NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

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EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	Page 1 of 6
Donald C. Cook Nuclear Plant - Unit 1	50-315	

TITLE (4)
Material Discovered in Containment Degrades Containment Recirculation Sump and Results in Condition Outside Design Basis

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 NAME	DOCKET NUMBER
09	17	97	97	-- 024 --	03	03	04	98	Cook Unit 2	50-316
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5
POWER LEVEL (10)	0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(3)(i)	50.73(a)(2)(iii)	73.71(b)
	20.2203(a)(1)		20.2203(a)(3)(ii)	50.73(a)(2)(iv)	73.71c
	20.2203(a)(2)(i)		20.2203(a)(4)	50.73(a)(2)(v)	OTHER
	20.2203(a)(2)(ii)		50.36(c)(1)	50.73(a)(2)(vii)	(Specify in Abstract below and in Text, NRC Form 366A)
	20.2203(a)(2)(iii)		50.36(c)(2)	50.73(a)(2)(viii)(A)	
	20.2203(a)(2)(iv)		50.73(a)(2)(i)	50.73(a)(2)(viii)(B)	
	20.2203(a)(2)(v)	X	50.73(a)(2)(ii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code
Mr. Paul Schoepf, Safety Related Mechanical Engineering Superintendent	616/465-5901, x2408

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
X	YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		04	30	98

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 11, 1997, a fibrous material, known as Fiberfrax, was identified in an electrical cable tray inside the Unit 2 containment. An investigation was initiated to determine the scope and magnitude of this condition. On September 17, 1997, with Units 1 and 2 in cold shutdown, it was determined that Fiberfrax was present in both containments in enough quantity to potentially cause excessive blockage of the containment recirculation sump screen during the recirculation phase of a Loss of Coolant Accident and render the sump inoperable. An ENS notification was made at 1629 hours on September 17, 1997, under 10CFR50.72(b)(2)(i), as a condition which was found while the reactor was shutdown, which if it had been found while the reactor was operating, would have resulted in the nuclear power plant being outside the design basis. As part of the investigation, reviews were conducted of industry information related to containment sump strainer blockage, and plant insulation specifications. Walkdowns were conducted of both containments and other potential material threats to blockage of the recirculation sump were identified and dispositioned.

The root cause of this condition has been attributed to inadequate specifications and procedures which did not preclude or strictly control these types of materials. The materials have either been removed from the containments, or have been evaluated and determined to not constitute a substantial threat to the recirculation sump. Additionally, the condition of containment coatings was reviewed and repair of some coatings has been undertaken. Specifications and procedures are being revised and /or developed to preclude or strictly control materials inside containment which could block the recirculation sump.

Analysis using models for debris generation and transport is ongoing to definitively determine the effect the materials would have had on the sump and the safety related equipment which take suction from it. This information will be provided to the NRC when it becomes available. The projected date for submittal of that information is April 30, 1998.

Condition Prior to Event
Unit 1 was in Mode 5, Cold Shutdown
Unit 2 was in Mode 5, Cold Shutdown

Description of the Event
On September 11, 1997, a fibrous material, known as Fiberfrax, was identified in an electrical cable tray inside the Unit 2 containment. An investigation was initiated to determine the scope and magnitude of this condition. On September 17, 1997, at 1400 hours, with Units 1 and 2 in cold shutdown, it was determined that the Fiberfrax was present in both containments in enough quantity to potentially cause excessive blockage of the containment recirculation sump screen during the recirculation phase of a Loss of Coolant Accident (LOCA), and render the sump inoperable. An NRC prompt notification was made at 1629 hours on September 17, 1997, under 10 CFR 50.72(b)(2)(i), as a condition which was found while the reactor was shutdown, which if it had been found while the reactor was operating, would have resulted in the nuclear power plant being outside the design basis.

Investigation determined that the fibrous material identified in the Unit 2 containment cable tray was "damming" material, which was a by-product from the installation of an adjacent foam fire stop. A series of three design changes installed the fire stops in 12 cable trays in the Unit 1 containment and in 15 cable trays in the Unit 2 containment. Installation of the fire stop and damming material was guided by a procedure, 12CHP5021.ECD.005, "Installation, Replacement and Repair of Silicone Fire Barrier Penetration Seals." The procedure and its referenced specification (DCC-FP-101-QCN, "Fire Barrier Penetration Seals"), allowed the option to leave damming material in place or remove it "as required," without additional guidance. The installers left the damming material in place since the fiber impregnates in and cures to the foam, removal would have required cutting the material from the foam, and there was no requirement to remove it.

The existence of exposed fibrous material inside the containments is inconsistent with thermal insulation specifications, which require that thermal insulation be covered with 10 mil stainless steel jacketing.

Industry information related to containment sump strainer blockage was revisited and used as guidance for the conduct of additional containment walkdowns to identify whether other potential threats existed to the recirculation sumps. Walkdowns identified the presence of other materials which were considered potential threats to blockage of the recirculation sump. These materials included other fibrous insulation and miscellaneous material.

Fibrous insulation material known as Temp-Mat, which was either exposed or encapsulated in stainless steel jacketing or stainless steel mesh, was identified in several localized areas both in the annulus (inactive sump) and lower volume (active sump), primarily where insulation had been removed for repair or weld examinations. Some fiberglass insulation material was also identified on a few lines.

Miscellaneous materials such as tape, labels and equipment stored in the containments were also identified and questioned with respect to their qualification for the containment environment, their condition and their potential for recirculation sump blockage.

Finally, the condition of coatings was also reviewed, including their qualification and condition. A limited amount of unqualified coatings was identified, as well as some coatings which showed signs of degradation or lack of suitable adhesion.

Cause of the Event

The root cause of this condition has been attributed to inadequate specifications and procedures which did not preclude or strictly control these types of materials.

Analysis of the Event

This event is reportable under 10CFR 50.72(b)(2)(i), as a condition which was found while the reactor was shutdown, which if it had been found while the reactor was operating, would have resulted in the nuclear power plant being outside the design basis and was reported via ENS on September 17, 1997, under that provision of 10CFR50.72. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(ii), as a condition outside the design basis.

An evaluation of the impact of the identified material noted that much of the material was in locations remote from the recirculation sump, and/or was in localized areas, and therefore, individually did not constitute a significant threat to the recirculation sump. Furthermore, the precise interaction of this material with the recirculation sump could not be predicted with certainty, due to the lack of models to determine post-accident debris generation and transport. However, given the quantity and variety of materials considered, and the lack of detailed models to study post-accident debris generation and transport in Pressurized Water Reactors (PWRs), blockage of the sump cannot be discounted. A discussion of the materials identified, considered and either removed or dispositioned, follows.

With regard to the fibrous material inside containment cable trays, the cable trays are 12 inches wide and 6 inches high. The length of the damming material varies with each installation, but averages approximately 1 foot. Therefore, the amount of fibrous damming material is approximately 0.5 cubic feet (ft^3) per installation. Based on this material being installed in 12 and 15 containment cable trays in Units 1 and 2 respectively, an estimate of the amount of this material is 6 ft^3 in Unit 1 and 7.5 ft^3 in Unit 2. As previously noted, the fibrous material cures to the adjacent foam fire stop during the installation process. The 27 locations where this material was installed were in the containment annulus or vertically adjacent instrument room. These areas contain relatively low energy lines, and are physically separated from and not in good communication with the active sump, which contains the recirculation sump, although some communication did exist between these two volumes of containment in past operating cycles. The cable trays are either of a steel mesh or a solid design, with mesh, slotted or solid covers, which provides some protection against the material's potential to migrate to the recirculation sump. Although the fibrous material in containment cable trays represents a potential threat to the recirculation sump, the threat to the sump was considered relatively minor given the physical configuration of the material and its location. This material has been removed from the containments.

With regard to the broader issue of other fibrous material, this material was installed in a several locations in both containments. In considering post-accident debris threats, the containment area of primary concern for communication with the recirculation sump is the lower volume which contains the reactor coolant system (RCS) loop piping and components. This area, which is inside the crane wall, is referred to as the active sump volume. An adjacent annular region outside the crane wall, referred to as the inactive sump volume, is not in good communication with the recirculation sump, and therefore, material in that area represents a relatively minor threat to recirculation sump blockage. Fibrous material in the active sump which was considered a potential threat to sump blockage included both exposed material and material covered with stainless jacketing in areas near to the RCS loop piping. A total of 333 pounds (lbs) and 167 lbs of fibrous material was removed from these areas in Units 1 and 2, respectively, which was well distributed in the lower volume. As a point of information, this material has a volume of approximately 10 ft^3/lb.

Analysis of the Event (cont'd)

Some fibrous material was also removed from the regions outside the crane wall (inactive sump volume), however, this material was primarily dispositioned by ensuring that any fibrous material was well covered in securely fastened stainless steel jacketing.

In February, 1998, additional fibrous material was discovered in the ice condenser area of both units. The fibrous material, which was a piece roughly 10 foot by 10 foot, represents approximately 15 ft^3 of additional material for each containment.

Another possible debris threat considered was the Containment Auxiliary Filter units located in the lower volume of each containment. These filter units had not been used since early plant operation. Although earlier analyses, which took credit for Leak Before Break (LBB), indicated the units would withstand the jet forces associated with postulated accidents, current guidance ruled that LBB may not be used when determining debris generation. The filter media in the ventilation units represented another source of debris. A total of 2980 lbs of material associated with these units was removed from each containment (100 lbs HEPA filter, 2880 lbs charcoal).

Several different types of tape were identified in the containments and evaluated. Gray duct tape was noted in several areas of both containments including the upper and lower regions of the ice condenser, the lower volume (active sump) and annulus (inactive sump). Although the tape was securely affixed, and in most cases a transport path to the recirculation sump would be tortuous, transport of this material to the recirculation sump could not be discounted. Therefore, identified duct tape, approximately 100 square feet (ft^2) in Unit 1 and 200 ft^2 in Unit 2, was removed. Black electrical tape and white fiberglass tape were also identified and reviewed. These tapes were inspected to ensure good adhesion, and minor amounts of loose tape were removed in some areas.

Labels used for equipment identification were inspected and found to be in good condition. A few labels which were peeling were either removed or replaced. Overall, labels were not considered to constitute a significant threat to sump blockage due to their good adhesion.

Coatings were evaluated from the perspective of qualifications and condition. Most containment coatings were confirmed qualified for use in the containment. A few areas were identified to have unqualified coatings and some areas were noted to show signs of degradation or lack of suitable adhesion. Areas of loose coatings were removed and new coatings were applied in some cases. A total of 3850 lbs of coatings were removed from the Unit 1 containment and 680 lbs were removed from the Unit 2 containment. The most notable area of repair was the floor of the Unit 1 lower volume, where coatings were electively removed down to base concrete and new coatings were applied. This accounts for the large mass of coatings removed from that unit. Due to the amounts of loose coatings, and the unavailability of debris generation and transport models, transport of this material to the sump could not be discounted.

The practice of storing equipment in the containments was also reviewed. This includes equipment such as welding machines, vacuums and manlifts, which are used during outages. Although this equipment was reviewed at the time of installation for proper seismic mounting, reviews did not consider debris generation and impact on debris transport due to localized velocity effects. This equipment was removed from the containments where its impact on debris generation or transport could not be discounted.

Analysis of the Event (cont'd)

Given the variety of locations and quantity of materials in combination with the lack of a model for debris generation and transport, blockage of the recirculation sump could not be discounted and the sumps were therefore considered inoperable in the as-found condition. In anticipation of the need for more detailed analyses for debris generation and transport to address the generic issue of sump/strainer blockage for PWRs, efforts are underway to develop models to study actual sump debris threats cause by this material.

An assessment of the operability of the containment recirculation sump is being prepared, which considers work ongoing and completed in the current outages, such as removal of fibrous insulation, insulation repair and coatings repair. This assessment will document the operability of the sumps in the as-left condition.

Corrective Action

The Fiberfrax material has been removed from 12 cable trays in the Unit 1 containment and from 15 cable trays in the Unit 2 containment.

The procedure which guides the installation of Cable Tray Fire Stops has been revised to require that damming and forming materials, which are not encapsulated, be removed from containment for any future fire stop installations. The related specification, which is referenced by the procedure, has also been revised to disallow fibrous damming materials to be left in place in the containment buildings.

Additional fibrous material was removed from the containments where it was considered a threat to the recirculation sump. The general condition of thermal insulation was reviewed and repairs were undertaken, where appropriate, to ensure that any remaining fibrous material was not exposed. Action Requests have been generated to remove the additional fibrous material from the ice condenser area that was discovered in February, 1998. This material will be removed prior to startup.

The Containment Auxiliary Filter Units, which contained both charcoal and HEPA filters, have been removed from the containments.

Miscellaneous materials such as tape and labels were examined and evaluated. Material was removed or repaired where it was considered a threat to the recirculation sump

Miscellaneous equipment, previously stored in the containments, has been removed where its impact on debris generation and transport could not be discounted.

A critical review of containment coatings was undertaken. Based on a review of the qualification and condition of coatings, a program of coatings remediation was undertaken which included both removal of loose coatings and repair of coatings which showed signs of degradation or lack of suitable adhesion. Of particular note, coatings on the floor of the Unit 1 lower containment were removed down to the concrete, and the floor was resurfaced.

A specification will be prepared to provide a single repository of comprehensive industry and plant specific guidance on requirements for installation and use of materials in the containments, including guidance on limits for degradation of this material. This will be completed prior to the next refueling outage on either unit.

Failed Component Identification

Not applicable

Previous Similar Events

None