MAY 20 1980

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAY 20 1980

Docket Nos. 50-369
and 50-370

APPLICANT: Duke Power Company

FACILITY: McGuire Nuclear Station, Units 1&2

SUBJECT: SUMMARY OF MEETING HELD ON MAY 14, 1980

A meeting was held with the applicant on May 14, 1980 in Bethesda, Maryland to discuss the applicant's design review of the McGuire control room. A list of attendees is shown in Enclosure No. 1.

An outline of the applicant's control room review project plan is shown in Enclosure No. 2. This outline was supplemented during the applicant's presentation by additional details shown in Enclosure No. 3. The presentations by the applicant provided the staff with a bases for its planned site visit later this month. The staff indicated that the site visit, originally planned for May 19-23, 1980 would be postponed for 1-2 weeks. During the discussion with the applicant it was agreed that both control room panel layout drawings and control room plant emergency procedures would be made available to the staff prior to the site visit. In addition the applicant stated that a status report of its' control room design review would be forwarded to the staff within two weeks. Arrangements for the site visit would be made subsequent to the meeting.

Ralph A. Birkel

Ralph Birkel
Licensing Branch No. 1
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Enclosures:
As Stated

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ENCLOSURE 1

Attendance List
McGuire Nuclear Station, Unit 1&2
May 14, 1980

Duke Power Company

C. J. Wylie
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G. A. Copp
K. S. Canady
T. C. McMeekin
R. S. Darke

NRC - Staff

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D. Scaletti
R. W. Froelich
W. N. Thompson
J. P. Joyce
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B. J. Youngblood
G. Kelly
J. Read
H. Krug
L. Beltracchi

MAY 20 1980

ENCLOSURE 2

DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION
UNIT ONE
CONTROL ROOM REVIEW PROJECT PLAN
OUTLINE

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1. OBJECTIVES
2. ORGANIZATION
3. PROCEDURES
4. BASES OF REVIEW
5. SPECIFIC ITEMS TO BE REVIEWED
6. CLASSIFICATION
7. IMPLEMENTATION SCHEDULE

MAY 20 1980

1. OBJECTIVES

A detailed design review is being instituted for McGuire Nuclear Station Control Room, to:

(A) Evaluate the amount, type, and form of information available to the unit operator.

(B) Review the requirements for control by the operator, and assess the degree to which the design of the control boards enables the operator to perform (or constrains him from performing) his duties safely and efficiently, and minimizing the potential for operator error.

(C) Identify and implement those changes and modifications to equipment, its arrangement and identification, on a schedule addressing the concerns for safety and operability.

This activity is compatible with and will be directed at complying with the NRC requirements described in Task I.D.1 of the draft Task Action Plan (NUREG - 0660).

2. ORGANIZATION

The Control Complex Engineering Group of the Electrical Engineering Division will have the lead responsibility, and with designated participation from the plant and the General Office of the Steam Production Department will operate as a task force or "team". It will meet periodically for overall coordination, but individuals will be assigned to specific tasks for investigation and specific responsibilities for implementation. Overall management review and concurrence will be attained through several strategically scheduled presentations in the program.

The full time participants include representatives from Design Engineering, McGuire Nuclear Station and Steam Production General Office. Specific "as required" assistance has also been designated from the Mechanical and Civil Engineering Divisions as well as from the Power Systems, Control Systems and Design Sections of the Electrical Engineering Division.

3. PROCEDURES

In the initial phase, review emphasis shall be placed on the generic, "across-the-board" items such as those listed in Section 5(A) below, since they affect all systems on all boards. Initiation of modifications can and should be initiated as soon as possible on their own merits.

Secondly, review efforts will then be concentrated on a system-by-system or board-by-board basis involving those human factors concerned with grouping of equipment and functions. This analysis involves reviews of operating procedures as well as systems definitions. Interaction with the initial review phase should be minimal, but where it is involved it can be dealt with on a singular basis.

Assignment of tasks will be based on this concept, though scheduling of individual efforts may well overlap, depending on the items.

4. BASIS OF REVIEW

The various portions of the control room will be examined with respect to the degree to which they meet the following three sets of criteria - as applicable.

(A) The original design concept and the standards and conventions applicable to the design of the control boards, including the following Duke Power Co. Design Engineering Dept. Standards: -

(1) DE-1.01 Indicating Lamps - Colors.
(2) DE-1.02 Indicating Lamps - Positions.
(3) DE-1.03 Indicating Lamps/Switches. -E30 Arrangements.
(4) DE-1.04 Indicating Lamps/Switches - Std. Operators.
(5) ID-1.01 Standard Abbreviations.

(B) Currently known and accepted Human Factors Criteria, as referenced in:

(1) Mil Std. 1472-B
(2) ESSEX TMI Report
(3) EPRI - NP 1118 "Human Factors Methods for Nuclear Control Room Design".
(4) E. J. McCormick "Human Factors in Engineering and Design.
(5) Joint Army/Navy/Air Force - Steering Committee "Human Engineering Guide to Equipment Design".

(C) The "Operability" of the plant based on operator inputs as well as that from the training center/simulator. These inputs are achieved thru:

(1) Nuclear Problem Reports (NPR's)
(2) Design Change Authorization requests (DCA's)
(3) Control Board Design Review

Guidelines - and the bases or benchmarks for evaluation will include those affecting safety and operability as well as those more detailed from a physical standpoint. Thus they will include:

(A) Readability/comprehension
(B) Locatability
(C) Accuracy/consistency
(D) Discrimiantion
(E) Clarity (vs. confusion)

5. SPECIFIC ITEMS TO BE REVIEWED

Specific items recognized as potential sources of operator error and safety risks will be reviewed. They will include, but not necessarily be limited to the following:

(A) Item Analysis

(1) Annunciators
(2) Monitor and status lights
(3) Operator Aid Computer displays and messages
(4) Indicators/recorders
(5) Environmental factors (lighting, noise, communications)
(6) Board layout and shape - anthropometric considerations
(7) Labeling and coding
(8) Documentation - drawings, B/M's, technical specifications, etc.
(9) Specific techniques and options for improvements

(B) Group Analysis

(1) "Remote" systems, requiring operator interaction (e.g. HVAC, RC Pump Monitor, Nuclear Instrumentation, Radiation Monitoring, Vibration Monitoring, etc.)
(2) Safety System Status Monitoring
(3) Functional Grouping
(4) Procedural Mechanism for Simulator Update
(5) Documentation and Drawings

6. CLASSIFICATION

Problems and/or deficiencies uncovered in the investigation will be classified in accordance with a judgement as to the relative safety significance and potential risk for error and error-induced safety impact. These classifications will be designated as follows: -

(A) Group "A" - Risk of error and safety significance of such error is relatively high. Modifications in this group will be made before fuel loading as will all improvements that can be implemented without delay.

(B) Group "B" - Risks of error and safety significance can reasonably be expected to be low. Modifications will be implemented before first fuel reloading.

7. MILESTONES

Major milestones to mark the progress of the Control Room Review include the following:

(A) April 1, 1980 - Designation of Group A improvements and initial implementation,

(B) May 15, 1980 - Completion of Review and classification of improvements to be made.

(C) July 1, 1980 - Definition of corrective action for Group B items.

(D) Fuel Load - (Completion of implementation of Class A improvements).

MCGUIRE CONTROL ROOM REVIEW PLAN MEETING MAY 14, 1980

1.-AGENDA

PLAN
SCHEDULE
STATUS

2.-PHOTO (CTRL RM)

MCGUIRE, A TWO-UNIT PWR, 1180 MWe PER UNIT, PLANT. THE CONTROL ROOM IS COMMON TO THE TWO UNITS, WIDE-ANGLE VIEW LOOKING TOWARD THE UNIT TWO BOARDS.

3.-TITLE - CONTROL REVIEW PLAN

4.-PLAN STRUCTURE

(1) OBJECTIVES AND SCOPE
(2) ORGANIZATION
(3) PROCEDURES
(4) BASES FOR REVIEW

5.-ELEMENTS OF REVIEW

(5) AREAS OF ATTENTION
(6) CLASSIFICATION
(7) IMPLEMENTATION

6.-OBJECTIVES

-*- REVIEW & ASSESS - as-built boards against orisinal intent & current acceptability
-*- IDENTIFY & IMPLEMENT - modifications to equipment and arrangements
-*- FOR - safety & operability

7.-ORGANIZATION

-*- DEDICATION
.. Full time assignment
-*- OBJECTIVITY
.. Participants from:-
.. Steam Production General Office

.. Operations - McGuire Operators
.. Design Engineering - Control Systems Specialists
-*- RESPONSIBILITY
.. For Implementatation as well as Review and Assessment

8.-PROCEDURES

-*- ITEM ANALYSIS
-*- GROUP ANALYSIS

9.-BASES FOR REVIEW

-*- ORIGINAL DESIGN OBJECTIVES, CONVENTION AND STANDARDS
-*- HUMAN FACTORS CRITERIA
-*- OPERABILITY

10-DUKE STANDARDS

* DE1.01 INDICATING LAMPS - Colors
* DE1.02 INDICATING LAMPS - Positions
* DE1.03 SWITCHES - Arrangements
* DE1.04 SWITCHES - Std Operators
* ID1.01 Standard abbreviations

11.-HUMAN FACTORS REFERENCES

-*- MIL-STD 1472B
-*- ESSEX TMI REPORT
-*- EPRI NP-1118
-*- E. J. McCORMICK "Human Factors in Engineering and Design"
-*- "Human Engineering Guide To Engineerin Design" (Joint A/N/AF Steering Committee)

12-OPERATOR INPUT

(1) CONCEPTUAL REVIEW
(2) PRELIMINARY LAYOUT
(3) FULL-SCALE MOCKUP
(4) CONTROL BOARD DESIGN REVIEW
(5) STATION PROBLEM REPORTS
(6) DESIGN CHANGE AUTHORIZATION

13-ITEMS FOR ATTENTION

-*- ANNUNCIATORS
-*- INDICATORS/RECORDERS
-*- LIGHTING/NOISE/COMMUNICATION
-*- PHYSICAL - SHAPE, DISTANCE, TRAFFIC
-*- LABELING AND CODING
-*- TECHNIQUES AND OPTIONS

14-GROUP ANALYSIS

-*- BOARD-BY-BOARD/SYSTEM-BY-SYSTEM
-*- EMERGENCY PROCEDURES/WORK STATION RELATIONSHIPS

15-CONTROL/DISPLAY INTEGRATION

-*- "REMOTE" SYSTEMS
-*- PROCEDURES/EQUIPMENT RELATION

16-CLASSIFICATION

GROUP A:
-*- HIGH PROBABILITY OF ERROR AND SAFETY IMPLICATIONS

GROUP B:
-*- LOWER PROBABILITY OF ERROR - ENGINEERING AND OPERATING EXPERIENCE REQUIRED

17-MILESTONES

(A) APR.1, 1980 - Desisnation of Group A Items. Initial Implementation Efforts
(B) MAY 15, 1980 - Completion of Review and Classification of Improvements
(C) JULY 1, 1980 - Definition of Corrective Actions for Group B items
(D) FUEL LOAD - Completion of Group A Improvements

MCGUIRE CONTROL ROOM REVIEW STATUS
AS OF MAY 9, 1980

18-PHOTO - UNIT ONE BOARDS

19-ANNUNCIATORS

-*- PRIORITIES ASSIGNED
-*- WINDOWS PRIORITIZED BY COLOR CODE
-*- ENGRAVING ANOMALIES BEING CORRECTED

20-PHOTO - PRIORITIZED ANNUNCIATOR

21-INDICATORS/RECORDERS

-*- SCALE RANGES BEING CORRECTED
-*- OPERATING RANGES/LIMITS ESTABLISHED AND MARKED
-*- ADDITIONAL INDICATIONS BEING PROVIDED AS REQUIRED

22-PHOTO - UNLABELED INDICATORS

23-PHOTO - EXPERIMENTAL LABELING

24-LABELING/CODING

-*- NEW N/P STANDARDS DEVELOPED
-*- NOMENCLATURE IMPROVED
-*- INDICATOR ID'S
-*- COLOR-CODED PARAMETER ID'S

25--PHOTO - LABELED RECORDERS

26-SWITCHES

-*- PROTECTIVE GUARD
-*- POWER SUPPLY ID LABEL
-*- IMPROVED LABELING

27-PHOTO - SWITCHES, GUARDS, COLORS

28-PHOTO - SWITCHES, LABELS, CONTROLLER

29-CONTROLLER/MANUAL STATION

-*- MEASUREMENT ID LABEL
-*- VALVE POSITION ID

-*- DEMAND/FEEDBACK

30-PHOTO - CONTROLLERS, ID CONFUSION

31-PHOTO - SYSTEM DELINEATION

32-PHOTO - CONTROL/DISPLAY PROBLEM

33-PHOTO - CRT GRAHIC,NI SYSTEM

34-PHOTO - CRT GRAPHIC,NC PUMPS

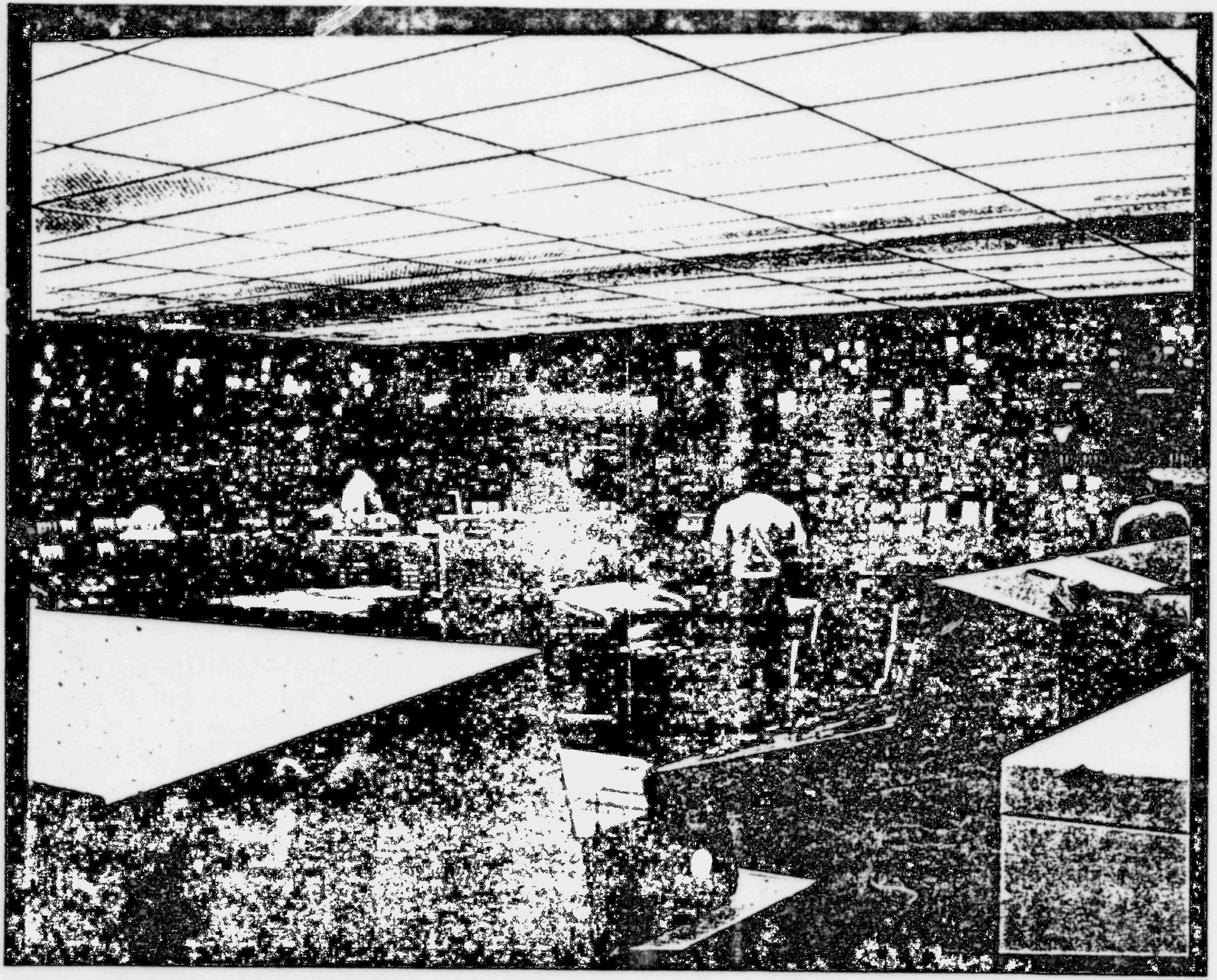
35-PHOTO - HVAC PANEL

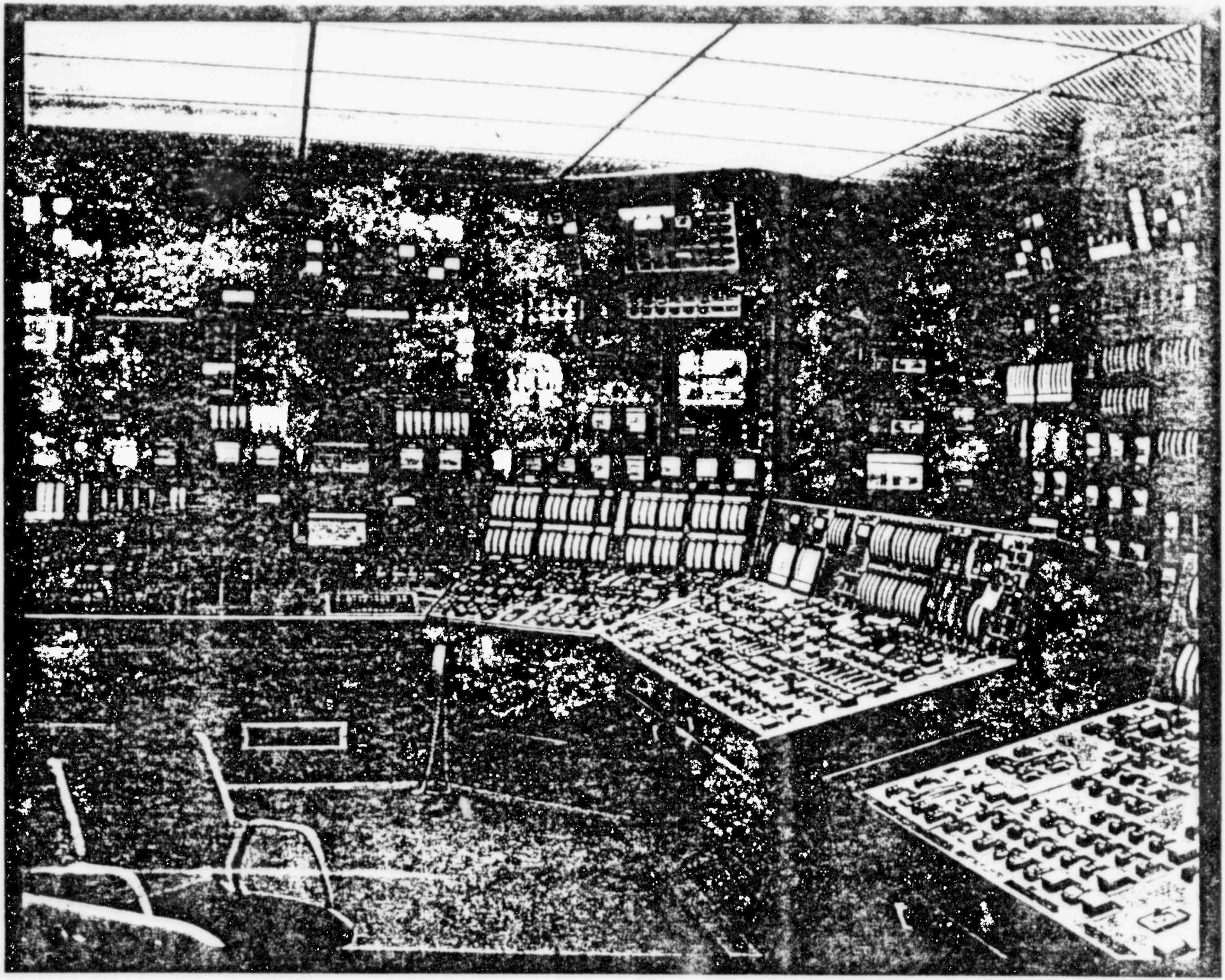
36-PHOTO - BACK OF CONTROL ROOM

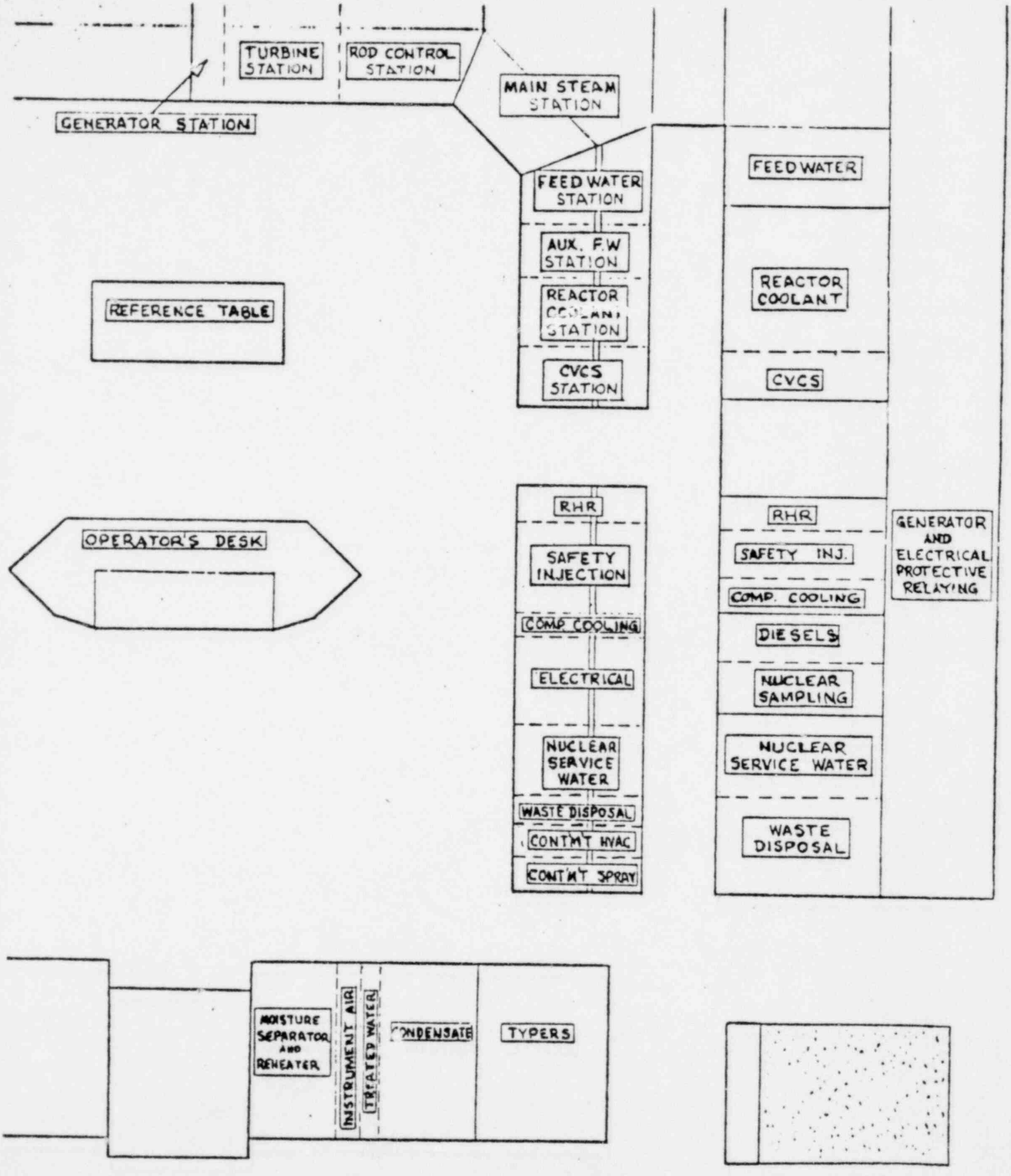
37-ENVIRONMENTAL

-*- NOISE BASELINE DATA
-*- ILLUMINATION REVISIONS
-*- COMMUNICATIONS

38-SUMMARY







MCGUIRE UNIT 1
CONTROL ROOM
GENERAL LAYOUT

DUKE POWER COMPANY
CONTROL BOARD REVIEW EVALUATION

Station McGuire
Unit 1
Equipt. Annunciator
System All
Cont. Bd. All

Date 3/24/80 By J. L. Herrin

Guideline:

The relative significance of each alarm (annunciator window) shall be indicated to the operator. Levels of significance shall be not less than two nor more than four. Status only shall not be considered in the alarm priority scheme.

Evaluation/Comment

No discernible prioritization exists, (except for the first-out) though audible annunciation was designed to identify the particular annunciator box which the alarm was to be indicated.

Problem Resolution

1. Prioritize alarms (per enclosed DPC general guidelines).
2. Provide window priority discrimination through color coding.
   a. Determine viable/possible color codes or combinations that can be adequately differentiated.
   b. Determine best method of implementation; viz:
      (1) Chartpak color film applied to window material.
      (2) Replace windows with colored plastic.

Classification

Group A - Complete Implementation by July 1, 1980.

Alarm Prioritization Guidelines

Consequence, If No Action Is Taken		Time for Consequence To Develop	
Level of Consequence	Description	0 - 10 min.	More Than 10 Minutes
		Rank of Importance	
A	a) Significant Loss of Power Generation Capability During Operation b) Release of Radioactive Materials in excess of authorized limits c) Reactor Core Damage d) Overpressurization of Reactor Coolant Boundaries e) Variations in NDT Restrictions f) Fines, or loss of Operating License	#1	#2
B	a) Significant Increase in Probability of a Level 1 Consequence Occurring b) Damage requiring a significant rapair program c) Tech Spec Limits Exceeded	#2	#3
C	a) Damage requiring temporary reduction in Power Generation Capability for Repair, but which can be Scheduled b) Improper lineup of Systems c) Maintenance Related Failures d) Significant Increase in Probability of Damage, per Level 2	#3	#4
	Status changes (for info. on operating systems, but no direct action required)		#4

NOTE: Group A - b, c, d, e are Nuclear Safety Related (s)

3/1/80
RS Parker

MCGUI : CONTROL OOM
SOUND LEVEL SUR\ EY CONDUCTED MARCH 20, 1980

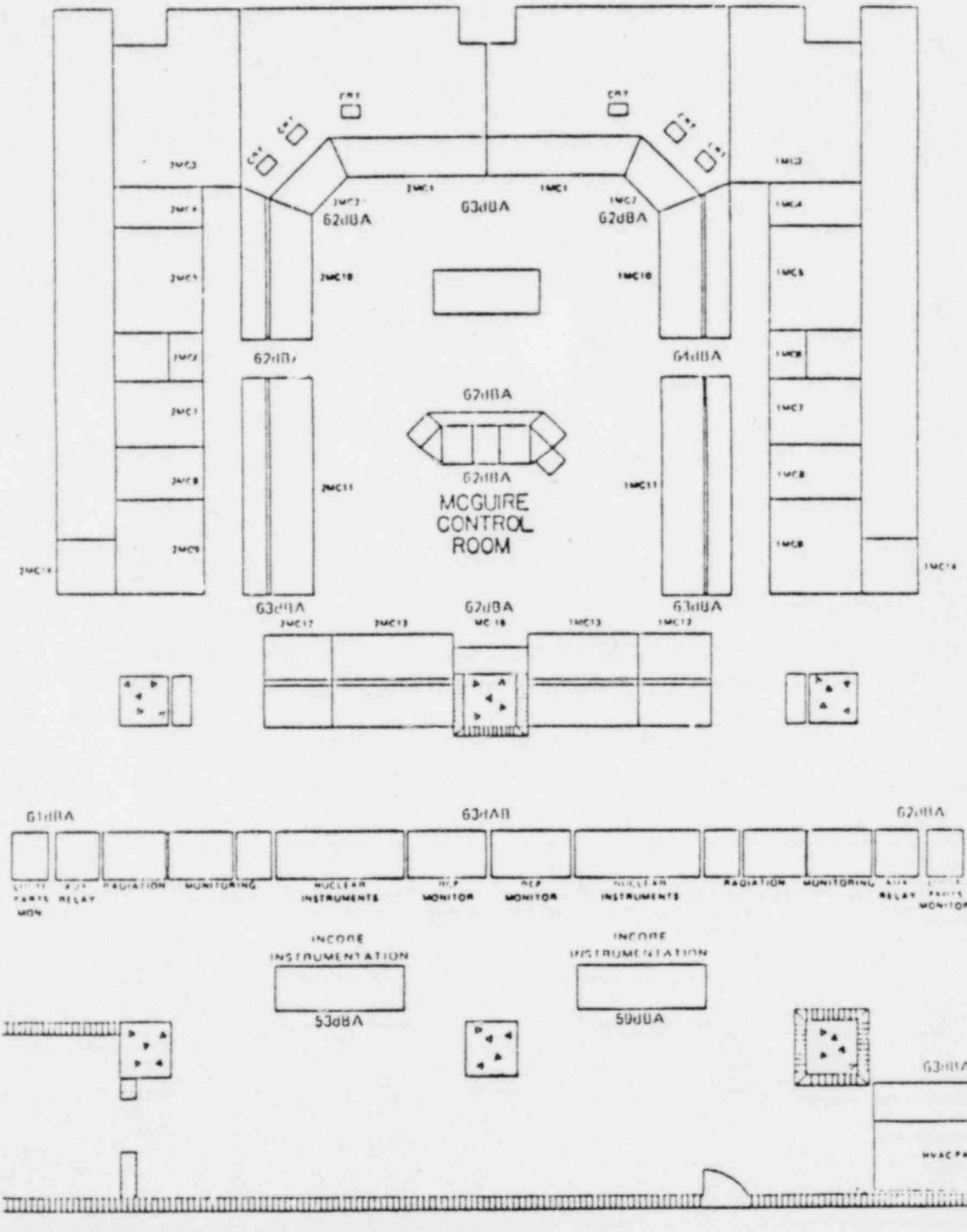


FIGURE 1

NOTES: 1) GENERAL RADIO MODEL 1982 SOUND LEVEL METER WAS USED.
2) ALL READINGS WERE TAKEN FIVE (5) FEET ABOVE THE FLOOR.
3) dBA = dB WEIGHTED AVERAGE (AS DEFINED BY OSHA).

MCGUIRE CONTROL ROOM
LIGHTING SURVEY
CONDUCTED MARCH 20, 1980

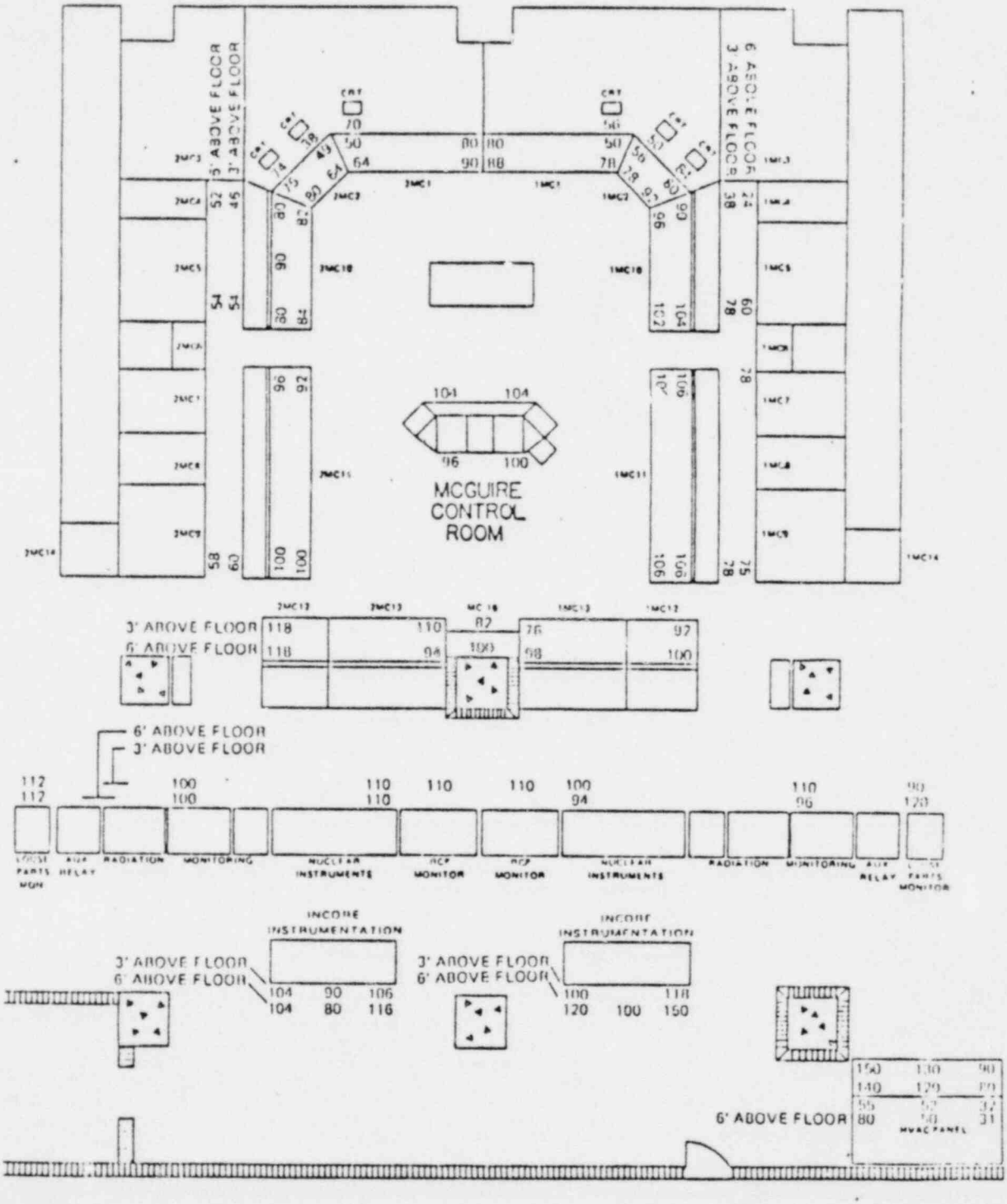


FIGURE 2

NOTES: 1) WESTON FOOT CANDLE METER WAS USED.
2) ALL UNITS ARE IN FOOTCANDLES.
3) ALL READINGS WERE TAKEN WITH THE LIGHT CELL PARALLEL TO THE FLOOR.
4) UNLESS OTHERWISE NOTED, READINGS WERE MADE CLOSE TO PANEL SURFACE.
5) ALL LIGHTING PANEL BREAKERS CLOSED.

MCGUIRE CONTROL ROOM
LIGHTING SURVEY
CONDUCTED MARCH 20, 1980

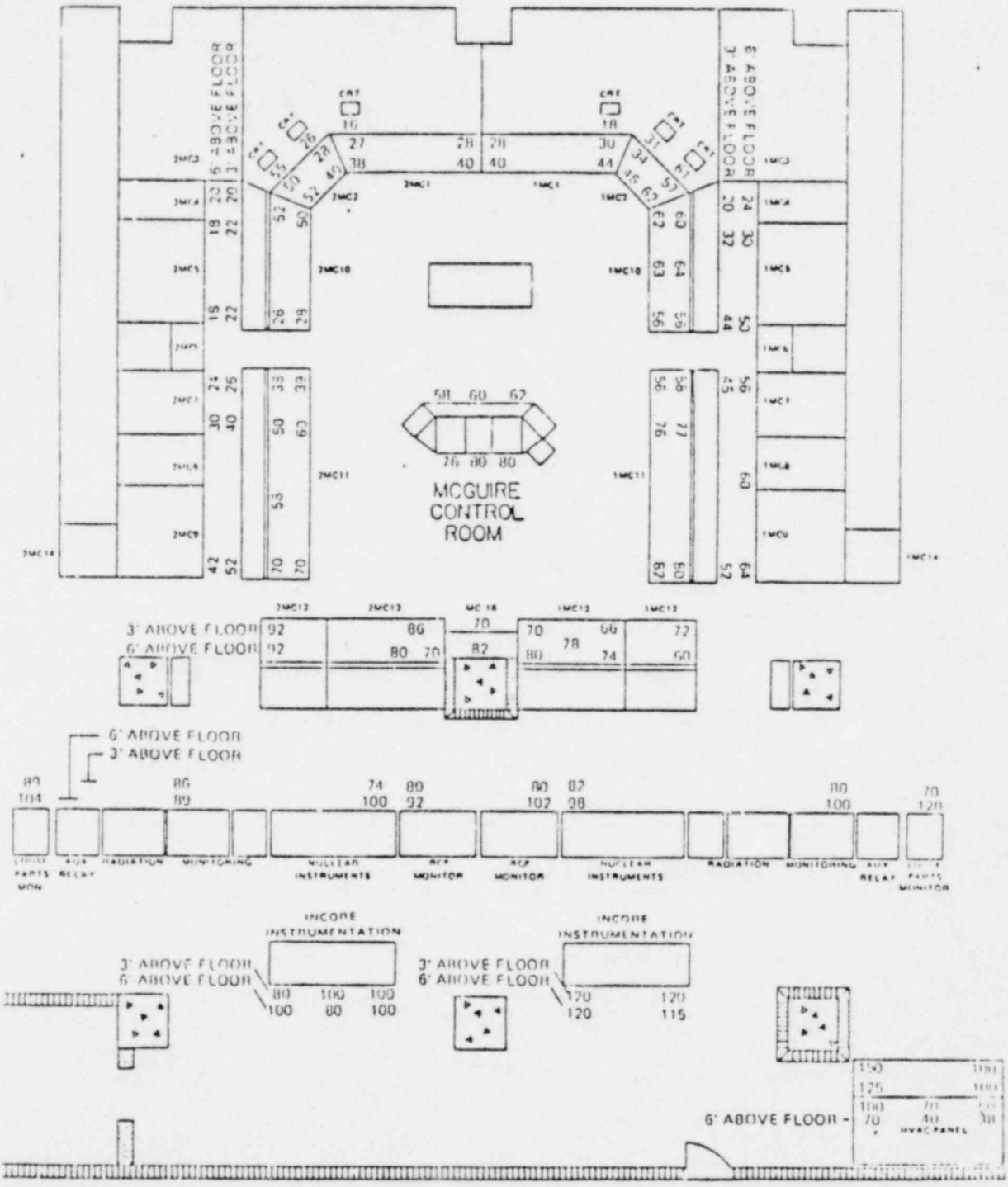


FIGURE 3

NOTES: 1) WESTON FOOT CANDLE METER WAS USED.
2) ALL UNITS ARE IN FOOTCANDLES.
3) ALL READINGS WERE TAKEN WITH THE LIGHT CELL PARALLEL TO THE FLOOR
4) UNLESS OTHERWISE NOTED, READINGS WERE MADE CLOSE TO PANEL SURFACE.
5) THE FOLLOWING LIGHTING PANEL BREAKERS WERE OPEN: 1L16-BKR 6
2L16-BKR 1, 4, 5, 8, 9.