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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Provides Phase II.a of util response to Sections 2.2 & 2.3 of Encl 3 to NRC 801222 ltr re control of heavy loads.

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August 27, 1982
AEP:NRC:00514A

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
Control of Heavy Loads - Phase II.a

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

This letter and its Attachments are Phase II.a of our response to Enclosure No. 3 to Mr. D. G. Eisenhut's letter of December 22, 1980. Phase II.a responds to Sections 2.2 and 2.3 of Enclosure No. 3.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

R. S. Hunter
Vice President

RSH/sag
Attachment

cc: John E. Dolan - Columbus
M. P. Alexich
R. W. Jurgensen
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Charnoff
Joe Williams, Jr.
Resident Inspector at Cook Plant

A033

ATTACHMENT TO AEP:NRC:0514A

DONALD C. COOK NUCLEAR PLANT

CONTROL OF HEAVY LOADS, NUREG-0612

2.2 SPECIFIC REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS OPERATING IN THE VICINITY OF FUEL STORAGE POOLS.

NUREG-0612, Section 5.1.2, provides guidelines concerning the design and operation of load-handling systems in the vicinity of stored, spent fuel. Information provided in response to this section should demonstrate that adequate measures have been taken to ensure that in this area, either the likelihood of a load drop which might damage spent fuel is extremely small, or that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG-0612, Section 5.1, Criteria I through III.

2.2-1 "Identify by name, type, capacity, and equipment designator, any cranes physically capable (i.e., ignoring interlocks, moveable mechanical stops, or operating procedures) of carrying loads which could, if dropped, land or fall into the spent fuel pool."

Response:

a) Auxiliary Building Crane
Whiting Corporation
Bridge
150T/20T Capacity

b) New and Spent Fuel Handling Crane
Dwight Foote Company
Name Plate: 4000 lb Distributed Load on Bridge
2000 lb Hoist Capacity-Each (Quantity-2)

2.2-2 "Justify the exclusion of any cranes in this area from the above category by verifying that they are incapable of carrying heavy loads or are permanently prevented from movement of the hook centerline closer than 15 feet to the pool boundary, or by providing a suitable analysis demonstrating that for any failure mode, no heavy load can fall into the fuel-storage pool."

Response:

The New and Spent Fuel Handling Crane is a bridge crane designed for the shuffling, removal and replacement of new, partially spent, and spent fuel assemblies, one at a time. In either Unit, the

weight of the fuel assemblies including the fuel handling tool, does not exceed 2,000 lbs. Because of the crane's bridge construction and its intrinsic design purpose, the crane has never been used or is intended to be used in the handling of Heavy Loads. Lastly, the fuel handling accident in the Auxiliary Building which could conceivably occur as a result of the crane maloperation, has already been addressed as part of the Cook Plant's licensing basis (FSAR, Unit 1, Section 14.2.1.1). Therefore, this crane is not discussed in Section 2.2-4.

The Auxiliary Building Crane is excluded because:

a) Limit switches and relay logic are used to prevent the Auxiliary Building Crane from moving loads over the Spent Fuel Pool. Procedure No. 12 MHP 4030 STP.015 "Auxiliary Building Crane Interlock Verification - Fuel Handling", assures the proper functioning of these limit switches within seven days prior to crane use.

b) Procedure No. 12 MHP5021.001.036, "Control of Heavy Loads in Auxiliary Building", provides instructions for safe and proper handling of heavy loads in this area. All heavy loads are or will be transported with the centerline of the load bearing hook, 15' or greater from the edge of the spent fuel pool with the following exceptions:

> The unloaded 150T load block may be positioned over the edge of the Spent Fuel Pool during the time new fuel is being handled with the small hook, 20T capacity. This item is discussed further in our response to section 2.2-4-a.
>
> Transporting loads through the Auxiliary Building utilizing the small hook, 20T capacity, positions the unloaded 150T load block approximately 4' from the southwest corner of the pool.
>
> Special procedures in conformance with the intent of NUREG 0612 will be written if other exceptions are required.

c) The Auxiliary Building Crane hooks are prevented from two-blocking by the use of a hoist geared limit switch and a paddle limit switch. The geared limit switch is the primary method used to stop the hoisting operation upon reaching end of travel. The limit switch operates directly from the cable takeup drum.

Backup to the geared limit switch is the paddle limit switch. This switch operates directly from the position of the blocks. When the lower block reaches end of travel, the paddle limit switch will de-energize the hoist motor. The geared limit

switch and the paddle limit switch are wired in series in the motor control circuit so either switch can stop the motor.

The potential load drop of the unloaded 150T load block (3 Tons), is extremely unlikely. The Auxiliary Building Crane Main hoist rope is 1¼" dia (6x37) regular lay special Improve/Plow Steel crane rope and has a breaking strength of 66.1 Ton, 12 parts of rope. The design safety factor of the line load, 150T, plus the block weight, 3T, is 5.18 Additionally a modification has been approved to provide three physically separated crane power cut-out switches for emergency use. This will enable the crane to be stopped at these locations by personnel other than the crane operator. The location of these switches is shown on the attached Figure 1 (Drawing 12-5170-3).

Based upon the above-mentioned considerations as well as on the plant arrangements discussed in our letter of June 18, 1982, (AEP:NRC:0514C), it is concluded that the likelihood of a load drop that may damage spent fuel, spent fuel storage racks and/or the spent fuel storage pool is extremely small.

Although the Auxiliary Building Crane is considered excludable, it has been addressed in Section 2.2-4.

2.2-3 "Identify any cranes listed in 2.2-1, above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6 or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1."

Response:

NONE

2.2-4 "For cranes identified in 2.2-1, above, not categorized according to 2.2-3, demonstrate that the criteria of NUREG-0612, Section 5.1, are satisfied. Compliance with Criterion IV will be demonstrated in response to Section 2.4 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the spent fuel area and your determination of compliance. This response should include the following information for each crane:

a. Which alternatives (e.g., 2, 3, or 4) from those identified in NUREG-0612, Section 5.1.2. have been selected."

Response:

The Auxiliary Building Crane complies with Alternative 2, of NUREG-0612, Section 5.1.2. This compliance is outlined below:

NUREG-0612, Section 5.1.2 (2) states,

(a) "Mechanical stops or electrical interlocks should be provided that prevent movement of the overhead crane load block over or within 15 feet horizontal (4.5 meters) of the spent fuel pool. These mechanical stops or electrical interlocks should not be bypassed when the pool contains "hot" spent fuel, and should not be bypassed without approval from the shift supervisor (or other designated plant management personnel). The mechanical stops and electrical interlocks should be verified to be in place and operational prior to placing "hot" spent fuel in the pool".

Response:

The discussion in Section 2.2-2 outlines the types and numbers as well as the method of verifying interlocks (Procedure No. 12 MHP 4030 STP.015). Interlocks are bypassed for one specific case as outlined under (b) below.

(b) "The mechanical stops or electrical interlocks of 5.1.2(2)(a) above should also not be bypassed unless an analysis has demonstrated that damage due to postulated load drops would not result in criticality or cause leakage that could uncover the fuel".

Response:

There is one case in which the interlocks are bypassed; this is done to move new fuel assemblies from the new fuel vault to the refueling canal using the 20T hook. The load path is as follows:

(1) The Auxiliary Building Crane interlocks are bypassed. This action is noted in the nonconforming equipment log in the Control Room.

(2) The new fuel assembly is lifted out of the new fuel storage vault and moved west until it is over the fuel transfer canal and then moved to and placed in the new fuel elevator.

(3) The new fuel elevator lowers the fuel assembly to the bottom of the transfer canal.

(4) The New and Spent Fuel Handling Crane lifts the new fuel assembly and moves it to the designated storage location.

(5) After all new fuel has been placed in the storage racks, the

interlocks are replaced and this action reported and entered in the nonconforming equipment log.

(6) If the new fuel transfer operation is suspended for any reason, the 20T hook will be moved to an approved position and the interlocks replaced.

During this movement of the new fuel, Procedure No. 12 MHP4050.FDF.011, "Auxiliary Building Crane Operating Instructions" will be in effect.

Any load drop that could happen during this movement is considered bounded by the spent fuel accidents already docketed in the FSAR for the following reasons:

1) a new fuel assembly instead of a spent fuel assembly is being moved.

2) the 20T hook weighs less than 1000 lbs

(c) "To preclude rolling if dropped, the cask should not be carried at a height higher than necessary and in no case more than six (6) inches (15 cm) above the operating floor level of the refueling building or other components and structures along the path of travel".

Response:

The D. C. Cook Plant does not currently ship spent fuel and therefore does not have a specific spent fuel cask handling procedure. Prior to spent fuel cask handling a procedure will be prepared which will be both consistent with FSAR commitments and responsive to the intent of NUREG-0612.

(d) "Mechanical stops or electrical interlocks should be provided to preclude crane travel from areas where a postulated load drop could damage equipment from redundant or alternate safe shutdown paths".

Response:

If upon completion of the analysis required by Section 2.4 such interlocks are necessary, we will incorporate the interlocks deemed necessary.

(e) "Analyses should conform to the guidelines of Appendix A".

Response:

This will be complied with.

2.2-4-b. "If Alternative 2 or 3 is selected, discuss the crane motion limitation imposed by electrical interlocks or mechanical stops and indicate the circumstances, if any, under which these protective devices may be bypassed or removed. Discuss any administrative procedures invoked to ensure proper authorization of bypass or removal, and provide any related or proposed technical specification (operational and surveillance) provided to ensure the operability of such electrical interlocks or mechanical stops."

Response:

See the description of the interlocks as discussed under Sections 2.2-2 and 2.2-4-a. Technical Specification 3.9.7 (for Units 1 and 2) is attached.

2.2-4-c. "Where reliance is placed on crane operational limitations with respect to the time of the storage of certain quantities of spent fuel at specific post-irradiation decay times, provide present and/or proposed technical specifications and discuss administrative or physical controls provided to ensure that these assumptions remain valid."

Response:

NONE

2.2-4-d. "Where reliance is placed on the physical location of specific fuel modules at certain post-irradiation decay times, provide present and/or proposed technical specifications and discuss administrative or physical controls provided to ensure that these assumptions remain valid."

Response:

NONE

2.2-4-e. "Analyses performed to demonstrate compliance with Criteria I through III should conform to the guidelines of NUREG-0612, Appendix A. Justify any exception taken to these guidelines, and provide the specific information requested in Attachment 2, 3, 4, as appropriate, for each analysis performed."

Response:

No load drop is postulated in the spent fuel pit that exceeds the bounds of the spent fuel accidents already analyzed.

2.3 SPECIFIC REQUIREMENTS OF OVERHEAD HANDLING SYSTEMS OPERATING IN THE CONTAINMENT.

NUREG-0612, Section 5.1.3, provides guidelines concerning the design and operation of load-handling systems in the vicinity of the reactor core. Information provided in response to this section should be sufficient to demonstrate that adequate measures have been taken to ensure that in this area, either the likelihood of a load drop which might damage spent fuel is extremely small, or that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG-0612, Section 5.1, Criteria I through III.

2.3-1 "Identify by name, type, capacity and equipment designator, any cranes physically capable (i.e., taking no credit for any interlocks or operating procedures) of carrying heavy loads over the reactor vessel.

Response:

Each containment has one:

a) Containment Building Polar Crane, Polar Bridge, 250/35 Tons, Whiting Corporation Serial No's 10039 and 10040.

b) Manipulator Crane, Rectilinear Bridge, 3,000 lbs, Stearns-Roger.

2.3-2 "Justify the exclusion of any cranes in this area from the above category by verifying that they are incapable of carrying heavy loads, or are permanently prevented from the movement of any load either directly over the reactor vessel or to such a location where in the event of any load-handling-system failure, the load may land in or on the reactor vessel".

Response:

The Manipulator Crane is a bridge crane designed for the shuffling, removal and replacement of new, partially spent, and spent fuel assemblies, one at a time. These fuel assemblies are handled by a gripper mechanism at the end of the retractable mast on the cranes. This gripper mechanism is designed to handle only fuel assemblies and is not capable of lifting Heavy Loads. Although the gripper rating is 3000 lb, interlocking circuitry limits upward movement of the mast to 2250 lb. The manipulator crane also has an auxiliary wire rope electric hoist of 3000 lb capacity. This hoist is used to handle miscellaneous refueling items all of which are lighter than a fuel assembly. For reasons similar to those provided in our response to Section 2.2-2 we do not discuss these cranes in Section 2.3-4.

2.3-3 "Identify any cranes listed in 2.3-1, above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1."

Response

NONE

2.3-4 "For cranes identified in 2.3-1, above, not categorized according to 2.3-3, demonstrate that the evaluation criteria of NUREG-0612, Section 5.1, are satisfied. Compliance with Criterion IV will be demonstrated in your response to Section 2.4 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the containment and your determination of compliance. This response should include the following information for each crane:

a. "Where reliance is placed on the installation and use of electrical interlocks or mechanical stops, indicate the circumstances under which these protective devices can be removed or bypassed and the administrative procedures invoked to ensure proper authorization of such action. Discuss any related or proposed technical specification concerning the bypassing of such interlocks."

Response:

The only interlocks provided in the Containment Building Polar Crane main and auxiliary hoists are ones that prevent it from two-blocking by the use of a hoist geared limit switch and a paddle limit switch. The geared limit switch is the primary method used to stop the hoist operation and the paddle limit switch is the back-up. If it is deemed necessary to by-pass the limit switches to complete a load lift, authorization of the maintenance supervisor is required and special care is taken to prevent two-blocking. Containment Building Polar Crane Operating Instructions, Procedure No. 12 MHP 4050 FDF .025, defines the manner in which the Polar Crane is to be operated. See our response to c. below.

The modification discussed in item 2.2-2-c also covers the Polar cranes, with the installation of two switches in each containment.

b. "Where reliance is placed on other, site-specific considerations (e.g., refueling sequencing), provide

present or proposed technical specifications and discuss administrative or physical controls provided to ensure the continued validity of such considerations."

Response:

NONE

c. "Analyses performed to demonstrate compliance with Criteria I through III should conform with the guidelines of NUREG-0612, Appendix A. Justify any exception taken to these guidelines, and provide the specific information requested in Attachment 2, 3, or 4, as appropriate, for each analysis performed."

Response:

The Containment Buildings are equipped with prompt, automatically actuated containment isolation systems. These isolation systems are in operation during core alterations. The containment isolation system and its functionability were previously described in our letters dated March 21, 1977 (J. Tillinghast of Indiana & Michigan Power Company to B. C. Rusche of NRC), June 17, 1977 (J. Tillinghast of I&MPCo. to E. G. Case of NRC) and September 30, 1977 (J. Tillinghast of I&MPCo. to E. G. Case of NRC) and as amended in our letter No. AEP:NRC:0642 dated December 7, 1981. The information on the behavior of the containment isolation system under the condition of a fuel handling accident is part of the Cook Plant FSAR.

An evaluation was done of the various load handling configurations inside containment. The results of this evaluation, given in Table 2.3-4-c, show that no credible load drops could occur which would violate Acceptance Criteria I through III.

This evaluation combined with the prompt containment isolation system, polar crane design features and polar crane operating procedures yield sufficiently low probabilities of adverse effects arising from a dropped heavy load. Thus assurance of adequate protection is provided.

Dropped Heavy Loads in Containment Evaluation

TABLE 2.3-4-c
(AEP:NRC:00514A)

Heavy Load	Weight (lbs)	Max Potential height of Drop (ft)	Max Impact Velocity (1) (ft-sec)	Max Potential Energy (1) (ft-lbs)	Fuel Assembly Protection during Heavy Lift	Acceptance Criteria (2) I Release of Radioactive Material	II Keff : increase over 0.95	III Reactor Coolant Boundary Damage	Comments (Basis)
RESAR 414* RV Head Assembly and Lift Fixture	318,673	case 1 – 14** case 2 through 5 – 28-1/2** case 6 – 24-1/2**	30.03 42.84 39.72	4.46×10^6 9.08×10^6 7.81×10^6	24-1/2 ft of water over RV Flange	No	No	No	Subject of Westinghouse WCAP – 9198
Missile Shield Blocks	200,000	To top of CRDM structure – 1	8.02	2.0×10^5	RV Head On Vessel	No(A)	No(A)		Maintenance procedures 12 MHP 4050 FDF .026
		To top of RV Flange – 32-1/2	45.75	6.5×10^6	RV Head On Vessel	No(A)	No(A)		
Lower Internals	300,000	To inplace position impact RV Flange – 32	45.40	9.6×10^6	No Fuel In Vessel	Not Possible	Not Possible	No Immediate Safety Consequence	No fuel in Reactor vessel when lower internals are handled.
Upper Internals	116,000	On Guide studs – 16 Off Guide studs to vessel Flange – 4-1/2	32.10 17.02	1.86×10^6 5.22×10^5	16ft of water over RV Flange 4-1/2ft of water over RV	No(D) No(C)	No(C)	No(B) No(B)	
Cavity Bulkhead Sections	80,000	To top of RV Flange – 32-1/2	45.75	2.6×10^6	RV Head On Vessel	No(A)	No(A)	No(B)	Maintenance procedures 12 MPH 4050 FDF .026
RC Pump Motor	76,000	To top of RV Flange – 32-1/2	45.75	2.47×10^6	RV Head on Vessel	No(A)	No(A)	No(B)	RC Pumps are only removed when missile shields are in place.
Polar Crane Main Load Block	12,500	To top of RV Flange – 105	82.23	1.31×10^6	24ft of water over RV Flange	No(C)	No(C)	No(B)	Potential Load Drop of unloaded 250T Load block, 6.25 T., is extremely small
		To top of Active Core – 117-1/2	86.99	1.47×10^6	36ft of water over Fuel Assy's	No(D)		No(B)	
Inservice Inspection Tool	3,600	To top of RV Flange – 32-1/2	45.75	1.17×10^5	24ft of water over RV Flange	No(C)	No(C)	No(B)	
		To top of Active core – 45	53.83	1.62×10^5	36ft of water over Fuel Assy's	No(D)		No(B)	

Notes
(1) Conservative valves – Fluid drag disreguarded
(2) Acceptance Criteria from NUREG – 0612, "Control of Heavy Loads at Nuclear Power Plants", Paragraph 5.1

* This Heavy Load is from WCAP-9198. Since the D. C. Cook R.V. Head weighs 297,000lbs and the heights are similar, this load is bounding

** These cases are from WCAP-9198.

A. RV Head Protects Fuel
B. Potential Drop Loadings Less than WCAP – 9198
C. Dropped Load does not impact Fuel
D. Rapid containment isolation Limits Release.

REFUELING OPERATIONS

CRANE TRAVEL - SPENT FUEL STORAGE POOL BUILDING*

LIMITING CONDITION FOR OPERATION

3.9.7 Loads in excess of 2500 pounds shall be prohibited from travel over fuel assemblies in the storage pool. Loads carried over the spent fuel pool and the heights at which they may be carried over racks containing fuel shall be limited in such a way as to preclude impact energies over 24,240 in.-lbs., if the loads are dropped from the crane.

APPLICABILITY: With fuel assemblies in the storage pool.

ACTION:

With the requirements of the above specification not satisfied, place the crane load in a safe condition. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.7.1 Crane interlocks and physical stops which prevent crane travel with loads in excess of 2500 pounds over fuel assemblies shall be demonstrated OPERABLE within 7 days prior to crane use and at least once per 7 days thereafter during crane operation.

4.9.7.2 The potential impact energy due to dropping the crane's load shall be determined to be $\leq$ 24,240 in.-lbs. prior to moving each load over racks containing fuel.

*Shared system with D.C. Cook - Unit 2.

REFUELING OPERATIONS

CRANE TRAVEL - SPENT FUEL STORAGE POOL BUILDING*

LIMITING CONDITION FOR OPERATION

3.9.7 Loads in excess of 2,500 pounds shall be prohibited from travel over fuel assemblies in the storage pool. Loads carried over the spent fuel pool and the heights at which they may be carried over racks containing fuel shall be limited in such a way as to preclude impact energies over 24,240 in.-lbs., if the loads are dropped from the crane.

APPLICABILITY: With fuel assemblies in the storage pool.

ACTION:

With the requirements of the above specification not satisfied, place the crane load in a safe condition. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.7.1 Crane interlocks and physical stops which prevent crane travel with loads in excess of 2,500 pounds over fuel assemblies shall be demonstrated OPERABLE within 7 days prior to crane use and at least once per 7 days thereafter during crane operation.

4.9.7.2 The potential impact energy due to dropping the crane's load shall be determined to be $\leq$ 24,240 in.-lbs. prior to moving each load over racks containing fuel.

*Shared system with D. C. COOK - UNIT 1

RFC 12 1513

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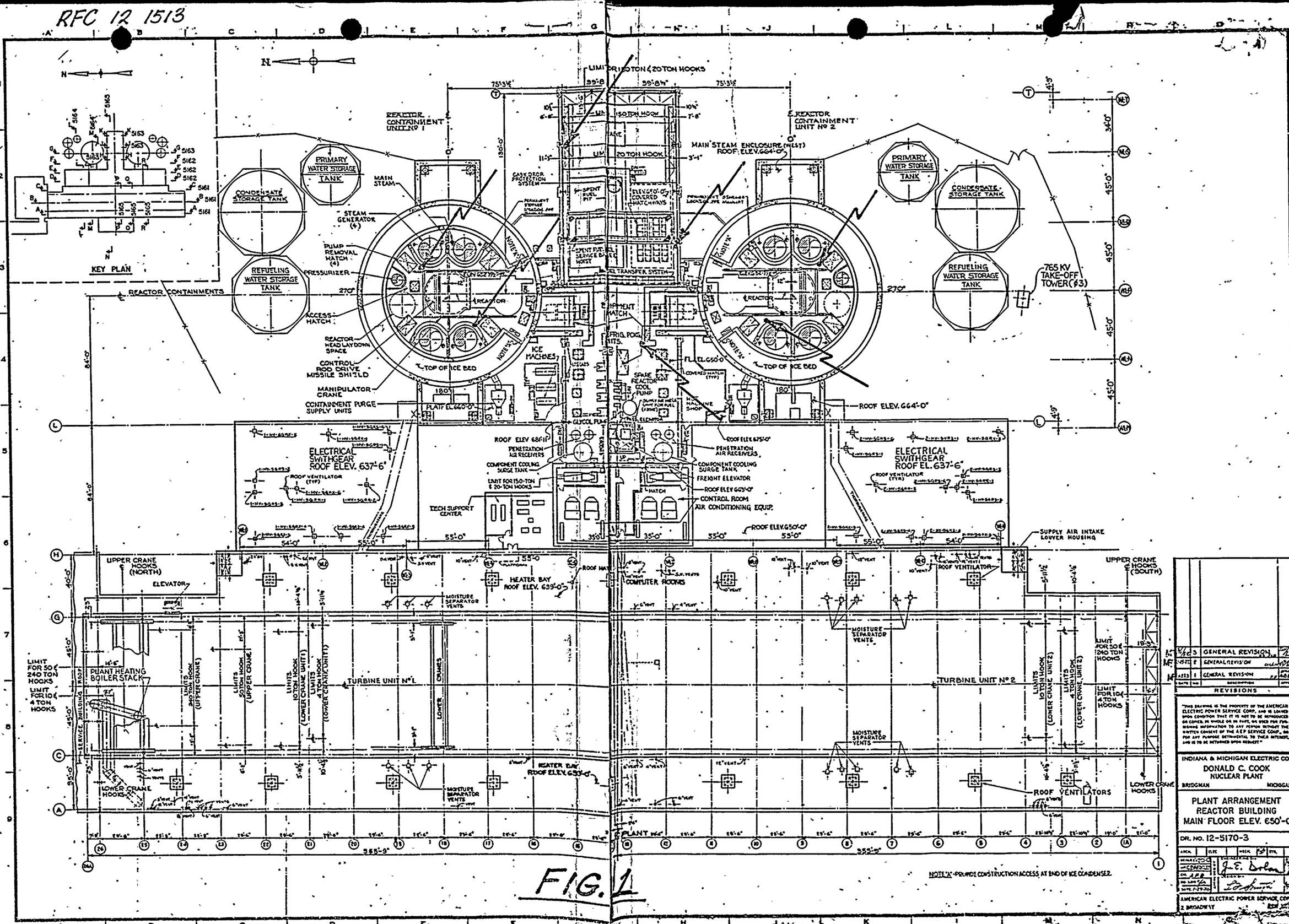

FIG. 1

3	9/16/81	GENERAL REVISION	
2	5/27/81	GENERAL REVISION	
1	4/23/81	GENERAL REVISION	
NO.	DATE	DESCRIPTION	APPD.

REVISIONS

INDIANA & MICHIGAN ELECTRIC CO.
DONALD C. COOK NUCLEAR PLANT
BRIDGMAN MICHIGAN

PLANT ARRANGEMENT REACTOR BUILDING MAIN FLOOR ELEV. 650'-0"

DR. NO. 12-5170-3

ARCH.	CIV.	MECH.	ELEC.
MANAGER			
PROJ. ENGR.			
DES. ENGR.			
DR. CHK.			
DES. CHK.			
DATE			

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY