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SUBJECT: Application for amend to licenses DPR-58 & DPR-74,involving movement of loads in excess of design bass seismic capability of auxiliary bldg load handling equipment & structures.

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Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Plant
Bridgman, MI 49106
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INDIANA MICHIGAN POWER

September 23, 1999

C0999-10
10 CFR 50.90

Docket No.: 50-315
50-316

U.S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 1 and Unit 2
LICENSE AMENDMENT REQUEST
MOVEMENT OF STEAM GENERATOR SECTIONS IN THE AUXILIARY BUILDING FOR STEAM GENERATOR REPLACEMENT PROJECT

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Unit 1 and Unit 2, proposes to amend Facility Operating License DPR-58 and DPR-74 to support the Steam Generator Replacement Project (SGRP). This activity involves movement of loads in excess of the design basis seismic capability of the auxiliary building load handling equipment and structures. I&M requests approval to move the steam generator sections through the auxiliary building and to disengage crane travel interlocks and provide relief from performance of Technical Specifications (T/S) Surveillance Requirement (SR) 4.9.7.1.

Attachment 1 provides a detailed description and safety analysis to support the proposed changes. Attachment 2 provides marked up T/S pages of the proposed change for Unit 1 and Unit 2. Attachment 3 provides proposed T/S pages with the changes incorporated for Unit 1 and Unit 2. Attachment 4 describes the evaluation performed in accordance with 10 CFR 50.92(c), which concludes that no significant hazard is involved. Attachment 5 provides the environmental assessment. Attachment 6 describes the modifications implemented for the Unit 2 SGRP that will be used for Unit 1. Attachment 7 identifies those actions committed to by I&M in this submittal.

A001

Preparations in containment for steam generator removal are planned to begin in September 1999. I&M requests approval of this request by December 3, 1999, to support removal of the first steam generator in early January 2000.

Copies of this letter and its attachments are being transmitted to the Michigan Public Service Commission and Michigan Department of Public Health, in accordance with the requirements of 10 CFR 50.91.

Should you have any questions, please contact Mr. Robert C. Godley, Director of Regulatory Affairs, at (616) 466-2698.

Sincerely,

A. C. Bakken III
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 23rd DAY OF September 1999

Notary Public

My Commission Expires PATRICIA A. EDDIE
NOTARY PUBLIC - BERRIEN CO. MICH
MY COMMISSION EXPIRES
NOVEMBER 5, 2000

/jen

Attachments

c: J. E. Dyer, w/attachments
MDEQ - DW & RPD, w/attachments
NRC Resident Inspector, w/attachments
R. Whale, w/attachments

ATTACHMENT 1 TO C0999-10

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

A. Summary of the Proposed Changes

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Unit 1, proposes to amend Facility Operating License DPR-58 and DPR-74 to support the Steam Generator Replacement Project (SGRP). This activity involves movement of loads in excess of the design basis seismic capability of the auxiliary building load handling equipment and structures. I&M requests approval to move the steam generator sections through the auxiliary building and to disengage crane travel interlocks and provide relief from performance of Technical Specifications (T/S) Surveillance Requirement (SR) 4.9.7.1 during the steam generator (SG) lifts.

The proposed changes are described in detail in Section E of this attachment.

B. Description of the Current Requirements

Current requirements for heavy load handling in the auxiliary building are identified in NRC Safety Evaluation Report (SER) for Heavy Loads, dated September 20, 1983. The requirements follow the guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," Phase I (Sections 5.1.1 and 5.3).

UFSAR Section 2.9.2, "Classification of Structures and Equipment," states that the design basis of the auxiliary building cranes and supporting auxiliary building structure is Seismic Category I.

T/S 3.9.7 prohibits the movement of loads in excess of 2,500 pounds over fuel assemblies in the spent fuel pool (SFP). Associated T/S SR 4.9.7.1 requires that the electrical interlocks that limit crane travel and help ensure compliance with T/S 3.9.7 are demonstrated operable within seven days of crane use and at least once per seven days thereafter. The T/S requirements are identical for Unit 1 and Unit 2 and the cranes and SFP are unit common.

C. Bases for the Current Requirements

Section 5.3 of the SER for NUREG-0612 provides the basis for the heavy load handling requirements at CNP. The requirements ensure adequate defense–in-depth for the handling of heavy loads near spent fuel and safe shutdown systems and result in a very low probability of unacceptable consequences.

The Seismic Category I qualification is needed because crane failure (either through load drop or failure of the crane and/or supporting structure) could cause or increase the severity of design basis accidents and/or result in an uncontrolled radiological release.

The basis of T/S 3/4.9.7 is to ensure that in the event of a load drop over spent fuel, the fuel handling accident analysis assumptions are maintained by preventing heavy loads from traveling over spent fuel assemblies. The postulated activity release assumed in this accident is limited to that contained in a single fuel assembly, and any possible distortion of fuel in the storage racks will not result in a critical array.

D. Need for Revision of the Requirement

The original Westinghouse Model 51 SGs will be replaced with Babcock & Wilcox (B&W) Model 51R SGs due to the degrading condition of the original SG tubes. The SG replacement will involve partial disassembly of the reinforced concrete enclosures surrounding the SG and implementation of a "two piece" replacement methodology. This approach includes cutting the SGs into an upper section (steam dome) and a lower section (SGLA). Both sections will be removed from containment. The steam domes will be refurbished and returned along with replacement SGLAs supplied by B&W.

The SG sections will be moved between the containment equipment hatch and crane bay using the auxiliary building cranes (see Figures 1 & 2). The load size and weights (Table 1), handling equipment and methods, and load path are similar to those approved for the Unit 2 SGRP in Amendment 100 to DPR-74 (Reference 1). However, since that approval was only applicable to the Unit 2 SGRP, another request must be made for Unit 1.

The existing CNP licensing basis includes the 55-ton radiation shields as the heaviest auxiliary building crane loads approved to be handled over the planned load path (Reference 2). Because the Unit 1 SG sections are heavier than those evaluated in the UFSAR, then pursuant to 10 CFR 50.59, the proposed activity may increase the probability of occurrence or the consequences of an accident. Therefore, NRC approval of the proposed load handling requirements is required.

E. Description of the Proposed Changes

I&M proposes to: 1) perform load handling for sixteen SG sections that are heavier than the loads previously evaluated for the proposed load path in the NRC's SER for CNP's heavy loads program; and 2) disengage the crane travel interlocks of T/S SR 4.9.7.1 to accommodate movement of the cranes at the southwest corner of the SFP. The T/S requirements are identical for Unit 1 and Unit 2 and the cranes and SFP are unit common.

F. Bases for the Proposed Changes

I&M has determined that the proposed changes associated with movement of SG sections are appropriate based on I) compliance with regulatory documents, II) seismic considerations, and III) comparison to approvals granted for the Unit 2 SGRP. Each of these is discussed in detail below.

I) Consistency with Regulatory Guidelines

NUREG-0612

The movement of SG sections in the auxiliary building will be performed in accordance with NUREG-0612 guidelines as approved for CNP. In the SER documenting the NRC staff review, the handling of heavy loads at CNP was determined to be acceptable and consistent with NUREG-0612. A point-by-point discussion of the proposed handling of SG sections with respect to the seven NUREG-0612 elements for an acceptable heavy loads program is provided below.

1. Safe Load Path

In the SER, the NRC concluded that there is a very low likelihood of a load drop when using NUREG-0612 guidelines. Primary reliance for safe load handling during the proposed activity is placed on the use of single-failure-proof cranes. However, as a conservative measure and for defense-in-depth, a review and walkdown of the load path through the auxiliary building has been performed to identify potential interactions with equipment important to safety.

The load drop evaluation includes conservative assumptions. The SG section is assumed to penetrate all intervening structures, systems, and components and stop at the building foundation. All components beneath the entire load path are assumed to lose functional capability, regardless of where along the path the drop occurs. The evaluation concludes that the integrity of the SFP would be maintained. This engineering judgement is based on the relative member sizes of the SFP wall and connecting adjacent floor structure. Although cracking and localized damage to the 5'-2" thick reinforced concrete pool wall would occur, the steel liner would remain intact due to significant ductility. The evaluation also concludes that, although equipment important to safety could be affected, the operating unit's safe shutdown and reactor decay heat removal requirements continue to be satisfied.

The UFSAR accident analysis for loss of spent fuel pool cooling specifies a minimum of 5.74 hours for the temperature in the pool to reach boiling assuming a worst case maximum heat load and a starting bulk pool temperature of 144°F. The evaluated load drop assumes both the loss of all spent fuel pool cooling and drain-down to the level of the suction lines. Further drainage is prevented by anti-siphon features in the design basis. Based on the

current stored spent fuel including recent core offload from both units, the time to boil during SG movements is estimated to be in approximately 20 hours for a starting bulk pool temperature of 144°F. Sufficient time exists and procedures are in place to restore cooling capability or by replacing water that could be lost to boil-off, thus preventing damage to the stored fuel elements.

Administrative controls will be incorporated in the load handling procedures that ensure the crane travel restrictions of T/S 3.9.7 are met while the crane travel interlocks are bypassed. The use of single-failure-proof cranes, a NUREG-0612 alternative to travel restrictions over the SFP, provides defense-in-depth while the administrative controls are in place.

2. Load Handling Procedures

Load handling procedures will be provided that are specific to the upper and lower SG sections. Load paths will be defined within the load handling areas, and qualified personnel will direct the crane operator to ensure conformance to the prescribed load path. These procedures will also address equipment identification, inspection and acceptance criteria, step-by-step load handling sequences, and special precautions.

3. Operator Training

The station trains crane operators using maintenance skills training lesson plans as the basis for training and qualification. The lesson plans include the requirements of ANSI B30.2, Chapter 2-3, "Conduct of Operators." Station-qualified crane operators used for the SG section lifts will receive both classroom and hands-on training based on these lesson plans. Training will include orientation with the specific procedures to be used for the SG section lifts prior to beginning the corresponding crane operations.

4. Special Lifting Devices

The CNP heavy loads program includes the use of special lifting devices and requires design, fabrication, and testing that provide load handling reliability consistent with that of ANSI N14.6-1978. Stress design factors specified by ANSI N14.6-1978, Section 3.2.1, are 3 for minimum yield and 5 for ultimate strength. Dynamic effects associated with the crane are not considered in the design of special lifting devices (Reference 6). The NRC previously found this approach acceptable for CNP (Reference 2).

The special lifting devices used for the Unit 2 SGRP will be used for Unit 1. The devices are designed with margins consistent with ANSI N14.6-1978, Section 3.2.1, (with dual load paths) or 6.2.1 (single load path with increased stress factors). Section 6.2.1 requires a stress factor of 6 for minimum yield and 10 for ultimate strength. Consistent with the NRC approved approach for CNP, the design of these special lifting devices did not consider

dynamic effects. Prior to use at Unit 1, the special lifting devices will be inspected to verify there has been no significant corrosion or structural distress and tested in accordance with ANSI N14.6-1978.

5. Lifting Devices (not specially designed)

Standard lifting devices used for the movement of the SG sections will be selected and used in accordance with the guidelines of ANSI B30.9-1996, "Slings." Dynamic effects associated with the crane movement are not considered in the design of lifting devices (Reference 6). The NRC previously found this approach acceptable for CNP (Reference 2).

6. Cranes - Inspection, Testing, and Maintenance

The auxiliary building cranes at CNP are inspected, tested and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976. In preparation for the planned Unit 1 SGRP, the cranes will be inspected to confirm consistency with the single-failure-proof guidelines of NUREG-0612 and NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants."

7. Cranes – Design

Both auxiliary building cranes were determined to be acceptable for the following requirements: Crane Manufacturer's Association of America "Specifications for Electric and Overhead Traveling Cranes," CMAA-70 (1975), and ANSI B30.2-1976 (Reference 1).

NUREG-0554

Both the auxiliary building cranes are designed to meet the single-failure-proof criteria of NUREG-0554. The west auxiliary building crane has a design rated load (DRL) capability of 150 tons and a maximum critical load (MCL) capability of 55 tons. The east auxiliary building crane has a DRL of 150 tons and MCL of 60 tons. The two auxiliary building cranes were modified for tandem configuration as a lift system to handle the eight lifts of the Unit 2 SGLAs. The tandem configuration retains the single-failure-proof features of the individual cranes and provides a DRL of 300 tons (Reference 1). Therefore, the lifts will be performed in accordance the single-failure-proof criteria of NUREG-0554.

II) Seismic Considerations

The SG sections are considered critical loads per NUREG-0554 because they are brought through the auxiliary building in the vicinity of the SFP. For these loads, the design basis seismic capability of the load handling equipment and structures is exceeded. However, the probability of exceeding a design basis seismic event (an SSE) during the movement of the SGs is estimated to be 5×10^{-7}. This is based on seismic probabilities reported in NUREG-1488, "Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the

Rocky Mountains," Draft Report for Comment, 10/93 (mean value) and estimated lift times of 3 hours for a steam dome and 6 hours for a SGLA.

Notwithstanding the highly unlikely event of an SSE during the movement of the SG sections, I&M has studied the design adequacy of the auxiliary building cranes and structure for the tandem crane 300 ton DRL with an SSE (References 8 and 9). The engineering study is not intended to seismically qualify or provide design basis documentation for the crane or supporting structure for these conditions. It is an engineering study that demonstrates that the loads are safely retained even in the event of an SSE.

The engineering study follows design basis methodology except in two aspects. First, the pendulum effect of the lifted load was incorporated into the analysis, thereby determining realistic effects of seismic accelerations of the load on the crane and supporting structure. Second, seismic vertical response spectra were generated instead of the design basis assumption of 2/3 of the horizontal spectra at the crane rail elevation. A mass and vertical stiffness mathematical model was developed that follows the criteria and methodology described in the UFSAR for the development of the design basis seismic horizontal response spectra. The design basis includes conservatism because it ignores vertical soil-structure interaction and the significantly stiffer, nearly seismically rigid, vertical dynamic response of the auxiliary building. Using calculated seismic vertical response spectra produces a large reduction in the maximum spectral amplitude (seismic induced "g" forces) compared to the design basis value.

The engineering study relies on existing auxiliary building and auxiliary building crane design basis calculations for its conclusion that the SG loads would be safely retained in the event of a concurrent SSE. Design basis calculations are currently being reviewed as part of CNP's restart effort to improve design basis documentation. It is anticipated that this review will not impact the engineering study's conclusion. The design basis review in support of this engineering study will be completed prior to movement of the SG sections through the auxiliary building.

The engineering study determined that the resultant wheel loads associated with the tandem crane, a 300 ton load and an SSE are bounded by those previously evaluated in the existing design basis for CNP. The design basis establishes the appropriate margin of safety between the design and ultimate failure limits in accordance with the structural code of record. Because the SG sections' wheel loads are less than those evaluated in the design basis as being safely retained during the SSE, this activity does not adversely impact margin of safety. Therefore, the MCL is considered to be equal to the DRL for the Unit 1 SGRP lifts over 55 tons, and the proposed activity satisfies the guidelines of NUREG-0554.

The runway beam system used for moving the loads through the containment equipment hatch uses carts with guided rollers, and is of simple design. The structure is temporary and is supported by the containment equipment hatch and the auxiliary building and containment building floor slabs. The runway beam system has been evaluated for the static and dynamic loads imposed by the SG sections, cart, and rigging. Similar to the Unit 2 SGRP, the loaded

runway beam system has not been evaluated for seismic loads. However, the design provides a defined travel path that is located within an evaluated auxiliary building load handling area. Consistent with NUREG-0612 safe load path guidelines, this minimizes the potential for impacting equipment important to safety and ensures that the requirements for safe shutdown, decay heat removal, and SFP cooling continue to be met in the event of a load drop.

III) Comparison of Proposed Unit 1 SG Load Handling to Previously Performed Unit 2 SGRP Load Handling

In Amendment 100 to DPR-74, the NRC approved Unit 2 SGRP lifts of heavy loads in excess of loads previously evaluated. As part of the Unit 2 SGRP, modifications and associated analyses were performed to support the handling of SG sections that are also applicable to the Unit 1 SGRP. Attachment 6 provides a detailed review of these items. Evaluations and inspections will confirm prior to the Unit 1 SGRP that the Unit 2 requirements remain satisfied.

The Unit 2 SGRP demonstrated that the methods, equipment, and procedures used during that project for handling the Unit 2 SG sections were appropriate and effective. In addition to the 125% load test of the tandem crane, the 16 lifts of the Unit 2 SG sections were successfully performed. The Unit 1 SGRP will closely follow the Unit 2 program, implementing changes only where an overall enhancement in load handling safety is achieved.

Because the Unit 1 SGRP uses the same two-piece replacement methodology as used for Unit 2, the types of heavy loads involved are the same. A comparison between Units 1 and 2 of the number and tonnage of lifts that exceed 55 tons is shown in Table 1. The reduction in the number of loads heavier than 55 tons for Unit 1 (to only the SG sections) will be accomplished by limiting the size of the SG enclosure concrete sections to be removed and transported through the auxiliary building.

The handling of the SGLAs during the Unit 2 SGRP required a rotation approaching 180 degrees at the containment equipment hatch exit/entry to establish the proper orientation relative to movement along the safe load path through the auxiliary building. This caused a portion of the SGLA to pass over the west end of the SFP. This will not be necessary for Unit 1 due to the SGLA orientation coming out of the containment equipment hatch in relation to the SFP. Therefore, no portion of the SG sections will pass over any part of the SFP.

G. Summary of Bases for Proposed Changes

The movement of SG sections in the auxiliary building for the Unit 1 SGRP will involve loads, methods and equipment, and load path similar to those employed during the Unit 2 SGRP. The auxiliary building cranes feature single-failure-proof hoisting and braking systems to minimize the risk of load drop. Since the SG lifts satisfy the guidelines of NUREG-0612 and the single-failure-proof design features of NUREG-0554, the probability of a load drop is very

remote. In addition, an engineering study has demonstrated that the load is safely retained even in the event of a SSE.

H. Impact on Previous Submittals

No previous submittals affect the proposed changes that are submitted in this request. If any future submittals affect these changes, then I&M will coordinate with the NRC Project Manager to ensure proper control when the associated license amendment requests are approved.

I. References

1. Letter from NRC to I&M, "Safety Evaluation Related to Amendment No. 100 to Facility Operating License No. DPR-74, D.C. Cook Nuclear Plant, Unit 2, Docket No. 50-316," dated March 8, 1988.

2. Letter from NRC to I&M, "Safety Evaluation for Heavy Loads," dated September 20, 1983.

3. Whiting Corporation, "Crane Seismic Report – Cask Handling Crane, 150 Ton Capacity, Existing Bridge S/N 10038, New Trolley S/N 12124," dated August 21, 1987.

4. Whiting Corporation, "Crane Seismic Report - Cask Handling Crane, 150/20 Ton Capacity, S/N 12115," dated September 9, 1987.

5. D.C. Cook Nuclear Plant Calculations DC-D-3053S-192, "Auxiliary Building Crane Girder Investigation for Steam Generator Replacement," Books I (Revision 2), II (Revision 1) and III (Revision 0); and DC-D-3053S-193, "Auxiliary Building Structure Investigation for Steam Generator Replacement," Revision 0.

6. Letter from I&M to NRC, "Control of Heavy Loads – Phase I.b," AEP:NRC:0514E, dated September 29, 1982.

7. Attachment 1 to letter from I&M to NRC, "Steam Generator Repair Report," AEP:NRC:0980J, dated February 18, 1988, Revision 6.

8. Stevenson & Associates Report, "Evaluation of Seismic Response of Auxiliary Building Cranes Using Revised Vertical Response Spectra w/ Full Load & SSE," Revision 0, dated July 6, 1999.

9. Stevenson & Associates Calculation 98Q3075-1, "Development of Vertical In-Structure Seismic Response Spectra – D.C. Cook Nuclear Plant Auxiliary Building at Crane Support Level," Revision 0, dated July 2, 1999.

10. NRC Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety Related Equipment," dated April 11, 1996.

11. NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," dated July 1980.

12. NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," dated May 1979.

13. ANSI B30.2-1976, "Overhead and Gantry Cranes."

14. ANSI N14.6-1978, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials."

15. ANSI B30.9-1971, "Slings."

16. Electric Overhead Crane Institute Specification (EOCI) #61, "Electric and Overhead Traveling Cranes," 1967.

17. Crane Manufacturer's Association of America CMAA-70, "Specifications for Electric and Overhead Traveling Cranes," 1975

TABLE 1

Comparison of Unit 2 SGRP and Unit 1 SGRP
Auxiliary Building Crane Lifts Over 55 Tons
(Weights Include Rigging)

Previous SGRP			Planned SGRP	
Est. Weight (tons)	Number of Items	Item	Est. Weight (tons)	Number of Items
72	4	SG Enclosure – Front Roof Concrete Section	N/A	N/A
62	4	SG Enclosure – Back Roof Concrete Section	N/A	N/A
118	4	Old SG - Upper Section	120	4
270	4	Old SG - Lower Section	270	4
118	4	Refurbished SG – Upper Section	119	4
277	4	New SG - Lower Section	265	4
Total:	24		Total:	16

Steam Generator Removal and Replacement - Upper Section

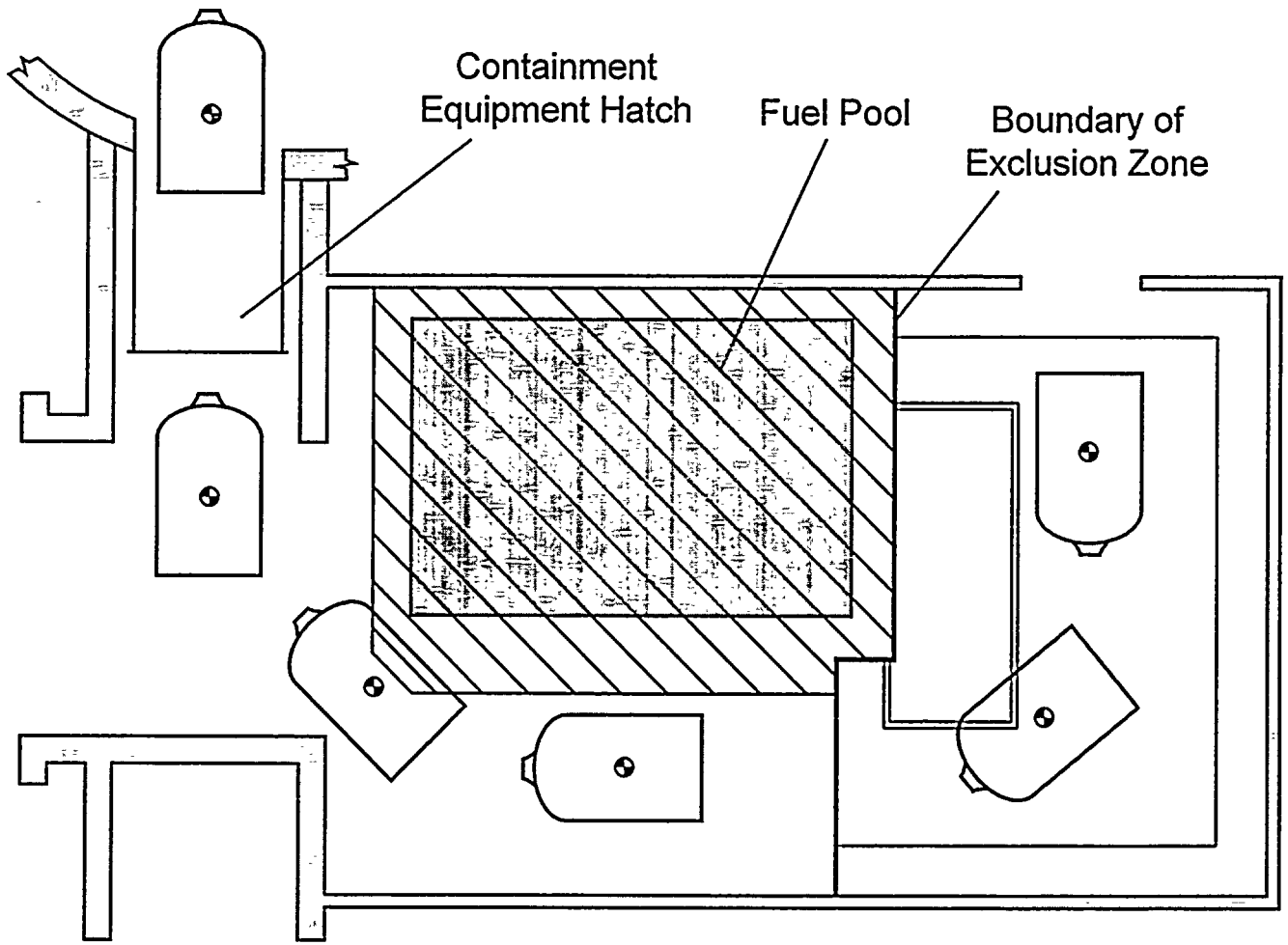

Figure 1

Steam Generator Removal and Replacement - Lower Section

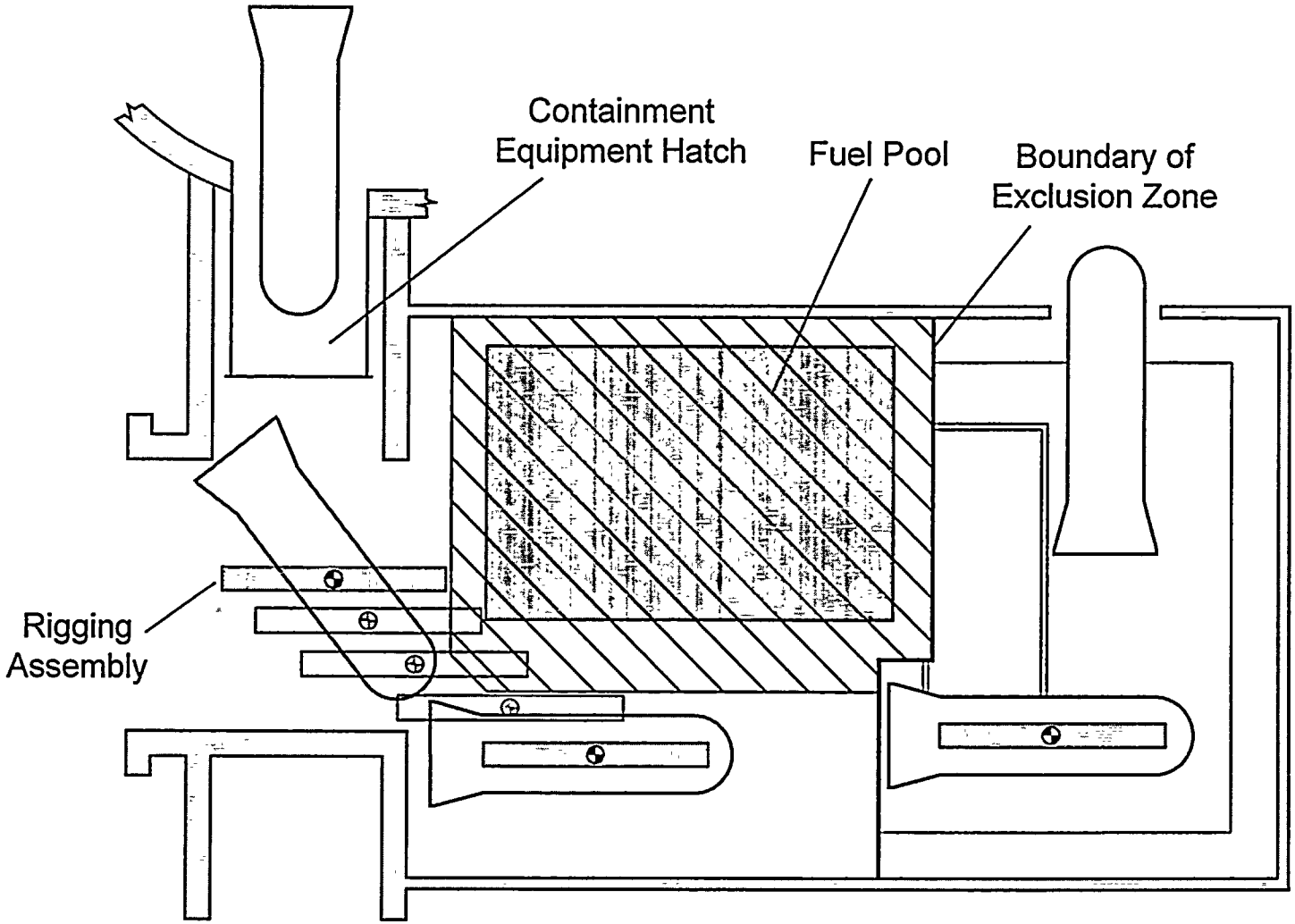

Figure 2