSs to eliminate the need for interpretations and improve ice condenser surveillance program reliability.

c. Conclusions for Flow Blockage Problem

An apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI was identified for failure to identify and correct significant ice condenser flow blockage. The identification of many stuck baskets in Bay 5 and the mass increase of other baskets during the 1997 Unit 1 refueling outage were additional opportunities to identify and correct the significant condition adverse to quality. Licensee evaluations regarding potential adverse impact of the leaking block-ice machine on critical minimum ice mass requirements were adequate.

Immediate licensee corrective actions for the flow channel problem, including a forced unit shutdown and extensive cleaning of the affected area, was considered adequate to support restart of the unit.

Based on the receipt of new design basis information, previous licensee interpretations regarding ice condenser flow passage areas were determined to be non-conservative. An unresolved item was identified concerning past ice condenser flow blockage operability.

M1.3 Foreign Material Identified in Unit 1 Ice Condenser

a. Inspection Scope (62700, 62707, 61726, 37551)

The inspectors reviewed NRC and licensee identification of foreign material in the Unit 1 ice condenser and requirements for maintaining areas inside the containment free of foreign material which could adversely impact the containment sump. The inspectors walked down applicable systems during this review.

b. Observations and Findings

T.S. 4.5.2.c requires, in part, that each emergency core cooling system (ECCS) subsystem shall be demonstrated operable by a visual inspection which verifies that no loose debris is present in the containment which could be transported to the containment sump. The visual inspection shall be performed for all accessible areas of the containment prior to establishing containment integrity. Implementation of this T.S. surveillance is accomplished, in part by, PT/0/A/4200/002, Containment Cleanliness Inspection. In addition, Duke Energy Nuclear Site Directive 104.7, Standards for Foreign Materia Exclusion, provides a program to prevent the instruction of foreign material into open systems or components.

Prior to the Unit 1 shutdown and throughout the outage, the licensee identified evidence of inadequate FME control in the Unit 1 ice condenser. Although full accounting of the foreign material was not complete at the end of the inspection period, the license estimated the total debris to be approximately 30 gallons. Types of debris identified included ice loading bags, tape and rope sections, gloves, shoe covers, tie wraps and various metal parts. Of particular concern were the large plastic ice loading bags found in the condenser, which had been previously used during ice condenser servicing. These bags (approximately 4.5 bags found) are one foot diameter tubular plastic, 55 feet in length. They are normally inflated in the ice channels to help retain the ice in the ice basket while ice filling is in progress. In the early 1990's, the licensee changed the color of the bags used from clear to orange to provide for better visibility. The majority of the bags recently discovered were the previously used clear type. The bags may have posed a particular threat to the operability of the ECCS sump after a loss of coolant accident, ice condenser blowdown, and swap-over to the ECCS sump recirculation. The potential transport pathway for this and other foreign material in the ice condenser would be ejection through the top of the condenser, initial transport to lower containment through the refueling drains or via the ice condenser drains, and then final transport through the polar crane wall penetrations to the ECCS sump location.

Prior to Unit 1 restart, the licensee identified a number of items which could not be easily removed from the ice condenser. These items, including sections of rope and tape, tie wraps, and several whole pieces of the plastic ice loading bags previously described, were evaluated via PIP 1-C-98-2911 to be left in the condenser until the next refueling outage. The inspectors reviewed the qualitative analysis which used several assumptions in determining the ultimate ability of the material to transport to the sump, and considered it generally conservative. Detailed NRC inspections were conducted prior to unit restart for FME concerns. Although final FME quality was the result of an iterative process, the as-left condition of the condenser was considered adequate. Since the most opportune time for inspecting for FME inside ice baskets is after the ice mass has been vibrated out during refueling outage scheduled servicing, the licensee planned to conduct more detailed inspections of the interior of emptied ice baskets during the next refueling outage.

The inspectors concluded that the above FME control requirements were not adequately implemented to meet the requirement of T.S. 4.5.2.c as evidenced by the substantial amount of foreign material identified in the Unit 1 ice condenser system. This failure to maintain ice condenser

FME control is identified as Apparent Violation EEI 50-413/98-13-03, Inadequate Ice Condenser Debris Visual Inspection.

At the end of the inspection period, the licensee was still evaluating the potential effect of the entire amount of foreign material identified on the Unit 1 ECCS sump. Pending licensee completion of this review and NRC evaluation, this issue is identified as Unresolved Item 413/98-13-04, Past Ice Condenser Foreign Material Effect on ECCS Sump Operability Review.

c. Conclusions

An apparent violation of T.S. 4.5.2.c was identified for failure to conduct adequate visual debris inspections in the Unit 1 containment. An unresolved item was identified concerning foreign material effects on the Unit 1 containment ECCS sump.

The licensee's efforts to exclude foreign material from the ice condenser during previous outages had not been adequate as evidenced by the amount of debris found during this outage and the evaluation discussed above. At the end of the inspection, licensee's attention to the area of foreign material exclusion in the ice condenser had improved.

M1.4 Dented/Buckled Ice Baskets

a. Inspection Scope (62707, 61726, 37551)

The inspector reviewed degraded ice basket material conditions identified in the Unit 1 ice condenser system identified during a forced Unit 1 shutdown. As-found conditions were evaluated with respect to the T.S., UFSAR, design basis documents, and applicable licensee drawings and procedures. Licensee corrective actions taken to correct the conditions were reviewed prior to unit restart.

b. Observations and Findings

During the Unit 1 shutdown, approximately 58 basket dents were identified, repaired and/or evaluated by the licensee. Denting or buckling of baskets could potentially affect the ability of the ice basket to sustain as-designed loading conditions. The licensee's previous allowable dent size for denting was one-inch deep and 10 inches in length. During the unit shutdown, the licensee received and incorporated more restrictive criteria from the vendor of 0.75-inch deep and six-inch length. The licensee repaired the identified dents with a

special tool developed to pull out dented baskets. The licensee also reviewed specific dents with the vendor, via pictures, to assure as-left configurations were acceptable. The majority of the identified dents were located on the bottom six-feet of the ice baskets. Late in the outage, one significant buckle was identified by the inspectors and adequately repaired by the licensee before unit restart. The licensee postulated that the majority of the dents were likely the result of original installation practices. The inspectors considered that the licensee had numerous opportunities to identify and correct the identified dented baskets, such as during flow passage inspections, weighing activities, or lower ice condenser bay cleaning. The licensee is required by 10 CFR Part 50 Appendix B, Criterion XVI, to establish measures to ensure that conditions adverse to quality are promptly identified and corrected. This failure to promptly identify and correct basket material condition problems is identified as Apparent Violation EEI 50-413/98-13-05, Failure to Identify and Correct Ice Basket Deformation.

At the end of the inspection period, the licensee had not yet completed a past operability review for the potential inoperability of the ice condenser due to the identified dented baskets. Pending license completion of this review and NRC evaluation, this issue is identified as Unresolved Item 50-413/98-13-06, Past Ice Condenser Dented Basket Operability Review.

c. Conclusions

An apparent violation of 10 CFR Part 50 Appendix B, Criterion XVI was identified for failure to promptly identify and correct ice condenser basket material condition problems. Corrective actions taken for the ice condenser basket denting problems was adequate to support restart of the unit. An unresolved item was identified concerning past operability for denting identified on ice condenser baskets.

M1.5 Deck Door Bolting and Hardware Issues

a. Inspection Scope (62707, 37551)

The inspectors reviewed the condition and installation of the Unit 1 ice condenser intermediate doors and top deck blankets. Areas reviewed included the bolting requirements for the intermediate deck door frames and the structural steel supports as described in drawings CNM 1201.17-0498, -0080, and -0488. The installation requirements for the top deck blankets as detailed on drawing CNM 1201.17-0512 were also reviewed.

b. Observations and Findings

The design of the intermediate deck doors (per bay) consists of a door frame unit housing eight intermediate deck doors. The door frames are attached to the structural steel I-beams located over the ice baskets. During the outage, the licensee identified a number of problems associated with the door frame fasteners including missing bolts, nuts, washers, and bushings, in addition to inadequate torquing of some of these components. In addition, one structural T-bar beam assembly to which the door frames are attached, had missing bolts. The licensee took corrective actions to address these concerns prior to unit restart. Toward the end of the outage, the inspectors also identified inadequate washer overlap on a number of the fasteners due to a variation in door frame alignment slot size. This problem resulted in a number of the fasteners not engaging the door frames at all. Upon identification to the licensee, the problem was corrected via the installation of larger washers. The inspectors noted that this specific problem had been previously identified by the licensee at the McGuire ice condenser facility and corrected at that facility by a modification.

Also, during the outage, several material issues were identified with the top deck blankets and associated hardware. These problems included several small perforations on four of the blankets. As the licensee did not have an approved repair method, the affected blankets were replaced with new vendor blankets in accordance with approved procedures. Other problems were identified with the condition of blanket hardware which were contrary to the installation requirements detailed on drawing CNM 1201.17-0512, specifically three missing vapor tape retaining clips. The licensee corrected the known material condition issues associated with the top deck blankets and hardware in an adequate manner prior to Unit 1 restart. The inspectors concluded that replacement of the torn blankets was a conservative action.

The licensee is required by 10 CFR 50, Appendix B, Criterion V to accomplish activities affecting quality in accordance with documented drawings. The failure to ensure that the intermediate deck door and structural bolting requirements were implemented per drawings CNM 1201.17-0498, -0080, and -0488, and the failure to install the vapor barrier retaining clips are identified as two examples of Apparent Violation EEI 413/98-13-07, Failure to Properly Install Ice Condenser Deck Door Bolting and Hardware.

c. Conclusions

An apparent violation of 10 CFR Part 50, Appendix B, Criterion V was identified for failure to accomplish activities affecting quality in accordance with documented drawings. Corrective actions taken for the ice condenser intermediate deck door problems and top deck blanket issues were adequate to support restart of the unit.

M1.6 Ice Bed Technical Specification Chemical Sampling

a. Inspection Scope (61726, 37551)

Technical Specification 4.6.5.1.b requires, in part, that the ice condenser shall be determined operable at least once per 9 months by chemical analysis which verifies that at least nine representative samples of stored ice have a boron concentration of at least 1800 ppm as sodium tetra borate and a pH of 9.0 to 9.5 at 20 degrees C. The inspectors reviewed the history of how the licensee performed the sampling and compliance with T.S.'s via Procedure OP/1/A/6200/027, Operating Procedure for Sampling Local Primary Sample Points.

b. Observations and Findings

Previous to this inspection, the licensee had performed the sampling by taking nine representative samples across the ice bed, mixing equal amounts from the samples together, and then performing one analysis of the sample to apply the T.S. criteria. During the inspection period, the inspectors questioned this practice as potentially being non-conservative and not providing sample data to identify a potential condition adverse to quality (i.e., specific high or low samples). The licensee addressed the issue via PIP 1-C-98-3004 which concluded that this mixing technique met the intent of the T.S. requirement. However, the licensee did consider that they would enhance their sampling technique to evaluate each of the nine samples independently to attain additional assurance of ice bed chemical integrity.

During the first-time performance of the expanded T.S. chemical surveillance, one of the nine samples taken indicated a significantly lower ppm of 1345 (basket 2-7-7). The licensee did not consider that the one low sample resulted in a failed T.S. surveillance, in that, the numerical average of all nine samples, 1993 ppm, was above the T.S. lower limit of 1800 ppm. The Catawba chemistry group then utilized a McGuire sampling technique which drew the sample from further in the ice bed, away from the affects of sublimation or clear ice build-up, and resampled a number of baskets. The second sample of the original low

basket of 1345 ppm was found to be approximately 1760 ppm, still below the T.S. limit. In addition, one additional low basket of 1642 ppm and one high basket exceeding the upper limit per the accident analysis of 2350 were identified. Although several individual samples were not within the T.S. or the accident analysis limit, the licensee considered that averaging the data from the samples to show compliance with the T.S. and other limits, met the intent of the T.S..

The licensee's approach to meeting the intent of T.S. 4.6.5.1.b.1 was discussed during a telecon between NRC headquarters and regional management, and the licensee. Based on the discussions, NRC management determined that the intent of the specific T.S. in this area was not sufficiently specific and warranted improvement to more clearly address T.S. intent in the actual specification. The licensee did perform limited additional sampling to gain added assurance that no immediate operability concern existed. As previously discussed in Section M1.2.b.7, the licensee was planning to pursue clarifying changes to the T.S..

c. Conclusions

The stored ice chemical sampling T.S. was not sufficiently specific and warranted improvement to more clearly address T.S. intent in the actual specification. No immediate operability concerns were identified in this area.

M1.7 Restart Inspections

After corrective actions were implemented by the licensee for the identified Unit 1 material condition issues, the inspectors performed final walkdowns of the ice condenser. The final inspections focused on foreign material identification, flow channel integrity, and compliance with known T.S. and design requirements. Nonconforming items were identified to the licensee and promptly corrected. The inspectors concluded that final material condition of the Unit 1 ice condenser was adequate to support operability of the ice condenser system. The inspectors also reviewed all applicable ice condenser T.S. surveillances prior to restart and concluded that the licensee had appropriately identified and implemented those warranted to be accomplished based on the extensive work activities during the forced outage.

II. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Unapproved Plant Modifications

a. Inspection Scope (37551)

NRC walkdown reviews were conducted in all areas of the Unit 1 ice condenser, comparing the as-built configuration to the design basis.

b. Observations and Findings

In general, the inspectors identified that the ice condenser system was being maintained and operated in accordance with the design basis and changes were being accomplished in accordance with approved procedures. However, the following three exceptions were noted and considered as unapproved modifications.

The first example was identified during the walkdown of the upper plenum around the intermediate deck doors. Specifically, the inspectors identified a substantial amount of wire mesh installed in the crevice behind the ice condenser air handling units (AHU) on both the containment and annulus side of the ice condenser. The purpose of the mesh was to prevent tools, debris, and other foreign material from falling behind the AHUs in locations where retrieval would be difficult. The inspectors determined that the installation of the mesh, which was estimated to have been installed in the mid-1980s, was not in accordance with existing design control measures as required by 10 CFR 50, Appendix B, Criterion III. The inspectors informed the licensee of the wire and it was removed from both units by the end of the inspection period. This failure to maintain design control of ice condenser system modifications is identified as the first example of Apparent Violation EEI 50-413, 414/98-13-08, Inadequate Design Control.

The second example of EEI 50-413, 414/98-13-08 concerned the unapproved original construction installation of a one-by-two-inch black foam (Armaflex) strip along the entire length of the ice condenser aside the top deck blanket. The purpose of the strip was to fill a gap created by the top deck vapor barrier curtain located at the containment liner and the edge of the top deck blankets. Installation of the material was not in accordance with established procedures or drawings or as part of an approved plant modification. This problem was also identified in Unit 2. The licensee performed a 10 CFR 50.59 safety review of the

impact of the strip and determined that it could remain in-place in both units after minor repairs were accomplished.

The third example of EEI 413, 414/98-13-08 concerned the unapproved installation of fiberglass tape used on the top deck blankets to provide additional vapor barrier protection outside of established design control measures. The plant design allowed for use of the subject tape in certain locations; however, the tape application in the allowed configurations called for the tape to be mechanically restrained to prevent the tape from dislodging during ice condenser ejection. Unrestrained tape could potentially become dislodged and could present a threat to the refueling drain and containment ECCS sump function. The inspectors identified several areas where tape was applied outside of the plant design. These areas were on the top deck blankets between bays and in a circumferential configuration on the blankets (containment liner side). The subject tape was removed from Unit 1. This issue was also identified on Unit 2 and evaluated for operability to remain installed until the next Unit 2 refueling outage. At the end of the inspection period, the licensee was evaluating the impact of the above and other foreign material items with respect to past ECCS sump operability, as discussed in Section M1.3.

c. Conclusions

An apparent violation was identified concerning inadequate design control measures within the Unit 1 and 2 ice condenser systems. Corrective actions taken for the identified concerns were adequate to support restart of Unit 1 and continued operation of Unit 2.

III. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on September 16, 1998. A subsequent re-exit was conducted by telephone on October 19, 1998 to discuss the specific apparent violations in the report. The licensee acknowledged the findings presented. Although proprietary information was identified and reviewed during the inspection, none of this information was utilized for this report.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Bradshaw, Safety Assurance Manager
R. Glover, Operations Superintendent
P. Herran, Engineering Manager
R. Jones, Station Manager
M. Kitlan, Regulatory Compliance Manager
G. Peterson, Catawba Site Vice-President
D. Rogers, Maintenance Manager

INSPECTION PROCEDURES USED

IP 62700: Maintenance Implementation
IP 62707: Maintenance Observations
IP 61726: Surveillance Observations
IP 37551: Onsite Engineering

ITEMS OPENED

OPENED

50-413/98-13-01	EEI	Failure to Identify and Correct Significant Ice Condenser Flow Blockage (Section M1.2)
50-413/98-13-02	URI	Past Ice Condenser Flow Blockage Operability Review (Section M1.2)
50-413/98-13-03	EEI	Inadequate Ice Condenser Debris Visual Inspection (Section M1.3)
50-413/98-13-04	URI	Past Ice Condenser Foreign Material Effect on ECCS Sump Operability Review (Section M1.3)
50-413/98-13-05	EEI	Failure to Identify and Correct Ice Basket Deformation (Section M1.4)
50-413/98-13-06	URI	Past Ice Condenser Dented Basket Operability Review (Section M1.4)
50-413, 414/98-13-07	EEI	Failure to Properly Install Ice Condenser Deck Door Bolting and Hardware (Section M1.5)
50-413, 414/98-13-08	EEI	Inadequate Design Control (Section E2.1)

LIST OF ACRONYMS USED

AHU	-	Air Handling Unit
CFR	-	Code of Federal Regulations
DBA	-	Design Basis Accident
ECCS	-	Emergency Core Cooling System
EEI	-	Escalated Enforcement Item
EOC	-	End of Operating Cycle
FME	-	Foreign Material Exclusion
IFI	-	Inspector Follow-up Item
IR	-	Inspection Report
LCO	-	Limiting Condition for Operation
LOCA	-	Loss of Coolant Accident
NRC	-	Nuclear Regulatory Commission
NRR	-	NRC Office of Nuclear Reactor Regulation
NSD	-	Nuclear Site Directive
OE	-	Office of Enforcement
PDR	-	Public Document Room
PIP	-	Problem Investigation Process
PM	-	Preventive Maintenance
PPM	-	Parts Per Million
PT	-	Periodic Testing
RO	-	Reactor Operator
T.S.	-	Technical Specifications
UFSAR	-	Updated Final Safety Analysis
WO	-	Work Order