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AUTH.NAME AUTHOR AFFILIATION
EURY,L.W. Carolina Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards addl info per NRC 821210 request re Generic Ltr reactor vessel level instrumentation sys completed.Sys installation 30% complete.

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CP&L

Carolina Power & Light Company

SERIAL: LAP-83-83

April 26, 1983

Mr. Darrell G. Eisenhut, Director
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
INADEQUATE CORE COOLING INSTRUMENTATION
SYSTEM (GENERIC LETTER 82-28)

Dear Mr. Eisenhut:

Carolina Power & Light Company (CP&L) has received your request for additional information dated December 10, 1982, regarding the Inadequate Core Cooling (ICC) Instrumentation System for the H. B. Robinson Steam Electric Plant Unit No. 2 (HBR2). Your requested items, with our response to each item, are as follows:

NRC Request Item No. 1

. . . identify . . . the design for the reactor coolant inventory system selected and submit . . . detailed schedules for its engineering, procurement and installation.

CP&L Response

Our response to Item No. 1 of your request, involving the design and schedule for engineering, procurement and installation of the reactor coolant inventory system selected, is provided in Attachment I.

NRC Request Item No. 2

. . . review the status of conformance of all components of the ICC instrumentation system, including subcooling margin monitors, core-exit thermocouples, and the reactor coolant inventory tracking system, with NUREG-0737, Item II.F.2 and submit a report on the status of such conformance.

A001

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

CP&L Response

Our response to Item No. 2 of your request, which is a report of the conformance of all of the components of the ICC instrumentation system, including subcooling margin monitors, core-exit thermocouples, and the reactor coolant inventory tracking system, with NUREG-0737, Item II.F.2, is provided in Attachment II.

NRC Request Item No. 3

. . . develop and submit [the HBR] plant specific schedule [for installation of the ICC instrumentation system] . . .

CP&L Response

Our response to Item No. 3 of your request, involving a plant-specific schedule for installation of the ICC Instrumentation System, is provided in Attachment III.

If you have any further questions regarding these matters, please contact a member of the Nuclear Licensing Staff.

Yours very truly,

L. W. Eury
Senior Vice President
Power Supply

DCW/cfr (6472DCW)
Attachments

L. W. Eury, having been first duly sworn, did depose and say that the information contained herein is true and correct to his own personal knowledge or based upon information and belief.

Franklin Murray
Notary (Seal)

My commission expires: OCT 04 1986

FRANKLIN MURRAY
NOTARY
PUBLIC
WAKE COUNTY, N. C.

cc: Mr. J. P. O'Reilly (NRC-RII)
Mr. G. Requa (NRC)
Mr. Steve Weise (NRC-HBR)

CP&L Response to NRC Request Item No. 1

Reactor Coolant Inventory System

As stated in our letter, Serial No. NO-81-569, dated March 31, 1981, CP&L has selected the Westinghouse Reactor Vessel Level Instrumentation System (RVLIS) for use as the reactor coolant inventory tracking system at HBR2.

To date, CP&L has completed the procurement of the RVLIS and installation is 30% complete. Engineering, consisting of plant specific installation design engineering and preparation of the modification package, is currently 80% complete and is targeted for completion by November 30, 1983. The installation of the system will be completed during the first refueling outage which commences 90 days after NRC approval of the plant specific design and installation engineering. The next refueling outage is currently scheduled to begin on January 21, 1984.

CP&L Response to NRC Request Item No. 2

Checklist for Plant Specific Review of
Inadequate Core Cooling (ICC) Instrumentation System

FOR: H. B. Robinson, Unit No. 2 DOCKET NO.: 50-261

OPERATED BY: Carolina Power & Light Company
P.O. Box 1551
Raleigh, NC 27602

NRC Request

Item 1 Description of the proposed final system including: a) a final design description of additional instrumentation and displays (Provide Reference, Deviations and Schedule); b)detailed description of existing instrumentation systems (Provide Reference, Deviations and Schedule); and c) description of completed or planned modification (Provide Reference, Deviations and Schedule).

CP&L Response

The ICCS at HBR2 will consist of three (3) independent systems including: the Core Cooling Monitor; the Core-Exit Thermocouple System; and the Reactor Vessel Level Instrumentation System (RVLIS).

1. Core Cooling Monitor

The Core Cooling Monitor is described in detail in our letter, Serial No. GD-79-3306, dated December 31, 1979, and in our letter, Serial No. NO-81-569, dated March 31, 1981. The Core Cooling Monitor for HBR2 is installed and operational at the present time. The Core Cooling Monitor Thermocouple locations are shown in Figure 1.

2. Core-Exit Thermocouple System

The Core-Exit Thermocouple System consists of 51 thermocouples (40 of which are currently fully functional), positioned to measure fuel assembly coolant outlet temperature at pre-selected locations. The Chromel-Alumel thermocouples are threaded into guide tubes which penetrate the reactor vessel head through seal assemblies, and terminate at the exit flow end of the fuel assemblies. Each thermocouple is enclosed in a stainless steel sheath within the guide tube. Thermocouple readings are monitored by a manually switchable precision indicator mounted in the "Flux Detector Control Console" with backup readout capability monitored on demand by the plant computer. The Core Cooling Monitor Thermocouple System consists of sixteen (16) of these thermocouples (fourteen (14) of which are currently fully functional), four (4) thermocouples from each of the four (4) core regions. Two (2) of the four (4) thermocouples located in each of the core regions are monitored on one (1) of the Core Cooling Monitor displays and the other two (2) thermocouples on the redundant

display unit. Thus, it possesses the required redundancy (for each of the four (4) core regions) in that it is comprised of two (2) channels which operate completely independent of each other. The functional thermocouples on the Core Cooling Monitor are also capable of being monitored by a manually switchable precision indicator and the P-250 computer. The locations of the thermocouples are shown in Figure 1. These readings are used to determine the margin-to-saturation.

The Core Cooling Monitor System is described in more detail in our submittal entitled "Lessons Learned Short Term Requirements," dated December 31, 1979. The design of the Core Cooling Monitor System has been accepted by your staff in your letter dated April 18, 1980, signed by Mr. A. Schwencer.

One (1) incore thermocouple signal to each Core Cooling Monitor channel has become inoperable since initial installation of the Core Cooling Monitor System.

Based on the original design of the Core Cooling Monitor System, as described in the letter referenced above, the two (2) thermocouples that provide input to the Core Cooling Monitor which are out of service do not cause the Core Cooling Monitor to be out of service.

The Core-Exit Thermocouple System and the Core Cooling Monitor System for HBR2 is installed and operational at the present time.

3. Reactor Vessel Level Instrumentation System

As stated in our response to Item 1, the Reactor Vessel Level Instrumentation System (RVLIS) is described in our letter, Serial No. NO-81-569, dated March 31, 1981.

The completion schedule for RVLIS is identified in our Attachment III.

NRC Request

Item 2 A design analysis and evaluation of the inventory trend instrumentation, and test data to support design in Item 1 (Provide Reference, Deviations and Schedule).

CP&L Response

The design analysis and evaluation of the RVLIS for HBR2 was submitted with our letter, Serial No. NO-81-569, dated March 31, 1981.

NRC Request

Item 3 Description of tests planned and results of tests completed for evaluation, qualification, and calibration of additional instrumentation. (Provide Reference, Deviations and Schedule).

CP&L Response

The tests identified in our letter, Serial No. NO-81-569, dated March 31, 1981, will be completed prior to declaring the system operational.

NRC Request

Item 4 Provide a table or description covering the evaluation of conformance with NUREG-0737, II.F.2, Attachment 1, and Appendix B (Provide Reference, Deviations, and Schedule).

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

1. Provide diagram of core-exit thermocouple locations

CP&L Response

The location of the Core-Exit Thermocouples is identified in Figure 1.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

2. Provide a description of the primary operator displays including:

   a. A diagram of the display panel layout for the core map and description of how it is implemented, e.g. hardware or CRT display.

CP&L Response

A diagram of the layout of ICC instrumentation, including the Core-Exit Thermocouple System, is provided in Figure 2.

1) The primary display is a fixed pointer meter with a scale that swings to the current value when the individual thermocouple selector switch is placed in the "READ" position. Switches are spring return to normal.

2) The computer is used to print out Core-Exit Thermocouple data representing current readings.

3) The computer will print out the thermocouple readings on demand in normal typewriter format. These readings can then be compared to thermocouple locations shown on a thermocouple map attached to the Reactor Turbine Generator (RTG) board in the location identified in Figure 2.

4) The Core Cooling Monitor will display individual thermocouple values for its functional thermocouples upon demand on a digital readout.

NRC Sub-Request

II.F.2 Attachment 1 (for Core-Exit Thermocouples)

2.b. Provide the range of readouts.

CP&L Response

The range of the primary (analog) readout display is 0-700°F. The range of the computer (digital) readout display is 400-700°F. The calibrated range of the Core Cooling Monitor readout display is 0-2300°F.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

2.c. Describe the alarm system.

CP&L Response

There are no alarms associated with the Core-Exit Thermocouple system.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

2.d. Describe how the ICC instrumentation readouts are arranged with respect to each other.

CP&L Response

See Figure 2 for detailed location of ICC instrumentation.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

3. Describe the implementation of the backup display(s) (including the subcooling margin monitors), how the thermocouples are selected, how they are checked for operability, and the range of display.

CP&L Response

Backup readout capability for the Core-Exit Thermocouples is provided by the P-250 computer and monitored on demand. The range of indication is 400-700°F for each thermocouple selected. Backup indication for the 16 thermocouples, two per quadrant per channel, as read by the Core Cooling Monitor is presented on the Core Cooling Monitor panel. The calibrated range of indication for these thermocouples is 0-2300°F. The Core Cooling Monitor Thermocouples can also be monitored on the analog indicator mounted in the Flux Detector Control Console and the P-250

computer. Operability of each thermocouple may be verified by checking adjacent thermocouple indications. If any five (5) in-core thermocouples which are operable prior to the start of an event indicates greater than 700°F then an Inadequate Core Cooling Condition exists as defined by the current plant Emergency Instruction (EI-1).

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

4. Describe the use of the primary and backup displays. What training will the operators have in using the core-exit thermocouple instrumentation? How will the operator know when to use them? Reference appropriate emergency operating guidelines where applicable.

CP&L Response

Primary and Backup display usage is described in CP&L's Emergency Instruction Nos. 1 and 14 (EI-1 and EI-14). Operator training is covered in "Mitigating Core Damage" training and is described in our letter, dated May 18, 1982, regarding NUREG-0737, Item II.B.4. In addition, the primary display system is used extensively during simulator training and requalification training for licensed operators.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

5. Confirm completion of control room design task analysis applicable to ICC Instrumentation. Confirm that the core-exit thermocouples meet the criteria of NUREG-0737, Attachment 1 and Appendix B, or identify and justify deviations.

CP&L Response

The control room design task analysis was completed by Essex Corporation based on the existing emergency instructions. The "Human Factors Evaluation Report for the H. B. Robinson Unit 2 Control Room" was issued on February 23, 1981 and revised on September 14, 1981. A new task analysis is scheduled to be completed on the new symptom oriented emergency instructions as these procedures are implemented. This task is described in more detail in our April 15, 1983 response to NUREG-0737, Supplement 1.

The Core-Exit Thermocouples conform to NUREG-0737, Item II.F.2, Attachment 1 and Appendix B except for the following:

1. The thermocouples do not meet safety grade criteria.

2. The Core-Exit Thermocouple system is not environmentally qualified in accordance with NUREG-0588.

3. The Core-Exit Thermocouples are not isolated from the Non-IE plant computer.

4. The backup display (computer typewriter) of the Core-Exit Thermocouple outputs has a range of 400-700°F.

Although this system does not currently meet the safety grade criteria or environmental qualification standards, it is part of the original design specifications for Westinghouse PWRs and was installed during construction as the best equipment available. The system is a reliable, redundant, multi-instrument system which has been in operation since inception of power production. Additionally, it is backed up by the Core Cooling Monitor and by procedures for the use of steam tables. The use of the steam tables is described in the Emergency Instructions for a reactor coolant system depressurization and in the operational procedure for the Core Cooling Monitor.

The use of isolation devices to isolate the Core-Exit Thermocouple System from the Non-1E plant computer is currently being considered and is pending upon the recommendations in developing a final Regulatory Guide (RG) 1.97 compliance plan. This final RG 1.97 compliance plan is described in more detail in our April 15, 1983 response to NUREG-0737, Supplement 1.

A range expansion for the primary display (computer typewriter) of the Core-Exit Thermocouple output is currently being considered and also is pending upon the recommendations in developing a final compliance plan as indicated above.

NRC Sub-Request

II.F.2, Attachment 1 (for Core-Exit Thermocouples)

6. Describe what parts of the systems are powered from the 1E power sources used, and how isolation from Non-1E equipment is provided. Describe the power supply for the primary display. Clearly delineate in two categories which hardware is included up to the isolation device and which is not.

CP&L Response

The backup readout capability is provided by the plant computer which requires a power source and is not safety related. Currently, there are no isolation devices between the Core-Exit Thermocouples and the Non-1E plant computer. The system is composed of thermocouples, instrumentation cable, and the plant computer.

The primary display system is composed of thermocouples instrumentation cables, and a fixed pointer meter, and does not require a power supply.

NRC Sub-Request

II.F.2 Attachment 1 (for Core-Exit Thermocouples)

7. Confirm the environmental qualification of the Core-Exit Thermocouple instrumentation up to the isolation device.

CP&L Response

As stated in our response to Item 4, II.F.2, Attachment 1 (for Core-Exit Thermocouples), 5.2, the Core-Exit Thermocouple system is not environmentally qualified in accordance with NUREG-0588.

NRC Sub-Request

Appendix B (of NUREG-0737, II.F.2)

Confirm explicitly the conformance to the Appendix B items listed below for the ICC instrumentation, i.e., the SMM, the reactor coolant inventory tracking system, the core-exit thermocouples and the display systems. (Provide Reference and Deviations for each item.)

1. Environmental Qualification
2. Single Failure analysis
3. Class 1E power source
4. Availability prior to an accident
5. Quality Assurance
6. Continuous indications
7. Recording of instrument outputs
8. Identification of instruments
9. Isolation

CP&L Response

The Core Cooling Monitor system conforms to NUREG-0737, II.F.2 and Appendix B with the exception of environmental qualification and Core Cooling Monitor Thermocouple isolation devices. When the system was purchased and installed during the last quarter of 1979, the equipment was the best available and all new equipment was fully qualified to IEEE-323, 1971 and IEEE-344, 1971 with the new cabling being qualified to IEEE-383, 1974. Resolution of qualification deficiencies are pending and a supplemental report will be submitted in accordance with the requirements of 10 CFR 50.49.

Westinghouse currently has in progress a program to review the qualification requirements in NUREG-0588 for the RVLIS. The use of isolation devices to isolate the thermocouples in the Core Cooling Monitor system is currently being considered and is pending upon the recommendations in developing a final compliance plan as indicated in our response to II.F.2, 5 (Attachment II of page 6 of 9).

NRC Request

Item 5. Describe computer, software and display functions associated with ICC monitoring in the plant. (Provide Reference, Deviations, and Schedule.)

CP&L Response

Information regarding the computer, software and display functions associated with the RVLIS and Core Cooling Monitor are addressed in our letters Serial No. NO-81-569, dated March 31, 1981, and Serial No. GD-79-3306, dated December 31, 1979.

The computer system installed at HBR2 is a Westinghouse Model P-250. This system is used as a vehicle for gathering and displaying Core-Exit Thermocouple output data. This data is displayed upon operator demand at any time. Additionally, 24 hours of historical data is retained by the computer and is available to the operator upon demand. The Westinghouse Model P-250 computer is a non-safety related, digital computer used primarily as a sentinel device for monitoring plant conditions.

NRC Request

Item 6. Provide a proposed schedule for installation, testing and calibration and implementation of any proposed new instrumentation or information displays. (Provide Reference, Deviations, and Schedule.)

CP&L Response

The requested schedules are included in Attachments I and III to this submittal.

NRC Request

Item 7. Describe guidelines for use of reactor coolant inventory tracking system, and analysis used to develop procedures. (Provide Reference, Deviations, and Schedule.)

CP&L Response

The guidelines for the use of the RVLIS were provided in our letter, Serial No. NO-81-569, dated March 31, 1981.

NRC Request

Item 8. Operator instructions in emergency operating procedures for ICC and how these procedures will be modified when final monitoring system is implemented. (Provide Reference, Deviations, and Schedule.)

CP&L Response

This information was provided by the Westinghouse Owners' Group in a letter, Serial No. OG-44, dated November 10, 1980.

NRC Request

Item 9. Provide a schedule for additional submittals required. (Provide Reference, Deviations, and Schedule.)

A. Westinghouse dp System

1. Describe the effect of instrument uncertainties on the measurement of level. (Provide Reference and Deviations.)

CP&L Response

This information was provided in our letter, Serial No. NO-81-569, dated March 31, 1981.

NRC Request

Item 9.A.2. Are the differential pressure transducers located outside the containment? (Provide Reference and Deviations.)

CP&L Response

The differential pressure transducers are located outside the containment as described in our letter Serial No. NO-81-569, dated March 31, 1981.

NRC Request

Item 9.A.3 Are hydraulic isolators and sensors included in the impulse lines? (Provide Reference and Deviations.)

CP&L Response

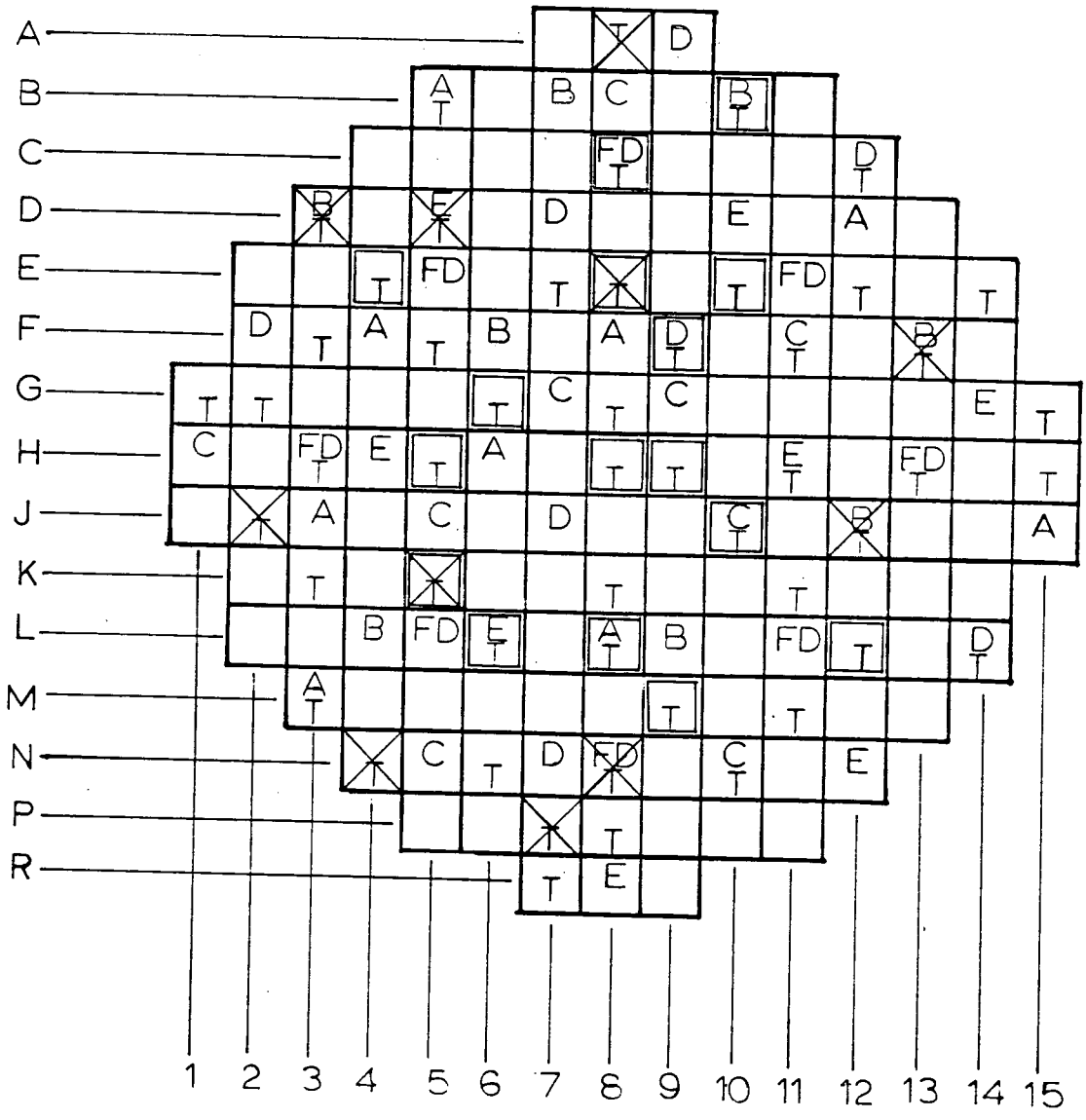
There are hydraulic isolators and sensors included in the impulse lines as described in our letter Serial No. NO-81-569, dated March 31, 1981.

H. B. Robinson Unit 2 ICC Instrumentation Installation Schedule

Current Status: Carolina Power & Light Company has completed installation of the Core Cooling Monitor System. The Core-Exit Thermocouple system was installed during the initial construction phase and has been modified to provide eight (8) Core-Exit Thermocouples inputs to each Core Cooling Monitor (sixteen (16) total). The Reactor Vessel Level Instrumentation System (RVLIS) installation is in progress with 30% of the installation completed.

Completion Schedule: (RVLIS ONLY)

	STATUS	PLANNED COMPLETION
System Procurement	100%	-
Installation Engineering (plant specific installation design engineering and mod package preparation)	80%	November 30, 1983
Installation	30%	First refueling outage which commences 90 days after NRC approval of the plant specific design and installation engineering.



T-LOCATIONS OF 51 CORE-EXIT THERMOCOUPLES (40 CURRENT--LY FULLY FUNCTIONAL.

□-LOCATIONS OF 16 CORE-EXIT THERMOCOUPLES USED FOR CORE COOLING MONITOR.

⊠-LOCATIONS OF CORE-EXIT THERM--OCOUPLES WHICH ARE NOT FUNCTIONAL (11).

⊠-LOCATIONS OF CORE-COOLING MONITORS WHICH ARE NOT FUNCTIONAL. (2).

A-FLUX THIMBLE, DETECTOR A

B-FLUX THIMBLE, DETECTOR B

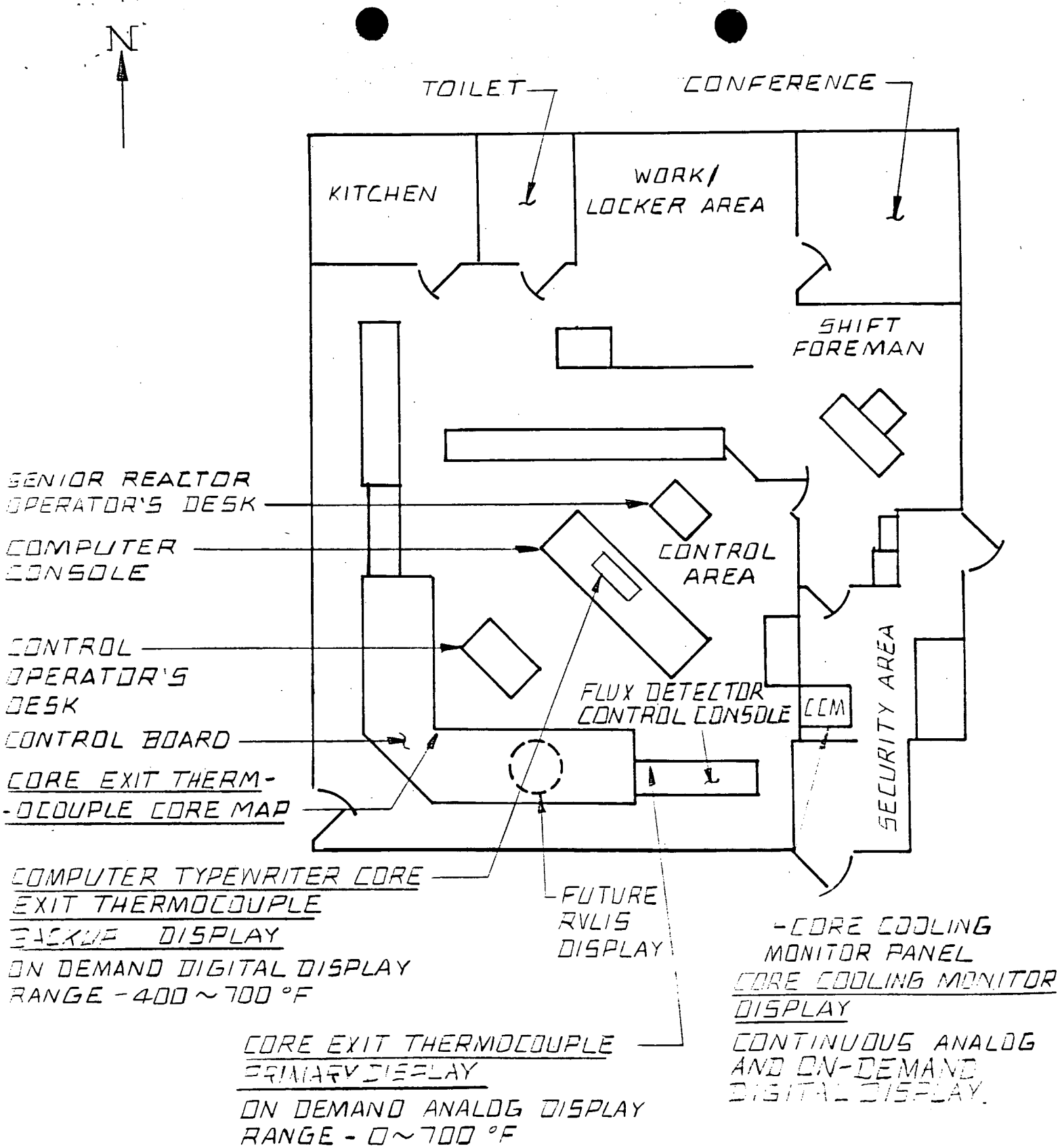
C-FLUX THIMBLE, DETECTOR C

D-FLUX THIMBLE, DETECTOR D

E-FLUX THIMBLE, DETECTOR E

FD-FLUX THIMBLE, FIXED DETECTORS

FIGURE 1. DISTRIBUTION OF FLUX THIMBLES AND THERMCPLS.



CONTROL ROOM
ELEVATION 254.0'

FIGURE 2.

ICC INSTRUMENTATION
LOCATION