

Doc. No. BECO/ESR-1
SEPTEMBER 1984
REV. 1

Detailed Control Room Design Review

Executive Summary Report

Pilgrim Station



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REVISION LOG

Revision No.	Date	Description	Pages Affected
DRAFT (REV. 0)	7/11/84	Draft Copy for Review	
REV. 0	8/24/84		
REV. 1	9/19/84		1-8, 2-75, 3-2, 3-7, 3-8, 4-1

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PREFACE

The Detailed Control Room Design Review of the Pilgrim Nuclear Power Station was started in September 1983. This review was performed by the Boston Edison Company with its consultant Torrey Pines Technology.

The Program Plan was presented to the NRC on October 14, 1983. The basic review work for Operating Experience Review, System Function and Task Analysis and Control Room Survey was begun in October 1983. Details of this review work are presented in the Program Plan.

Documentation describing the work performed for the DCRDR is summarized below.

- A. Program Plan - Defines the plan for performing the DCRDR.
- B. Criteria Report - Provides the detailed guidelines and basis for the DCRDR and describes the interface between the control room and plant systems.
- C. Operating Experience Review Report - Describes the review process results, conclusions and recommendations of the operating experience review task defined in the Program Plan. This report also includes the review procedures and human factors data developed during the review that will be useful for future panel modifications.
- D. Control Room Inventory - Identifies by a unique number each instrument and control device in the main control room. These data have been entered into a computer data base. Use of the unique number allows for data base search and retrieval of device description and panel location.

- E. System Function and Task Analysis (SFTA) Report - Describes the methodology, results, conclusions and recommendations for the SFTA effort defined in the Program Plan.

- F. Control Room Survey Report - Describes the review process, results, conclusions and recommendations of the Control Room Survey task defined in the Program Plan. This report also includes the final results and dispositions for the human factors observations obtained from the Criteria Report Operating Experience Review and System Function and Task Analysis.

- G. Executive Summary - Summarizes the DCRDR results, conclusions, recommendations, and implementation plans. Technical details are in the Operating Experience Review Report, the System Function and Task Analysis Report and the Control Room Survey Report.

ACKNOWLEDGMENTS

The following individuals are acknowledged for their participation in the Detailed Control Room Design Review of the Pilgrim Nuclear Power Station.

Boston Edison Company

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J. L. Rogers	System and Safety Analysis Engineer
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L. Nichols	Watch Engineer, Sr. Reactor Operator

Acknowledgement is made to the whole operations staff who made significant contribution to the DCRDR.

Torrey Pines Technology

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ACRONYMS AND ABBREVIATIONS
LISTED ALPHABETICALLY BY DEFINITION

Alternating Current	AC
Annunciator	ANN
Anticipated Trip Without Scram	ATWS
Area	A
Associated	ASSOC
Assistant	ASST
Augmented Off-Gas	AOG
Automatic Depressurization System	ADS
Auxiliary	AUX
Auxiliary Operator	AO
Average Power Range Monitor	APRM
Balance-of-Plant	BOP
Category	CAT
Cathode Ray Tube	CRT
Central Processor Cabinet	CPC
Circulating Water System	CWS
Color Monitor	CM
Condenser, Condensate	COND
Containment Cooling & Isolation	CCI
Control	CONT
Control Rod Drive	CRD
Control Rod Position	CRP
Control Room	CR
Control Room Survey	CRS
Core Spray System	CSS
Core Standby Cooling Systems	CSCS
Detailed Control Room Design Review	DCRDR
Digital Input/Output Cabinet	DI/OC
Direct Current	DC
Drywell Sump	DWS

Electric Power Research Institute	EPRI
Electrical System	ES
Emergency Core Cooling System	ECCS
Emergency Event Sequence	EES
Emergency Operating Facility	EOF
Engineered Safety Feature(s)	ESF
Estimate(d)	EST
Experience	EXPER
Feedwater	FW
Feedwater and Recirculation	FW&R
Final Safety Analysis Report	FSAR
Heating, Ventilation and Air Conditioning System	HVACS
High Pressure Coolant Injection System	HPCIS
Human Engineering	HE
Human Engineering Discrepancy	HED
Human Engineering Observation	HEO
Input Cabinet	ANALOG
Input/Output	I/O
Institute of Nuclear Power Operators	INPO
Instrument; Instrumentation	INSTR
Instruments and Controls	I&C
Intermediate Range Monitor	IRM
Jet Pump	JP
Leader	LDR
Local Power Range Monitor	LPRM
Loss of Coolant Accident	LOCA
Loss of Off-site Power	LOSP
Low Pressure Coolant Injection System	LPCIS
Low Temperature Off Gas System	LTOGS
Main Control Panel	MCP
Mainsteam Isolation Valve	MSIV
Management Team	MT

Man/Machine	M/M
Megawatts (electric)	MW(e)
Monitor	MON
Motor Generator	MG
Neutron Monitoring System	NMS
Nuclear Regulatory Commission	NRC
Numbers	NOS
Operating Experience Review	OER
Operational Support Center	OSC
Operator Console	OC
Power Supply	PS
Preliminary Safety Analysis Report	PSAR
Primary Containment and Reactor Vessel Isolation Control	PCRVIC
Process	PROC
Project Review Team	PRT
Radiation Monitor	RM
Reactor	RX
Reactor Building Closed Cooling Water System	RBCCW
Reactor Containment Building	RCB
Reactor Core Isolation Cooling System	RCICS
Reactor Neutron Mapping Control	RNMC
Reactor Operator	RO
Reactor Pressure Vessel	RPV
Reactor Protection System	RPS
Reactor Recirculation Pump	RRP
Reactor Recirculation System	RRS
Reactor Water Clean-Up	RWCU
Reactor Water Clean-Up System	RWCUS
Recirculating	RECIRC
Recirculation Actuation Signal	RAS
Refueling Water Storage Tank	RWST
Required	REQ'D
Residual Heat Removal System	RHRS
Rod Block Monitor	RBM

Safety Injection System	SIS
Safety Parameter Display System	SPDS
Safety/Relief Valve	SRV
Selected Operational Event(s)	SOE
Senior Reactor Operator	SRO
Standby Gas Treatment System	SGTS
Standby Liquid Control System	SLCS
Startup Range Monitor	SRM
Steam	ST
Subsystem	SS
Supervisor	SUPVR
Suppression Pool	SP
Switch	SW
System	SYS
System Function and Task Analysis	SFTA
System Task Analysis Team	STAT
Tape Punch	TP
Tape Reader	TR
Technical Support Center	TSC
Temperature	TEMP
Test and Monitoring	T&M
Three-Mile Island	TMI
Turbine Bypass System	TBS
Turbine Generator	TG
Turbine Supervisory	TS

ACRONYMS AND ABBREVIATIONS
LISTED ALPHABETICALLY BY ACRONYMS

A	Area
AC	Alternating Current
ADS	Automatic Depressurization System
ANALOG	Input Cabinet
ANN	Annunciator
AO	Auxiliary Operator
AOG	Augmented Off-Gas
APRM	Average Power Range Monitor
ASSOC	Associated
ASST	Assistant
ATF	Above Top of Active Fuel
ATWS	Anticipated Transient Without Scram
AUX	Auxiliary
BOP	Balance-of-Plant
BWROG	Boiling Water Reactor Owners' Group
CAT	Category
CCI	Containment Cooling & Isolation
CM	Color Monitor
COND	Condenser, Condensate
CONT	Control
CPC	Central Processor Cabinet
CR	Control Room
CRD	Control Rod Drive
CRP	Control Rod Position
CRS	Control Room Survey
CRT	Cathode Ray Tube
CSCS	Core Standby Cooling Systems
CSS	Core Spray System
CWS	Circulating Water System

DC	Direct Current
DCRDR	Detailed Control Room Design Review
DI/OC	Digital Input/Output Cabinet
DRT	Design Review Team
DWS	Drywell Sump
ECCS	Emergency Core Cooling System
EES	Emergency Event Sequences
EOF	Emergency Operating Facility
EPRI	Electric Power Research Institute
ES	Electrical System
ESF	Engineered Safety Feature(s)
EST	Estimate(d)
EXPER	Experience
FSAR	Final Safety Analysis Report
FW	Feedwater
FW&R	Feedwater and Recirculation
HE	Human Engineering
HED	Human Engineering Discrepancy
HEO	Human Engineering Observation
HPCIS	High Pressure Coolant Injection System
HVACS	Heating, Ventilation and Air Conditioning System
I&C	Instrumentation & Control
INPO	Institute of Nuclear Power Operators
INSTR	Instrument; Instrumentation
I/O	Input/Output
IRM	Intermediate Range Monitor
JP	Jet Pump
LDR	Leader
LOCA	Loss of Coolant Accident
LPCIS	Low Pressure Coolant Injection System
LOSP	Loss of Off-site Power
LPRM	Local Power Range Monitor
LTGS	Low Temperature Off-Gas System
MCP	Main Control Panel

MG	Motor Generator
M/M	Man/Machine
MON	Monitor
MSIV	Mainsteam Isolation Valve
MT	Management Team
MW(e)	Megawatts (electric)
NMS	Neutron Monitoring System
NOS	Numbers
NPO	Nuclear Plant Operator
NRC	Nuclear Regulatory Commission
OC	Operator Console
OER	Operating Experience Review
OSC	Operational Support Center
PCIS	Primary Containment Isolation System
PCRVICES System	Primary Containment & Reactor Vessel Isolation Control System
PNPS	Pilgrim Nuclear Power Station
PROC	Process
PS	Power Supply
PSAR	Preliminary Safety Analysis Report
RAS	Recirculation Actuation Signal
RBCCW	Reactor Building Closed Cooling Water System
RBM	Rod Block Monitor
RCB	Reactor Containment Building
RCICS	Reactor Core Isolation Cooling System
RECIRC	Recirculating
REQ'D	Required
RHRS	Residual Heat Removal System
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
RM	Radiation Monitor
RNMC	Reactor Neutron Mapping Control
RO	Reactor Operator

RRP	Reactor Recirculation Pump
RRS	Reactor Recirculation System
RWCU	Reactor Water Clean-Up
RWCUS	Reactor Water Clean-Up System
RWST	Refueling Water Storage Tank
RX	Reactor
SBGTS	Standby Gas Treatment System
SIS	Safety Injection System
SFTA	System Function and Task Analysis
SLCS	Standby Liquid Control System
SOE	Selected Operational Event(s)
SP	Suppression Pool
SPDS	Safety Parameter Display System
SRM	Startup Range Monitor
SRO	Senior Reactor Operator
SRV	Safety/Relief Valve
SS	Subsystem
ST	Steam
STAT	System Task Analysis Team
SUPVR	Supervisor
SW	Switch
SYS	System
T&M	Test and Monitoring
TBS	Turbine Bypass System
TEMP	Temperature
TG	Turbine Generator
TMI	Three-Mile Island
TP	Tape Punch
TR	Tape Reader
TS	Turbine Supervisory
TSC	Technical Support Center

SUMMARY

The detailed control room design review for the Pilgrim Nuclear Power Station was performed principally as stated in the Program Plan submitted to the NRC in October 1983, and revised in June 1984, to comply with the NRC comments as noted in the letter dated March 6, 1984 from Mr. Dominic B. Vassallo, Chief Operating Reactor Branch #2 Division of Licensing to Mr. William D. Harrington, Senior Vice President, Nuclear, Boston Edison Company.

The review identified 153 Human Engineering Discrepancies (HEDs) which were classified as follows:

<u>Category</u>	<u>No.</u>
A	8
B	120
C	25

An analysis of these discrepancies indicates the need for the following general areas for improvements (see Tables 4-2 thru 4-6 for greater detail):

1. Some front panel re-layout involving rearrangement of present equipment, relocation of some back panel equipment to the front panel to reduce the current operator traffic pattern in executing emergency procedures and the addition of a few new panel devices to improve operator feedback from the plant systems. This effort is underway and the initial results are included in Attachment A.
2. A new annunciator warning system to optimize the system's relationship of alarms, improve reliability and provide added features for overall improvement.

3. An integrated labeling and demarcation effort to enhance the operators man/machine interface. Addition of operator aids and system mimics will also be included.
4. Habitability modifications including improved lighting, temperature and humidity control.
5. Modifications to optimize control room communications and reduce noise.
6. Control room layout improvements to enhance overall control room work station efficiency.

The corrective methods selected for the 153 HEDs show that:

- o Simple enhancement techniques will be used to correct 14 HEDs, i.e. HED 1B014.2 recommends that carpeting and noise inhibitors on the computer printers be installed to reduce noise levels.
- o Design changes will be used to correct seven HEDs, i.e. HED 5A005.3 recommends that the meters and scales will all have a common reference zero while maintaining individual functional span requirements.
- o Panel re-arrangements and/or equipment replacements will be used to correct 48 HEDs, i.e. HED 1B015.5 recommends that the "scram solenoid indicator lights" be moved from back panels to the main control panels.
- o Design improvement programs will be undertaken to correct 80 HEDs by an integrated corrective action, i.e. the installation of a new annunciator warning system, that will have all human factors considerations integrated into the design.

- o Administrative procedure changes will correct the remaining four HEDs, i.e. HED 6C023.7 recommends that a procedure be prepared to assure a consistent label cleaning schedule and technique.

1.0 INTRODUCTION

1.1 GENERAL COMMENTS

This report summarizes the results of Boston Edison Company's detailed control room design review (DCRDR) of its Pilgrim Nuclear Power Station. The purpose of this DCRDR was to identify and implement control room design improvements that offer a high probability for meeting plant safety and availability objectives.

The need for control room design reviews has been well documented by the NRC as a result of the investigations of the Three Mile Island accident. The principal areas of concern identified were: non-compliance of control room facilities with human factors principles, deficiencies in operator presented information, and inadequate operating procedures.

This is part of an integrated plan covering TMI-related actions referenced in the TMI-2 Action Plan, NUREG-0660 and considered the relationship of the DCRDR with NUREG-0737, Supplement 1: "Requirements for Emergency Response Capability (Generic Letter No. 82-33)" dated 12/17/82 and "NRC staff review of the BWR Owners Group (BWROG) Control Room Program," (Generic Letter 83-18) dated 4/19/83 which included:

- o Establishing a qualified multi-disciplinary review team.
- o A function and task analysis that identified control room operator tasks and information and control requirements during emergency operations.
- o A comparison of the display and control requirements with a control room inventory.

- o A control room survey that identified deviations from acceptable human factors principles.
- o An assessment of Human Engineering Discrepancies (HEDs) and determined which HEDs were significant and should be corrected.
- o A selection of design improvements.
- o A verification that selected design improvements will provide the necessary correction.
- o A verification that improvements will not introduce new HEDs.
- o A coordination of control room improvements with changes from other programs such as the Safety Parameter Display System, Operator Training, Regulatory Guide 1.97 instrumentation and upgraded emergency operating procedures.

Figure 1-1 is a block diagram showing the relationship of the NUREG-0660 Task Action items Boston Edison Company is addressing.

A Program Plan was prepared in October 1983 to be consistent with and responsive to the guidelines provided in NUREG-0700 and NUREG-0801 as directly applicable to the design and status of the Pilgrim Nuclear Power Station and good human factors principles. NRC comments on the Program Plan were received in March 1984 and the Program Plan was revised in July 1984 to incorporate the NRC comments.

The Pilgrim Station had already received an intensive review by the BWR Owners' Group Control Room Improvement Committee with an associated review by Dr. T. Sheridan and Dr. D. Lanning, human factors consultants of the MIT Group. The results of this review were used in this program.

This Program Plan is in compliance with Generic Letter 83-18 which noted:

"Since the BWROG survey program addresses only the planning and review phases of DCRDR, you are expected to complete for following tasks:

- "a. Submit an individual program plan to the NRC referencing the BWROG Generic Program Plan. The plant-specific submittal should:
 - i. Document the qualifications of survey team members, and number and extent of plant personnel participation.
 - ii. Identify portions of the plant's DCRDR not performed in accordance with the methodology specified in the BWROG Program Plan.
 - iii. Discuss your program for prioritization of HEDs, reporting of DCRDR results, and implementation of control room enhancements.

(This was done on October 14, 1983.)

- "b. Complete the BWROG control room survey Checklist Supplement.
(A complete NUREG-0700 Section 6 survey was performed and the results compared with the original BWROG results. Results are summarized in this report and reported fully in CRS-1).
- "c. Prioritize HEDs, determine corrective actions, develop an implementation schedule, and report the results of the DCRDR to the NRC. **(This is discussed in this report.)**
- "d. Repeat portions of the task analysis using updated plant specific emergency operating procedures to account for differences in the new procedures.
(This was done in SFTA portions of the DCRDR and is summarized here and reported fully in the System Function and Task Analysis Report SFTA-1).

"e. Update operating experience review."

(This was completed and is summarized in this report and reported fully in the Operating Experience Report OER-2.)

1.2 OBJECTIVES

Boston Edison Company performed this review in order to:

- o Determine whether the control room provided the system status information, control capabilities, feedback, and analytical aids necessary for control room operators to accomplish their functions in an effective, safe and reliable manner.
- o Identify characteristics of the existing control room instrumentation, controls, other equipment, and physical arrangements that may impact optimum operator performance.
- o Define and put into effect a plan of action that applied additional human factors principles to enhance operator effectiveness. Particular emphasis was placed on improvements recommended by this review affecting control room design and operator performance under abnormal or emergency conditions.

1.3 PLANT DESCRIPTION

The Pilgrim Nuclear Power Station is located on the western shore of Cape Cod Bay in the Town of Plymouth, Plymouth County, Massachusetts. It is 38 miles southeast of Boston, Massachusetts. Bechtel Power Corporation was the architect/engineer and constructor of the station. The station consists of one 670 MW(e) (nominal) unit. It is powered by a single cycle, forced circulation General Electric Boiling Water Reactor producing steam for direct use in the General Electric 1,800 RPM tandem compound, four flow, non-reheat turbine generator. Commercial operation of the unit began in December 1972. A photograph of the plant is shown in Figure 1-2.

1.4 DEFINITION OF CONTROL ROOM

For purposes of the DCRDR project the control room (see Figure 1-3) is defined as the following consoles, bench boards and panels, including the SPDS displays, plant computer interface devices and communications console, which are used by the operators for normal and emergency plant operations:

FRONT PANELS

903	Reactor & Containment Cooling & Isolation Bench Board
904	Reactor Water Clean-up & Recirculation Bench Board
905	Reactor Control Bench Board
C2	Turbine Bench Board
C1	Feedwater & Condensate Bench Board
C3	345 K.V., Generator Auxiliary Power Bench Board
C170	Post Accident Monitoring Panel, Train A
C171	Post Accident Monitoring Panel, Train B
CP600	Augmented Off-gas Panel

BACK PANELS

902	Area & Process Radiation Recorder Vertical Board
910	Process Radiation Monitoring Vertical Board
911	Area Radiation Monitoring Cabinet
C4	Feedwater Heaters Control Vertical Board
C7	Containment Ventilation, Isolation & Gas Treatment Vertical Board

The DCRDR extended to other Man/Machine interfaces identified as a result of the analysis of selected events during the System Function and Task Analysis activity.

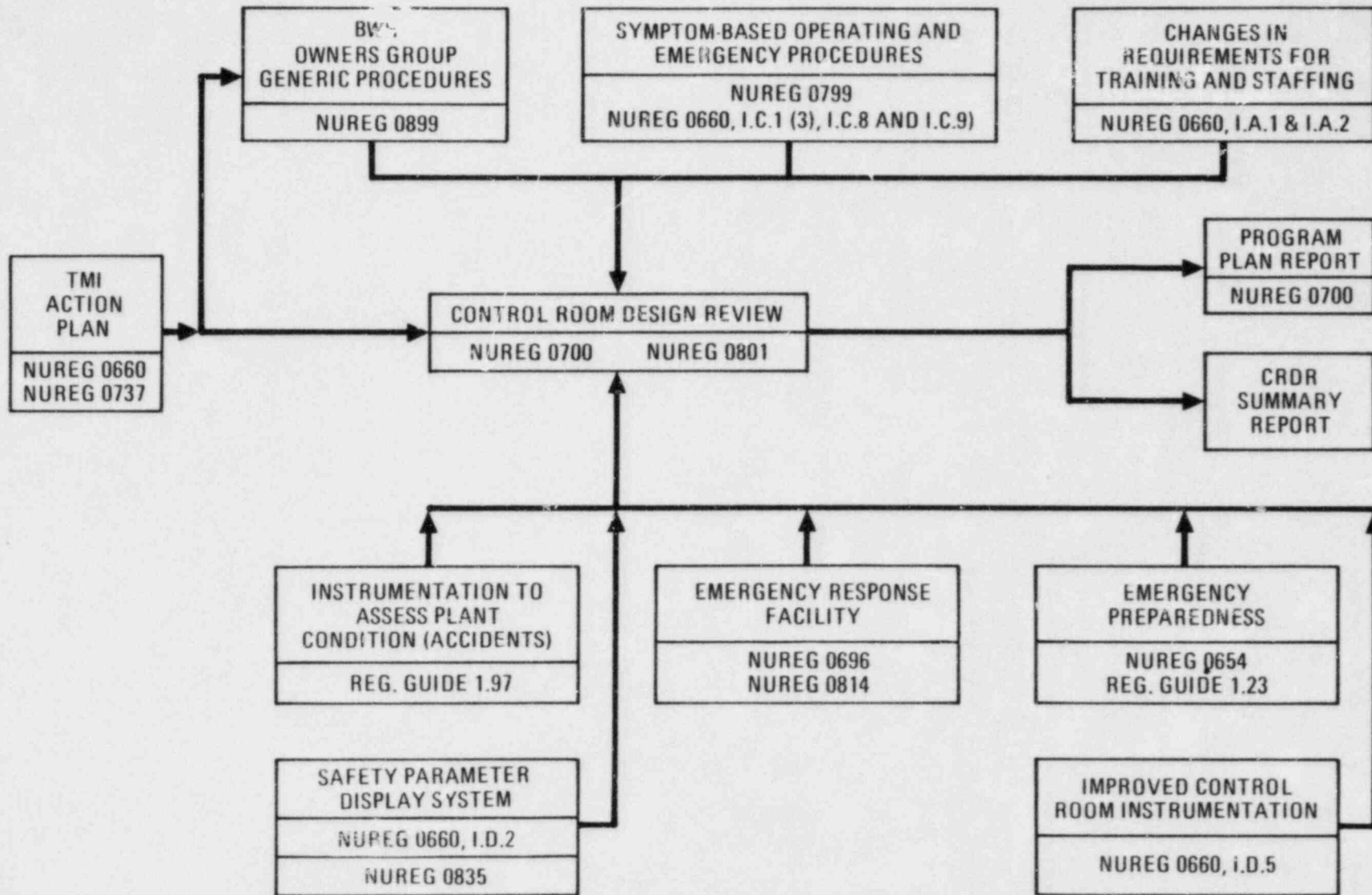


Figure 1-1 Relationship of NUREG-0660 Task Actions Items to be Addressed

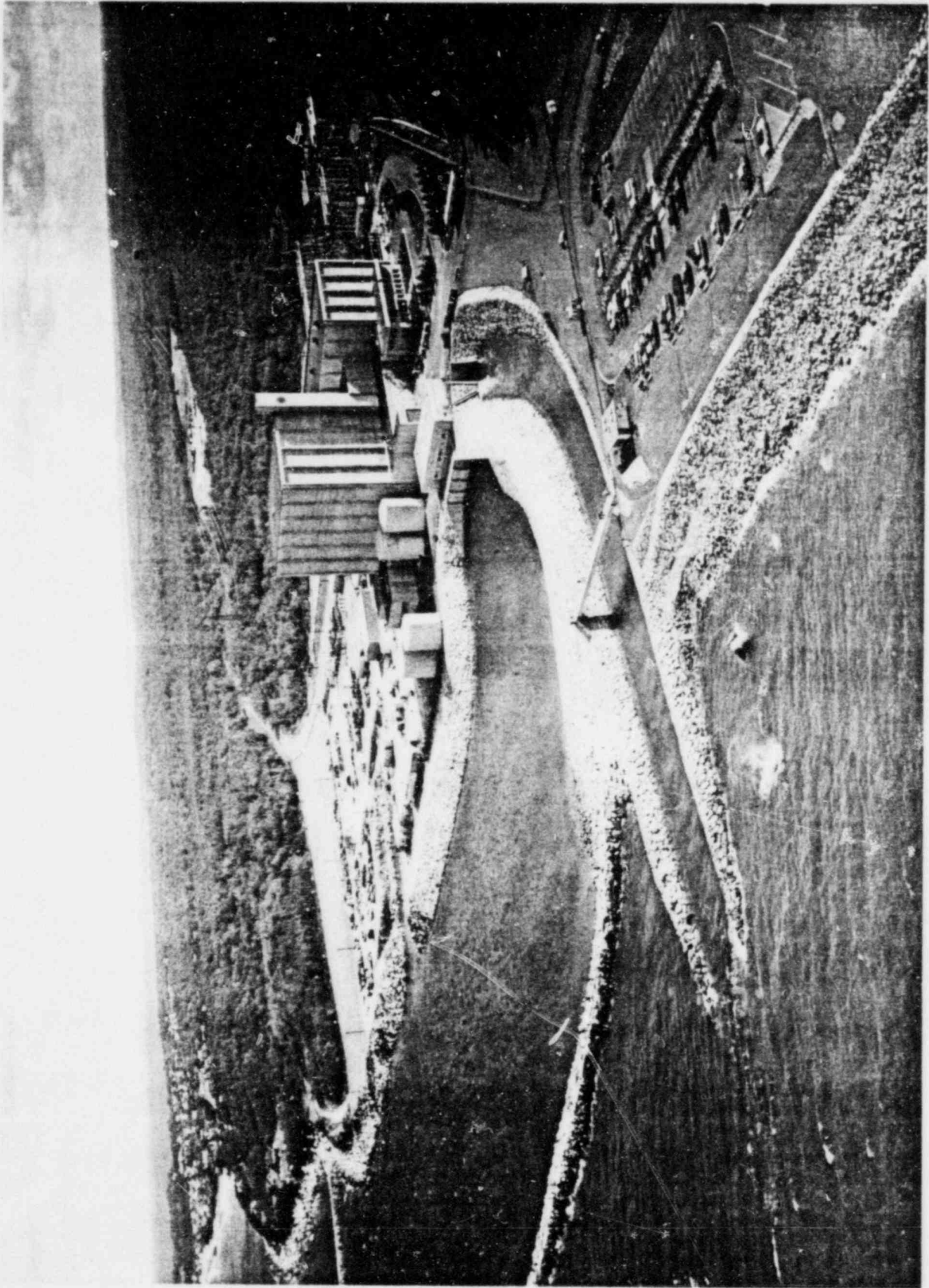


Figure 1-2. Boston Edison Company - Pilgrim Nuclear Power Station

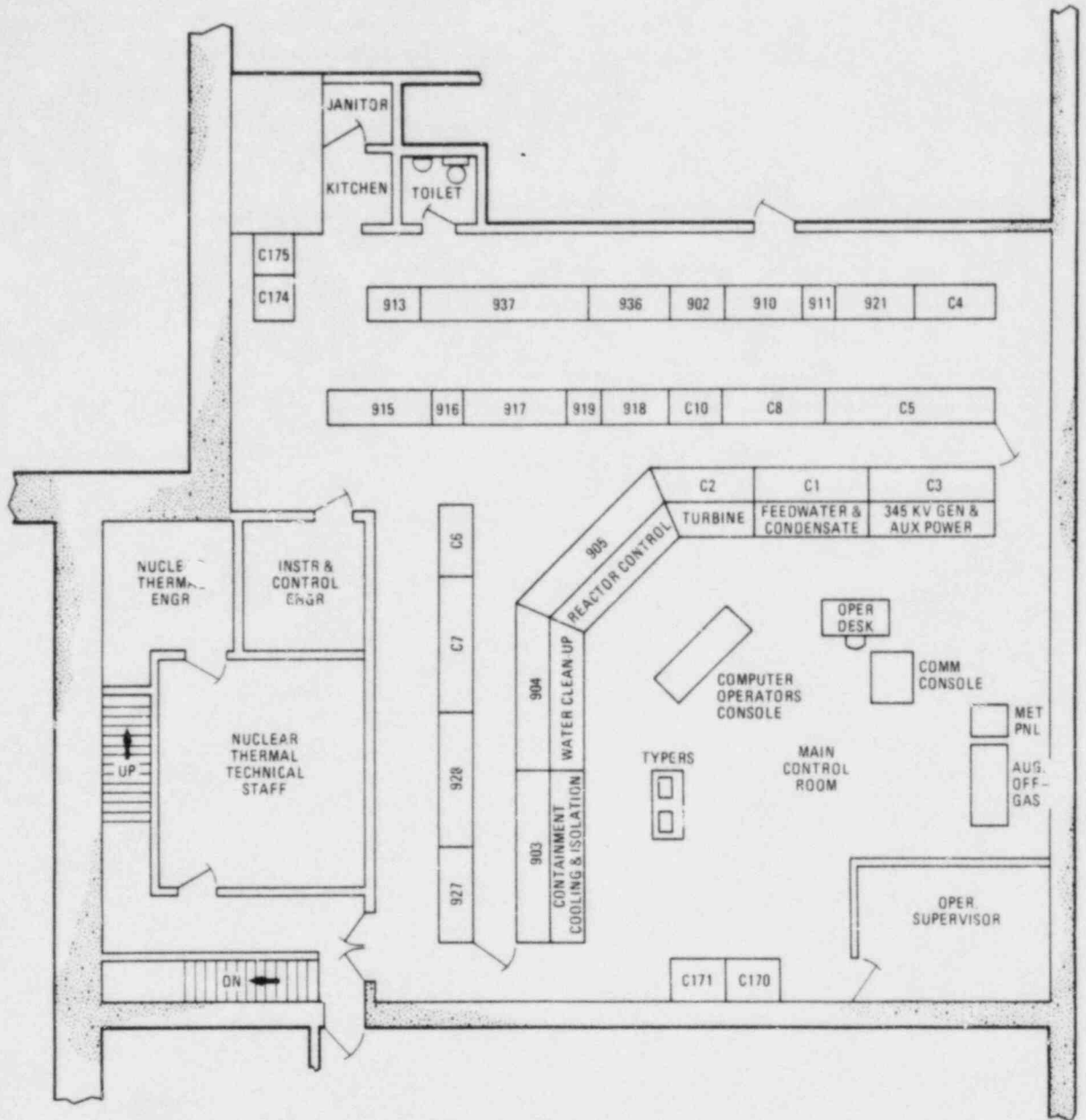


Figure 1-3. Layout of Central Control Room

2.0 DCRDR PLANNING AND METHODOLOGY

2.1 PLANNING

2.1.1 Organization

Boston Edison Company organized an Executive Team to guide, monitor and implement the DCRDR process as shown in Figure 2-1. The Executive Team had made provisions for designating alternates to key positions. The functions of this team corresponded to those recommended for management in NUREG-0700. They were to:

- o Assure proper relationships and awareness between this project and other NUREG-0660 efforts.
- o Assign key Management and Design Review Team personnel (see Figure 2-2).
- o Approve the detailed Program Plan.
- o Provide resources required to carry out the Program Plan.
- o Identify and assure that plant operational constraints and project requirements were properly coordinated.
- o Monitor DCRDR progress.
- o Review and approve control room improvement recommendations.
- o Establish and initiate the control room improvement program.

A Management Review Team was established to monitor and approve the results of the Design Review Team. All assessment and implementation recommendations were approved by the Management Review Team in executing its function. Table 2-1 shows the composition of the Management Review Team.

4.1.7/091084
BECO #51

The Management Review Team analyzed NUREG-0700 in relation to this plant facility and resources. The major activities are shown in Figure 2-3. The planning activity included, in addition to the above items, the following:

- o Definition of all man/machine interfaces and related activities to be reviewed.
- o Definition of objectives.
- o Definition of Management Review Team role.
- o Formulation of the task structure for the program (see Figure 2-3) and corresponding personnel assignment (see Table 2-2).
- o Development of administrative procedures to govern this review.

To facilitate this review, project management authorized the construction of a full scale, realistic mock-up for an extensive review by human factors and system specialists. (See Figure 2-4.)

Boston Edison Company had assigned engineering and operations specialists to the Design Review Team and had the responsibility for the technical scope of the DCRDR. Lead members of this Team and the tasks to which they are assigned are shown in Table 2-2. This table indicates the strong participation of human factors specialists in all major tasks and participation of the key Design Review Team members in most activities.

2.1.2 Documentation

Boston Edison Company established a library to assist the Design Review Team. The documents contained therein are the latest plant construction documents consistent with Section 2.4.1 of NUREG-0700.

Torrey Pines Technology also established a reference library of pertinent human factors documents including many of those listed in NUREG-0700, as well as relevant documents generated in other DCRDRs and relevant EPRI and INPO documents.

The relevant documents include Program Plans, DCDRs Executive Summary Reports, human factor documents generated for the aircraft industry and guidelines for the validation and verification efforts. In addition, reports on demarcation studies, annunciator design and labeling reports are included.

A filing system was set up to accurately file all of the letters, reports and data generated by this study.

The following documents were generated in support of the review:

- o Program Plan Report
- o Criteria Report
- o Operating Experience Review Report
- o System Function and Task Analysis Report
- o Control Room Survey Report
- o Control Room Inventory Report
- o Compilation of Observations and Human Engineering Discrepancies (HEDs)
- o Executive Summary Report

2.2 Methodology and Results

2.2.1 General

This section summarizes the methodology used for each of the separate tasks in the DCRDR and discusses the results, starting with the development of the criteria used in the study and the establishment of a data base management system.

2.2.2 Criteria Development

A listing was made of each of the NUREG-0700 Section 6 Guidelines. Associated with each of these Guidelines was a matrix indicating which criteria would be used in evaluation of the Guideline (i.e. NUREG-0700, directly, INPO Guidelines or BWROG Guidelines). Whenever an 0700 criteria was not used as the basis of the Guideline a justification was included. Added to this matrix was the data collection method, i.e. Operating Experience Review, Control Room survey or SFTA. For example, Section 6.8.2.2, "Logical Arrangement and Layout" of the panels cannot be determined fully from the Control Room Survey alone. The SFTA along with the associated Operational Sequence Diagram are needed.

An example of this matrix developed is shown in Figure 2-5.

2.2.3 Data Base Management System (DBMS)

Several major tasks in this DCRDR involved the collection, filing, comparing, and sorting of large amounts of related data. The most significant of these tasks were:

- o System Function and Task Analysis
- o Control Room Inventory
- o Control Room Survey

A DBMS was used at this DCRDR. This system was available on a mini-computer. This system has large storage capacity for storing large numbers of multiple field records. It also has a capability for sorting up to 16 fields and for linking files (groups of records) through a common field in each file.

The following are descriptions of the implementation of this DBMS for the tasks listed above.

System Function and Task Analysis

The tabulation of task data involved the filing and sorting of information about each step in the event sequence such as step sequence number, step description, equipment number, panel number, operator, etc. These data were stored and sorted by different fields for use in the traffic flow analysis and the task sequence analysis. Also using the file linking option of the DBMS, the task analysis file was linked with the control room inventory file via the device field in both files. This provided an automated method for verifying the presence of the devices and characteristics of devices required to accomplish the operator action.

Control Room Inventory

The control room inventory required the compilation of a complete list of the control room devices. This information was recorded and sorted using the DBMS. Some of the detailed data required for each device is as follows:

- o Device number
- o Panel number
- o Device location coordinates
- o System
- o Device type
- o Switch positions
- o Instrument range
- o Instrument division
- o Device label
- o Device manufacturer

This information was sorted by panel to provide a file of information for evaluating the inventory of equipment required for the events reviewed in the task analysis.

Control Room Survey

The control room survey required reporting and sorting of human engineering observations (HEOs), which is a term used for potential HEDs. The DBMS not only provided the capability for filing and reporting this information but the "sort" option provided quick reference to all the HEDs for a particular device or to all the HEDs for a particular panel or panel face.

2.2.4 Operating Experience Review

The activities for this task included the following:

- o A review of plant specific Licensee Event Reports (LERs)
- o The preparation, distribution and completion of an operations personnel questionnaire and analysis of the responses
- o Structured interviews based on the responses to the written questionnaire and analysis of the interview results.

This task was performed as a team effort. Initially, a meeting of the task team was held to detail the task efforts and make arrangements for executing these efforts in accordance with the DCRDR Program Plan. Mr. Warren Babcock, the Boston Edison Company Principal Investigator, provided the liaisons necessary for executing the collection of the data.

The task was conducted in a manner to provide maximum confidentiality for the operations personnel. The Torrey Pines Technology task team members handled the review of the questionnaires and interviews directly with the operators.

2.2.4.1 Review of Operating History Documents

A review was made of the Licensee Event Reports written over the past five years to determine possible human factors involvement based on criteria developed by the Design Review Team.

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Those reports that were suspect were reviewed further during the operations personnel interviews. If the interviews indicated human factors involvement, these concerns were given to the Control Room Survey or the System Function and the Task Analysis Task Groups for background information and further analysis.

The review of the Boston Edison Company Pilgrim Nuclear Power Station LERs was performed as follows:

Mr. Warren Babcock reviewed the LERs for 1979 and 1980 and could not directly link reported incidents to human error or human engineering design deficiencies. This review was conducted as a portion of the BWR0G Control Room Design Review.

Mr. Sal Luna reviewed the LERs for 1981, 1982 and those recorded to date for 1983. There were 65 LERs for 1981, 57 LERs for 1982 and 46 LERs for 1983. The bulk of these LERs were attributed primarily to equipment failure. Five LER writeups indicated a possibility of being attributed to human error and were selected for a more thorough review as part of the plant personnel operating experience interviews. The five possible human error related LERs are: 81-002/03L-0, 81-012/03L0, 81-052/03L-0, 82-011/01T-0 and 83-036/03L-0.

2.2.4.2 Questionnaire

A questionnaire containing four separate sections was prepared covering the topical areas of NUREG-0700, Section 6. The four sections were specifically directed at operations personnel in positions or former positions of:

- o Nuclear Power Operators
- o Shift Supervisors/Watch Engineers
- o Shift Technical Advisors
- o Operations Managers.

All personnel were requested to complete an experience profile (see Figure 2-6).

All applicable guidelines contained in NUREG-0700 were used to structure the four sections of the questionnaire.

The question topics included:

- A) Workspace and Environment
- B) Communications
- C) Annunciator Warning Systems
- D) Controls
- E) Visual Displays
- F) Labels and Location Aids
- G) Process Computers
- H) Panel Layout
- I) Control - Display Integration
- J) Procedures, Manning and Training
- K) Control Room Equipment and Storage

Questions were posed such that the undesirable responses required an explanation. For the undesirable response, operations personnel were asked to explain the specific problem or deficiency and, if applicable, to identify the associated panel, system, equipment, and/or component. Recommendations concerning actions that could be taken to correct or improve the deficiencies also were sought. See Figure 2-7 for sample questions from the Questionnaire.

2.2.4.3 Questionnaire Responses

Table 2-3 is a summary of the number of operations personnel by position and Pilgrim Nuclear Power Station experience that responded to the questionnaire.

Operator and Supervisor Questionnaire Responses

The written operator and supervisor questionnaire responses are summarized below by NUREG-0700 content area. This summary provided data to structure the interviews and to provide a one-on-one systematic comparison of the Operating Experience Review data with data collected during the Control Room Survey phase of this DCRDR.

Management Questionnaire Responses

Two (2) completed questionnaires, contained responses to the operator and supervisor portions and the management portion. The responses from the management portion of the questionnaire yielded little data relevant to the DCRDR.

Shift Technical Advisor Questionnaire Responses

The data from the Shift Technical Advisor portion of the questionnaire yielded little data relevant to DCRDR. The only problem indicated was the lack of plant specific systems and simulator training for retraining and updating technical proficiency.

The observations having the potential to cause a human error or degrade operator performance in the control room were documented as OER Observations. The OER Observations that could be directly associated with a NUREG-0700, Section 6 checklist item were identified and were considered during the Control Room Survey. If the Control Room Survey verified the OER Observation it was documented as a human engineering observation. For example, observation OER-001, is the first observation associated with the OER task. Since this observation is related to CRS item 6.1.1.3c., the HEO documenting this item was identified under the CRS checklist number 6.1 as HEO 6.1.002. This approach was used to reduce potential HEO duplications.

Observations unique to the Operating Experience Review having human factors implications but not associated with a checklist item were documented as HEOs specifically relating to the OER findings.

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Summaries of the written responses by topic are as follows:

A) WORK SPACE AND ENVIRONMENT

- o The operator workspace is too small
- o The supervisors' workspace is too small
- o The watch engineers' office is outside the control room
- o The communications work area is too cluttered
- o It is difficult to view the overhead CRT monitor
- o Indicator readings are difficult to make due to glare

B) COMMUNICATIONS

- o There are no operator controls to filter "noise" over paging system
- o Voice communication is inadequate while wearing a face mask or ear protectors
- o The number of control panel plug-in jacks is inadequate
- o There is too much voice traffic and noise over the paging system

C) ANNUNCIATOR WARNING SYSTEM

- o False alarms result from recorder failure
- o A first-out annunciator is not provided
- o Tiles are lit for "out of service" equipment
- o There are too many dual tiles (Hi/Lo)
- o There is no annunciator prioritization
- o Annunciator tiles are not compatible with control/display locations
- o Annunciator windows are too small

D) CONTROLS

- o The direction of motion for some controls differs from convention.
- o Safeguards are needed for some controls to prevent accidental activation
- o Some instrument controls are outside the CR, e.g., RCIC Reset Control
- o There are no controls to select recorder channels.
- o There are insufficient quantity of spare handles for some controls.
- o Some controls are hard to operate, e.g. control rod drive
- o Some controls are too close to each other, e.g. RHR and HPCI

E) VISUAL DISPLAYS

- o Some recorders are difficult to read and are often inoperative.
- o Meter values must be interpolated, e.g., CONDENSOR VACUUM TURBINE BACK PRESSURE INDICATION
- o There is a lack of instrument status feedback, e.g., TORUS WATER LEVEL
- o There is no out of service equipment status board

F) LABELS AND LOCATION AIDS

- o Labels are missing for some controls and displays
- o Labels are illegible for some controls and displays
- o The AOG panel needs mimics
- o Some mimics are confusing

G) PROCESS COMPUTER

- o The keyboard often malfunctions
- o The CRT location is not convenient for operator viewing
- o The computer response is too slow

- o The CRT screen glare is a problem

H) PANEL LAYOUT

- o Many essential controls and displays are on the back panels
- o The Reactor Water Clean-up controls are too spread out
- o The turbine back pressure recorder should be supplemented with a condensor vacuum meter
- o The RPS lights cannot be seen from the operator's normal work position
- o The Panel layout for CP-600 is confusing

I) CONTROL-DISPLAY INTEGRATION

- o Some annunciator tiles are located on different panels from their associated controls and displays
- o There is a large separation between SRM display and the rod control

J) PROCEDURES, MANNING AND TRAINING

- o The operating procedures are not complete
- o The operating procedures are not current
- o There is no work space provided to lay out procedures at the panels
- o The emergency procedure books are not uniquely identified
- o Operators have not been trained for operations while wearing protective equipment

K) CONTROL ROOM EQUIPMENT AND STORAGE

- o The supply of and organization of expendable spare parts is inadequate
- o The emergency equipment is located too far from control room

2.2.4.4 Interview Questions

Questionnaire responses were carefully reviewed and evaluated by the review team. These results enabled the OER team to develop questions that focused the follow-up interviews on potential problem areas.

2.2.4.5 Operations Personnel Interviews

Each interview session consisted of one or two operations personnel interviewees and two interviewers.

Each interview started with the same introduction and a general lead-in question, "What are the highest priority improvements you would like to see implemented in the control room?"

Each interview lasted approximately one-and-one-half hours, with the last ten minutes used to assure that the notes taken by the interviewers were an accurate account of the information recorded. Categories addressed during the interview were summarized on a form as shown in Figure 2-8.

Most of the interviews were conducted within the Pilgrim Nuclear Power Station control room to permit the interviewees to point out specific problems in support of their responses. This also provided an opportunity to identify additional related control room problems.

To assure that the information would not be misinterpreted, the interview data were recorded on a specially designed form. The form provided the review team members the opportunity to assess the recorded data immediately following each interview session.

During the Control Room Survey and the System Function and Task Analysis conducted on the full-scale mock-up at Torrey Pines Technology, three additional operations management personnel, with SRO licenses, were interviewed regarding operator-equipment interactions that have potential to degrade operator performance.

Table 2-4 is a summary of the nineteen operations personnel by position and Pilgrim Nuclear Power Station experience that were interviewed.

2.2.4.6 Operations Personnel Interview Responses

In general the verbal responses received during the interview sessions were in agreement with the written responses to the operator and supervisor portions of the questionnaire. The operations personnel responding to the written questionnaire. The operations personnel responding to the written questionnaire, were not necessarily the same as those that participated in the interview.

The responses to the interview queries were summarized as observations by NUREG-0700, Section 6 topics.

The Operating Experience Review resulted in 49 observations that were of concern to the operations personnel. The interviews confirmed that two of the LERs review were notable observations and were used in support of the Control Room Survey portion of the DCRDR. Four (4) observations unique to the Operating Experience Review were documented as HEOs. The HEOs that resulted from the remaining 45 OER observations were documented under the Control Room Survey or System Function and Task Analysis portion of the DCRDR. The OER Observations generated and cross-referenced with the HEO from the Control Room Survey shown in Table 2-5.

2.2.5 Control Room Survey

The objectives of the Control Room Survey were to:

- o Identify characteristics of the control room controls, instrumentation, displays and physical arrangements that may degrade operator performance.
- o Determine whether the control room provides the system status information, control capabilities, feedback, and analytical aids necessary for safe and effective plant operation.

- o Provide recommendations for correcting observations based on good human factors principles.

The Control Room Survey was conducted at both the control room and the full size photomosaic mock-up.

The survey was performed according to a written procedure. This procedure describes the development of the criteria for evaluating the control room and the method for performing the evaluation. The criteria were provided in nine evaluation checklists. The topics for these checklists were:

Control Room Workspace	(Section 6.1)
Communications	(Section 6.2)
Annunciator Warning System	(Section 6.3)
Controls	(Section 6.4)
Visual Displays	(Section 6.5)
Labels and Location Aids	(Section 6.6)
Process Computers	(Section 6.7)*
Panel Layouts	(Section 6.8)
Control-Display Integration	(Section 6.9)

*Checklist developed but survey deferred until new plant computer is installed.

The basis for the criteria used in each of the checklists was established in the Criteria Report. This report, which was developed specifically for the Pilgrim Nuclear Power Station, identifies all the references and guideline criteria used to develop each checklist.

The task was performed as a Design Review Team effort. Initially, a meeting of the task team was held to detail the task efforts in accordance with the DCRDR Program Plan. Mr. Warren Babcock, the DCRDR Principal Investigator, provided the liaison necessary for executing the collection of the survey data.

The Control Room Survey activities included the following:

1. Preparation of a criteria matrix that sequentially listed each item of the NUREG-0700, Section 6, guidelines along with the guideline used, the method of data collection and a space for comments.
2. Preparation of nine checklists with each checklist containing all the guidelines for a given topic (e.g., Controls). The checklists used the same numbers and titles contained in NUREG-0700, Section 6. An example from the checklist is shown in Figures 2-9 and 2-10.
3. Determination of where and how the data regarding each guideline item was obtained, i.e., either in the control room or at the mock-up.
4. Examination or measurement of each guideline contained in the nine checklists.
5. Recording the data in topical loose-leaf bound checklist notebooks (nine).
6. Proposed HEOs for areas of non compliance with guidelines.
7. Preparation of a computer program for the storing and sorting of HEOs.

2.2.5.1 Completion of the Checklists

Checklists that were completed in the control room (items that required measurement or observation during power operation) included:

- o Checklist 6.1 Control Room Workspace:
 - Sections 6.1.1 General Layout, 6.1.2 Workstation Design, 6.1.4 Emergency Equipment and 6.1.5 Environment.
- o Checklist 6.2 Communications

Checklists that were completed on the mock-up included:

- o Checklist 6.3 Annunciator Warning Systems
- o Checklist 6.4 Controls
- o Checklist 6.5 Visual Displays
- o Checklist 6.6 Labels and Location Aids
- o Checklist 6.8 Panel Layout (partial)
- o Checklist 6.9 Control-Display Integration (partial)

The Controls, Visual Displays, Labels and Location Aids, Panel Layout and Control-Display Integration Checklists were evaluated on a panel by panel basis. All applicable criteria from the checklists were applied to each of the panels. Checklist 6.8 and 6.9 were completed later as part of the SFTA Validation and Verification effort.

The Annunciator Checklist was evaluated on a system basis regardless of panel location. The Control Room Workspace Checklist was evaluated on the whole control room since the majority of the checklist pertains to the control room layout, furnishings and panel profiles. The Process Computer Checklist was deferred pending installation of the new plant computer. The Communications Checklist review used a standard word list to determine speech intelligibility over the communications systems.

2.2.5.2 Human Engineering Observations

When a checklist item met the criteria, the "complied" box in the checklist form was marked (see Figure 2-9). Items that did not meet the criteria were so noted and a comment form completed (see Figure 2-10). In addition an HEO number was assigned and an HEO assessment form (Figure 2-11) was

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prepared for each checklist item not satisfying the criteria. Devices that did not meet the criteria were listed by line number (see Section 2.2.6). To observe the item listed in the HED, the reader is urged to refer to the Control Room Inventory Report that includes photos of the whole control room along with the unique line number written next to the devices on the control room panels.

The HEOs were sequentially numbered by Checklist 6.1 thru 6.9, i.e., 6.1.001 was the first HEO identified under Checklist 6.1, likewise 6.2.001 was the first HEO identified under Checklist 6.2, etc. The Control Room Survey generated 167 HEOs for submittal to the Assessment Team (see Table 2-6 for survey) of the HEOs, 60 were related to the OER observation.

2.2.5.3 Human Engineering Observation Form

A computer program was developed using a data base management system for storing, reporting and sorting of the HEOs. The program produces individual forms as shown in Figure 2-11 for each HEO generated. It also sorts on any of the categories or words within a category. For instance, if it is desirable to search for all of the HEOs regarding a given instrument, the program will search in the "HEO Description" section for the instrument in question and then link it to the HEO number or any other item of interest.

The HEO form contains the following fields:

1. EVALUATOR - The human factors specialist who prepared the HEO.
2. HED - The Human Engineering Discrepancy number to be assigned by the Assessment Team.
3. TASK - In this case, the Control Room Survey.
4. HEO - A unique identifying number for each HEO.
5. CL - Checklist number.

6. CL ITEM - These numbers correspond to the guideline number in Section 6 of NUREG-0700.
7. DATE - The date the HEO was prepared.
8. REV - The revision if applicable.
9. CL TITLE - The title of the checklist.
10. HEO CATEGORY - This is for category designations to be assigned by the assessment team for presentation to the management team. See Section 3.0 for details on the categorizing and processing procedure.
11. CONTROL BOARD LOCATION - The name of the Board/Console containing the instrument in question.
12. BOARD NO - The number of the Board/Console as defined in the Program Plan containing the instrument in question.
13. HEO DESCRIPTION - Starts off with a description of the CL item, identifies the instrument and/or boards in question and describes the nature of the observation.
14. POTENTIAL OPERATOR ERROR - Describes the potential operator error.
15. RECOMMENDED REVISION - Contains a suggested human engineering fix for presentation to the assessment team.
16. AIT REVIEW, MANAGEMENT REVIEW - This portion of the HEO form was filled out by hand by the assessment and management teams.

2.2.6 Control Room Inventory

A total of 1,538 individual items grouped into each of 14 panels were listed in the inventory. A sample of the inventory list is shown in Figure 2-12.

2.2.6.1 Specific Characteristics

The inventory list includes the following:

- o Line Number

A unique sequential line number was arbitrarily assigned each panel mounted equipment item (or collection of items treated as a unit) on the panels to facilitate accountability and quality in compiling the inventory. These same numbers were also on labels affixed to the full scale mock-up photos and to the proof photos. In addition, the line numbers have been used to identify items on the panel drawings and in some cases on the P&IDs. These line numbers were unique and as such were used exclusively with the Control Room Survey and System Function and Task Analysis. Since many instruments had no unique identifier, the line number was used to identify instruments not complying with NUREG-0700, Section 6, guidelines and were listed in any HEOs generated. The SFTA task also used these numbers to outline the operator steps. Line numbers had also facilitated discussions and reviews of the mock-up and other non-computerized aspects of the DCRDR.

- o Instrument Numbers

Instrument numbers were assigned to the majority of the items in the inventory. An item was identified in the inventory just as labeled on the panel if it was identified by both a descriptive

prefix and a number. An item identified by number only on the panel was assigned a prefix followed by this same number. Items not identified (on the panels) by either a prefix or a number were assigned both.

The assigned prefixes (all beginning with an "X") were listed (see Table 2-7 for a sample). Care was taken to prevent ambiguity, and where possible, the established ground rules were followed. Each instrument number is unique to its item and has a one-to-one correspondence with its line number; the two, thus, are interchangeable.

- o Service Description

Information included parenthetically in this column was added by Torrey Pines Technology in order to either create a non-existent label or to render more definitive the information given in the label; P&IDs, the Instrument Index, FSAR and GE documents were consulted at various times for more definitive information.

- o System Number

The system numbers shown in the inventory resulted from an extensive review by Boston Edison Company personnel. (See Table 2-8 for samples)

- o Manufacturer/Model

This column was used for general information only. An example of the equipment identifications used is shown in Table 2-9.

- o Range Units

These values were used during the SFTA verification and validation effort of the DCRDR.

- o Minimum Scale Increment

These values were used during the SFTA verification and validation effort of the DCRDR.

- o Board Number

The numbers are equivalent to the panel numbers.

- o Panel Identifier

The panel drawings were divided into sections (using yellow hi-liter) identical to those used in the Photo Log I.D. System (see Figure 2-13) and the line numbers were entered to identify each item; the marked-up panel drawing was then used to identify the Panel I.D. A sample of a panel photograph is shown in Figure 2-14.

2.2.7 System Function and Task Analysis

The System Function and Task Analysis (SFTA) was a structured review and analysis conducted according to the guidelines presented in NUREG-0700 and was performed by the SFTA team members identified in Figure 2-2. The results of the review and analysis were assembled into data sheets and diagrams showing operator task actions and movement required in the Verification and Validation phases of the DCRDR.

2.2.7.1 SFTA Data Base

The SFTA data base was one of three in the Data Base Management System defined for the DCRDR of the Pilgrim Nuclear Power Station (see Section 2.2.3). The data base was a collection of data records as shown in Figure 2-15. Each record was uniquely defined by event and Operator Step. Various collections of these data records comprised the data sheets which in turn formed the basis for the diagrams.

2.2.7.2 Plant Document Review

The initial activity in the SFTA was to review documents related to plant design and operations as they pertained to the DCRDR. The primary documents reviewed were:

- o FSAR (e.g. system description; plant normal and accident analysis)
- o System Operating Procedures (e.g. Proc. 2.2.86, Residual Heat Removal System)
- o Emergency Operating Procedures (there are a total of eight e.g. EOP-01, RPV Control, Power)
- o Operating Procedures (e.g. Proc. 2.1.6, Reactor Scram)
- o Technical Specifications
- o P & IDs (system configurations)

The information presented in these documents were found to be sufficient for the SFTA. The EOPs are plant-specific, symptom-oriented and were in the final stage of the EOP upgrade program. These eight EOPs were found adequate based primarily on the following considerations:

- o Adequately address basic plant safety functions (Table 2-10)
- o Format is adequate for defining operator tasks (Figure 2-16)
- o Format contains operator decision-points for guidance in selection for analysis concerning assumptions of failures in systems required to respond to the assumed initiating events.

2.2.7.3 System and EOP Data Collection

This activity concerned documenting the system and EOP information for use in the process of selecting operating events (SOE) for evaluation as well as for general use in the DCRDR. The format shown in Table 2-11 lists the following headings and corresponding tabular information.

- o System - Identifies major systems presented in the FSAR.
- o EOP - Identifies those systems addressed for each of the eight EOPs that required some form of operator attention related to the basic plant safety functions (Table 2-10).
- o SOE - Identifies those systems addressed in the selected operating event.

2.2.7.4 Selection of Events for Analysis

To select the events for analysis, the following selection criteria were established by the SFTA team.

The selected event should:

- o Utilize a broad range of control room functions.
- o Require time-dependent action by the operator.
- o Require multisystem operation and interaction by the operator.
- o Represent potentially high stress situations for the operator.

The selection of events was iterative and was based on the following:

- o Select an initial set of Initiating Events requiring the use of EOP.
- o Determine the EOP flow-paths for each Initiating Event. (See Figure 2-16)
- o Evaluate the systems required for each EOP flow-path against the above selection criteria and revise the initiating event and/or the EOP flow-path optimize compliance with the selected criteria.
- o Evaluate operator decision-points (see Figure 2-16) on each EOP flow-path against selection criteria and add to each initiating event the assumption of system failures as necessary.
- o Select a normal operating event using Table 2-10 and selection criteria.

The above process resulted in the selection of events shown in Table 2-12. Each selected operating event (SOE) was given a unique number.

2.2.7.5 SOE Data Collection

The collection of SOE-specific data for input to the data base consisted of the following major activities conducted independently of each other:

- o Operator Task Data - formulation of task description, requirements and alternate tasks from the EOP flow-paths for each SOE.

- o Operator Step Data - formulation of step description and identification of control room devices that the operator could use for each step on the EOP flow-path for each SOE. And, formulation of step requirements from estimates of related system status based on an estimate of SOE elapsed-time.
- o Operator Area of Responsibility - see Figure 2-17.

In order for the above data to be effective when evaluated for guideline compliance in the Verification and Validation phases, it was necessary for the operator task data to be consistent in meaning between task description, requirement and alternate task. Passive task descriptors, such as "Verify" and "Monitor" were used to indicate a requirement for status information without control capability. Conversely, active descriptors such as "Close", "Isolate" and "Transfer" were used to indicate a requirement for control capability as well as for information. Alternate tasks were not pursued in terms of operator steps except for those necessary to accommodate the assumed failures in systems required to respond to the initiating event.

2.2.7.6 SOE Data Sheets and Diagram

The SOE data contained in the data base were reviewed for completeness and revisions were made as necessary. However, this effort was not completed due to the EOPs undergoing revisions in the final stage of the EOP upgrade program. The contents of each SOE in terms of operator tasks and steps is summarized in Table 2-13.

The necessary operations between the SFTA and Control Room Inventory data bases were made and the data sheets and diagrams for Verification and Validation were produced. (See Figures 2-18 through 2-24.)

2.2.8 Verification

The verification of operator task performance capabilities was conducted in a manner consistent with the objectives of NUREG-0700 and was performed by the verification team members identified in Figure 2-2. The results of the verification were specific Human Engineering Observations (HEOs) that were submitted for assessment or potential HEOs that were forwarded to the Validation phase for further evaluation.

2.2.8.1 Verification Checklist Development

In this activity, the aspects of verification of information and control availability, and of human engineering suitability were compared with those NUREG-0700 guidelines indicated in the Criteria Matrix as requiring SFTA data (see Section 2.2.2). All verification aspects were found to be adequately addressed by these guidelines.

Since these guidelines had been included in the Control Room Survey Checklists, these checklists were also used for verification but distinguished from the survey through the use of a separate reference/comment form shown in Figure 2-25.

This had the added benefit of inherently including the Control Room Survey and Operating Experience Review results in the verification process.

2.2.8.2 Checklist Execution

Execution of the checklists consisted primarily of evaluating the data sheets and diagrams produced by the SFTA for guideline compliance. This was analogous to the evaluation of the control panels in the Control Room Survey. However, the results of the survey contained in the checklists were also reviewed.

In addition to the above data sheets and diagrams, guideline-specific or task-specific data groupings were obtained from the SFTA or Control Room Inventory data bases as necessary to facilitate evaluation.

For documentation of non-compliance with a guideline, existing HEOs for the guideline were reviewed for revision possibilities. Lacking same, a new HEO was prepared.

Potential non-compliance with a guideline was identified on a task basis for further evaluation in the Validation Phase.

2.2.9 Validation

The validation of operator function execution in the control room was conducted in a manner consistent with the objectives of NUREG-0700 and was performed by the Validation Team members identified in Table 2-2. The results of the validation resolved potential HEOs from the Verification Phase and generated additional HEOs for submittal for assessment.

2.2.9.1 Validation Checklist Development

In this activity, the aspects of operator function execution within the structure of plant operating procedures and control room configuration were compared with those NUREG-0700 guidelines indicated in the Criteria Matrix as requiring SFTA data (Section 2.2.2). All validation aspects were found to be adequately addressed by these guidelines.

As in the Verification Phase (Section 2.2.8.1), the Control Room Survey Checklists were used along with the same separate reference/comment form (Figure 2-25).

2.2.9.2 SOE and Task Selection

The selection of operator tasks and SOEs for validation was made from a comprehensive evaluation of all tasks of all SOEs using the following criteria:

- o Maximizes operator workstation utilization, potential stress, interaction and workload.

- o Addressess all significant operator tasks.
- o Addresses all potential HEOs identified in the Verification Phase.

From the above process, SOE 2 (Small Break LOCA in Primary Containment with LOSP and Recovery) was selected plus specific tasks from the remaining SOEs (Table 2-14).

2.2.9.3 Procedure Development

A validation procedure was developed based on the photo-mosaic mockup of the main control panels in the primary operating area of the control room (Figure 2-17).

The procedure consisted of the following principal elements:

- o Walk/talk-through method.
- o Three observers with the lead observer directing all activity using the appropriate SFTA data sheets and diagrams.
- o Two operator-instructors who executed tasks as directed by the lead observer.
- o Execution of the checklist for guideline compliance.
- o Video recording of all activity.

2.2.9.4 Procedure (and Checklist) Execution

The execution of the validation procedure inherently included the execution of the checklist. Operator activity was initiated by the lead observer giving plant symptoms or task descriptions from the SFTA data sheets. Operator response was execution of a task sequence and/or steps to accomplish

the task(s) which was evaluated by the observers for guideline compliance. The evaluation process included frequent discussions with the operators and reference to the Control Room Inventory data base or EOPs as necessary.

The potential HEOs from the Verification Phase were resolved and any additional non-compliance with a guideline was documented in the same manner as in the Verification Phase (Section 2.2.8.2).

2.2.10 Assessment

The assessment for the dispositioning of all HEOs identified in the DCRDR was conducted in a manner consistent with the objectives of NUREG-0700 and NUREG-0801 and was performed by the assessment team identified in Table 2-2. The results of the assessment were Human Engineering Discrepancies (HEDs, significant HEOs) with correction methods selected, and non-HEDs for which corrective actions were optional.

2.2.10.1 Assessment Data Base

The assessment data base was one of three in the Data Base Management System defined for the DCRDR of the Pilgrim Nuclear Power Station (see Section 2.2.3). The data base was a collection of data records as defined in Figure 2-26. Each record was uniquely defined by the HEO number throughout the assessment.

2.2.10.2 Document Review

The initial activity in the Assessment Phase was to review documents related to HEO dispositioning. The primary documents reviewed were:

- o NUREG-0700
- o NUREG-0801
- o NUREG-0737, Supplement 1
- o Summary reports issued by the Design Review Team
- o EPRI NP-2411, Human Engineering Guidelines for Enhancing Nuclear Control Room

The information presented in these documents was used to establish an assessment methodology tailored to the Pilgrim Nuclear Power Station.

2.2.10.3 Assessment Methodology Development

The assessment methodology developed for the Pilgrim Nuclear Power Station is presented in Figure 2-28 which summarizes review team definition, team scope of responsibilities and HEO routing. The Assessment Process was defined in terms of HEO categorization (Figure 2-29) and analysis for corrections (Figure 2-30). A written procedure for HEO assessment was developed by the Technical Review Team prior to the start of this process.

2.2.10.3.1 HEO Categorization

In this activity, each HEO was categorized by the Technical Review Team using the Assessment Factor Criteria and logic path shows in Figure 2-27. The relationship between the criteria elements was based on the following definitions:

1. Category A - HEOs Associated with Documented or High Potential Errors.

Category A includes HEOs which are known to have previously caused or contributed to an operating error as documented in a Licensee Event Report (LER) or other historical record, or as established by the interview (or questionnaire) responses of operations personnel, or which have the potential to cause an error of high safety consequence.

2. Category B - HEOs Associated with Safety Considerations.

Category B includes those HEOs determined by documentation or by potential to be of low safety consequence or to cause an unsafe condition.

3. Category C - HEOs Associated with Availability or Reliability Considerations.

Category C includes HEOs which have been assessed and determined to have potential for causing or contributing to a human error that impacts the commercial aspect of electrical generating capabilities.

4. Category D - HEOs that are Minor or Non-Significant.

Category D includes any observation that has been evaluated and determined neither to increase the potential for causing or contributing to a human error nor to have adverse safety consequences.

HEOs assigned categories A, B or C were defined as HEDs and were analyzed for corrections.

2.2.10.3.2 Analyses for Correction

The analyses for correction was adopted as the final element in the assessment process and is summarized in Figure 2-30. However, this was expanded to provide a clearer distinction between enhancement, design and alternatives by defining the following Correction Methods:

- o Enhancement (Interim) -
a corrective action implemented while a long-term corrective action is being developed.
- o Enhancement (Final) -
a corrective action using surface treatment techniques.
- o Design Change -
a corrective action for non-related HEDs. (Correctable on an individual basis.)
- o Design Improvement Program -
an integrated corrective action for related HEDs.

- o Panel Devices Relocation Program -
an integrated corrective action for related HEDs.
- o Operation Procedure Change -
a corrective action for operation procedure related HEDs or for HEDs affected by design limitations.
- o Administrative Procedure Change -
a corrective action for administrative procedure related HEDs.
- o Justification for non-corrective action.

The use of Correction Methods provided the necessary flexibility in the event the implementation of the corrective action originally designated proved not feasible.

2.2.10.4 Assessment Methodology Execution

Execution of the assessment was initiated by the Design Review Team submitting observations of non-compliance with guidelines to the Technical Review Team, documented on the HEO form generated by the data base (Figure 2-27). The Design Review Team completed all items on the left side of the form except for "HED#" and "HEO CATEGORY". HEO dispositioning was controlled by the Technical Review Team through the use of an HEO Disposition Log (Figure 2-31).

For each HEO, the Technical Review Team assigned an HEO Category and, as appropriate, an HED#, coded to indicate the Correction Method selected (see Table 2-15). To support their evaluation, the Technical Review Team had at their disposal:

- o Technical Specification Safety Limits
- o Operating Limits
- o Limiting Conditions for Operations
- o LERs

- o Photo-mosaic Mock-up
- o Data Base Management System

The results of the review were recorded on the space provided and the form submitted to the Management Review Team.

The Management Review Team documented the results of their evaluation in the space provided and submitted the HED for implementation of corrective action. It should be noted that during the Management Review it was determined that additional operations input would be needed to properly evaluate many HEDs. Consequently, a watch engineer/senior reactor operator was assigned to the Management Review Team.

TABLE 2-1

DCRDR Management Review Team and Advisory Committee

Management Review Team

W. J. Armstrong

R. E. Grazio

S. Dasgupta

L. Nichols

S. F. Luna

Advisory Committee

P. Mastrangelo

J. W. Ashkar

TABLE 2-2

DCRDR Design Review Team Members
and Associated Task Assignments

C. H. Minott
Project Manager

W. Babcock, Jr.
Principal Investigator

S. F. Luna
Project Engineer
Sr. Human Factors Specialist

Planning

C. H. Minott
W. Babcock, Jr.
S. F. Luna
R. Sabeh

Operating Experience Review

W. Babcock, Jr.
K. N. Taylor
S. F. Luna
R. Sabeh

Control Room Survey

W. Babcock, Jr.
S. F. Luna
R. Sabeh
W. Welch
E. P. Gagnon
W. Arnold

Control Room Inventory

W. Babcock, Jr.
F. Scaletta
E. P. Gagnon

System Function and
Task Analysis

W. Babcock, Jr.
D. Hughes
J. L. Rogers
C. S. Brennon
K. N. Taylor
W. Olsen
E. P. Gagnon
S. F. Luna
W. R. Arnold
R. C. Potter
F. Scaletta

Verification

E. P. Gagnon
F. Scaletta
W. R. Arnold
R. Sabeh

Validation

W. Babcock, Jr.
W. Olsen
D. Hughes
E. P. Gagnon
R. Sabeh

TABLE 2-2
(continued)

DCRDR Design Review Team Members
and Associated Task Assignments

Assessment

W. Babcock, Jr.
D. Hughes
C. S. Brennon
S. F. Luna
R. Sabeh
W. R. Arnold
E. P. Gagnon
W. J. Armstrong
R. E. Grazio
S. Dasgupta

Documentation

C. H. Minott
W. Babcock, Jr.
E. P. Gagnon
S. F. Luna
R. Sabeh

TABLE 2-3

SUMMARY OF POSITION AND EXPERIENCE PROFILE
OF THE TEN QUESTIONNAIRE RESPONSES

	Number	Position	Average Years Experience at Pilgrim Nuclear Power Station
	3	WE	11.25
	2	SSUPVR	6.7
	4	NPO	5.4*
	1	STA	3.5
Total	10		

* One respondent did not identify years of experience.

TABLE 2-4

POSITION AND EXPERIENCE PROFILE OF THE
19 OPERATIONS PERSONNEL INTERVIEWED

Number	Position	Average Years Experience at Pilgrim Nuclear Power Station
3	OPERATIONS AND TRAINING MANAGEMENT	12.0
3	WE	10.8
5	SSUPVR	8.2
6	NPO	7.5
2*	STA	3.5
<hr/>		
Total	19	

* One STA was a former operator.

TABLE 2-5

SUMMARY OF OER OBSERVATIONS

OER #	NUREG 0700 Section 6 Criteria Item Description	NUREG 0700 Section 6 Criteria Item	HEO # (From CR Survey)
001	Furniture and Equipment Layout Desk Dimensions	6.1.1.3c.(2) 6.1.2.7a.,b.,c.	6.1.002 6.1.016
002	Accessibility of Instrumentation/ Equipment	6.1.1.1b.	6.1.001
003	Illumination (Glare and Reflectance)	6.1.5.3f.(3)	6.1.022
004	Accessibility of Instrumentation/ Equipment	6.1.1.1b.	6.1.001
005	Supervisor Access Conventional Telephones (Handsets)	6.1.1.6a.,b. 6.2.1.2b.(7)	6.1.007 6.2.001
006	Ventilation (Air Quantity)	6.1.5.2a.	6.1.019
007	Auditory Environment (Limit and Noise Distractions) Announcing Systems (General) Announcing Systems (Loudspeaker Vol.)	6.1.5.5b.,c.,d. 6.2.1.6a. 6.2.1.6e.(2)	6.1.023 6.2.004 6.2.005
008	Emergency Communications (Equipment Usability and Voice Communications with Masks)	6.2.1.8b.,c	6.2.008
009	Conventional-Powered Telephone Systems (Handsets)	6.2.1.2b.(7)	6.2.001
010	Supervisor Access Point-to-Point Intercom Systems	6.1.1.6a.,b. 6.2.1.7	6.1.007 6.2.007
011	Announcing Systems (Intelligibility and Coverage)	6.2.1.6a.(2)	6.2.003
012	Plug-in Console Jacks		OER-002
013	First Out Annunciators (Reactor System and Turbine-Generator System)	6.3.1.3a.,b.	6.3.004
014	Alarm Parameter Selection (Multi- channel or Shared Alarms) Visual Tile Legends (Singularity and Specificity)	6.3.1.2c.(1) 6.3.3.4b.,c.	6.3.002 6.3.016

TABLE 2-5 (continued)

OER #	NUREG 0700 Section 6 Criteria Item Description	NUREG 0700 Section 6 Criteria Item	HEO # (From CR Survey)
015	Prioritization (Levels of Priority)	6.3.1.4a.(2)	6.3.005
016	Visual Tile Readability (Distance and Letter Dimensions and Spacing)	6.3.3.5a.,d.	6.6.017
	Visual Tile Readability (Type Style)	6.3.3.5b	6.3.018
017	Visual Annunciator Panels (Location)	6.3.3.1a.	6.3.007
	Visual Tile Legends (Singularity and Specificity)	6.3.3.4b.,c.	6.3.016
018	Arrangement of Visual Alarm Tiles (Out of Service Alarms and Blank Tiles)	6.3.3.3e.,f.	6.3.023
019	Visual Alarm Recognition and Identifi- cation ("Dark" Annunciator Panels)	6.3.3.2e.	6.3.011
020	Visual Annunciator Panels (Lamp Replacement)	6.3.3.1c.(2,3)	6.3.009
021	Signal Detection (Intensity)	6.3.2.1a.	6.3.024
022	Sequence, Frequency of Use, and Functional Considerations (Func- tional Considerations)	6.8.2.1c.(2)	6.8.006
023	General Principles (Human Suitabili- Coding of Controls (Consistency)	6.4.1.1c.(1)	6.4.001
	Coding of Controls (Shape Coding)	6.4.2.2a. 6.4.2.2d.,e.	6.4.006 6.4.008
024	Direction of Movement	6.4.2.1	6.4.005
	Control Position Labeling (Direction)	6.6.3.8b.	6.6.009
025	Prevention of Accidental Activation (Resistance to Movement)	6.4.1.2e.	6.4.016
026	Prevention of Accidental Activation (Movable Covers or Guards)	6.4.1.2c.(1)	6.4.003
027	Information to be Displayed (Completeness of Information)	6.5.1.1b.	6.5.015
028	Recorder Failure (False Alarms)		OER-001

TABLE 2-5 (continued)

OER #	NUREG 0700 Section 6 Criteria Item Description	NUREG 0700 Section 6 Criteria Item	HEO # (From CR Survey)
029	Scale Markings (Multi-Scale Indicators)	6.5.1.5f.	6.5.016
030	Usability of Displayed Values (Elimination of Operator Conversion)	6.5.1.2b.	6.5.002
031	Usability of Displayed Values (Scale Selection)	6.5.1.2a.	6.5.017
032	Information to be Displayed (Completeness of Information)	6.5.1.1b.	6.5.018
033	Usability of Displayed Values (Elimination of Operator Conversion)	6.5.1.2b.	6.5.002
034	Information to be Displayed (Completeness of Information)	6.5.1.1b.	6.5.019
035	Scram Discharge Header Panel (Indicator Location)		OER-003
036	Functional Groups (Functional Relationships and Location)	6.6.3.7	6.6.008
037	Need for Labeling	6.6.1.1	6.6.001
038	Readability (Character Height)	6.6.4.1a.	6.6.010
039	Consistency (Internal Consistency and Consistency with Procedures) Brevity	6.6.3.3.a,b 6.6.3.5	6.6.006 6.6.007
040	Use (Necessity and Human Factors Practices)	6.6.5.1a.,b.	6.6.012
041	Hierarchical Scheme	6.6.1.2a.,b.	6.6.002
042	Need for Labeling	6.6.1.1	6.6.001
043	Enhancing Recognition and Identifi- cation	6.8.1.3	6.8.001
044	Use of Mimics (Color)	6.6.6.4b.(4)	6.6.020
045	Coding of Controls (Location Coding) Mirror Imaging	6.4.2.2b. 6.8.3.3	6.4.007 6.8.006

TABLE 2-5 (continued)

OER #	NUREG 0700 Section 6 Criteria Item Description	NUREG 0700 Section 6 Criteria Item	HEO # (From CR Survey)
046	Usability of Displayed Values (Elimination of Operator Conversion)	6.5.1.2b.	6.5.020
047	Alarm Parameter Selection (General Alarms)	6.3.1.2b.(1,2)	6.3.001
048	STA Simulator Training		OER-004
049	Annunciator Warning System	6.3	6.3.010 6.3.014 6.3.015 6.3.003 6.3.006 6.3.020 6.3.025 6.3.026 6.3.027

TABLE 2-6
 SUMMARY OF HEOs BY CHECKLIST NUMBER
 GENERATED BY THE CONTROL ROOM SURVEY

Checklist No.	Checklist Name	HEO per Checklist No.	Related OER Observations
6.1	Control Room Workspace	28	9
6.2	Communications	11	6
6.3	Annunciator Warning Systems	27	16
6.4	Controls	18	7
6.5	Visual Displays	34	8
6.6	Labels and Location Aids	27	11
6.7	Process Computer	--(a)	—
6.8	Panel Layout	16	3
6.9	Control Display Integration	6	0
	Total	167	60

(a) This checklist is deferred until installation of the plant computer system.

TABLE 2-7

ASSIGNED INSTRUMENT NO. PREFIXES FOR
BOSTON EDISON COMPANY CONTROL ROOM INVENTORY (SAMPLE)

PREFIX	DESCRIPTION	COMMENTS
XAN-	Annunciator Board	
XARADM-	Area radiation monitor indicator	
XCHANSS-	Channel selector switch	
XCPSI-	Counts per sec indicator	
XDDI-	Digital display indicator	
XDPI-	Differential press. indicator	
XDVM-	Digital voltmeter	
XFI-	Flow indicator	
XFIC-	Flow indicator and controller	
XFLUXTILT-	Flux tilt monitor	
XFREQ-	Frequency meter	
XFR-	Flow recorder	
XHS-	Hand switch	
XINTERVTIMER-	Interval timer	
XKHS-	Hand switch in which the key itself permits turning the switch	
XI/I-	Current indicator (amps)	
XJI-	Power indicator (watts)	
X%JI-	Percent power indicator	
XKBD-	Keyboard	
XKEY-	Key (by itself)	

TABLE 2-8
SAMPLE PILGRIM NUCLEAR POWER STATION SYSTEM INDEX

NO	NAME
1	Main Steam and Turbine Steam Bypass (includes moisture separators)
2	Reactor Recirculation Motor Generator Units Recirc. Pumps & Associated Pipes & Valves Reactor Recirc. Control system & Jet Pump Instrumentation
3	Reactor Control Rod Drives & Hydraulic System
4	Sampling
5	Station Lighting
6	Condensate & Feedwater (from Condensate Pump Section to Reactor Vessel Injection Point)
8	Offgas & Augmented Offgas (all of PID M-210 & 254 and panel CP-600)
9	Primary Containment Atmospheric Control Inerting & Makeup N ₂ Recycle Purge & Exhaust O ₂ analyzer/C-19 H ₂ Analyzer PAM Panels C-170 & 171
10	Residual Heat Removal (RHR) - divide into 10A and 10B
11	Reactor Standby Liquid Control
12	Reactor Water Cleanup
13	Reactor Core Isolation Cooling (RCIC)
14	Core Spray - divide into 14A and 14B
15	Glandseal & Hold Up (for Main Turbine Generator - PID M-226 only)
16	Extraction Steam (Steam Supply to F.W. Heaters)

TABLE 2-9
EQUIPMENT IDENTIFICATION (SAMPLE)

EQUIPMENT CODE	ACRONYM	MANUFACTURER/MODEL
1	GE S3M, CS P-GP	GE model "SBM" control switch with pistol-grip handle
2	GE CR29YO SW	GE series "CR2940" switch (selector, PB, key lock types) also joy stick
3	GE ET-16 FVLTE	GE model ET-16 lamp full-voltage type (R, G, A, W color caps)
4	GE 180 EW MTR	GE model 180 edgewise meter (or equiv.)
5	GE MAC RCDR	GE "GEMAC" recorder, model
6	GE MAC CPMTR	GE "GEMAC" controller model
7	GE SB1 P-GP KL	GE model "SB1" control switch with keylock pistol-grip handle
8	GE SB1 OVAL-GP	GE model "SB1" control switch with oval handle
9	GE SB1 P-GP	GE model "SB1" control switch with pistol-grip handle
10	GE SPM OVAL-GP	GE model "SBM" control switch with oval handle

TABLE 2-10
PRINCIPAL EOP SAFETY FUNCTION

Basic Plant Safety Function

EOP Title*	No.	Core Cooling	Primary Containment Integrity	Reactivity Control	Fission Product Control
RPV - Level & Pressure	1	X			
RPV - Power	2			X	
RPV - Level Restoration	3	X			
RPV - Flooding	7	X			
RPV - Power by Level	8			X	
PC - Temperature	4		X		X
PC - Pressure	5		X		X
PC - Level	6		x		X

* RPV = Reactor Pressure Vessel
PC = Primary Containment

TABLE 2-11
 PILGRIM STATION SYSTEMS CROSS REFERENCED WITH THE STATION EOPs AND SOEs

SYSTEM	EOP								SOE				
	01	02	03	04	05	06	07	08	1	2	3	4	5
Reactor Recirculation	X	X		X	X	X			X	X	X	X	X
Residual Heat Removal													
- Low Pressure Coolant Injection	X	X	X	X	X	X	X	X	X	X	X	X	X
- Suppression Pool Cooling				X	X				X	X	X	X	
- Shutdown Cooling	X								X	X	X		X
- Fuel Pool Cooling													
Reactor Water Cleanup	X	X							X	X	X	X	X
Turbine Generator		X	X						X	X	X	X	X
Turbine Bypass	X		X	X	X	X	X	X		X			X
Turbine Steam Sealing	X								X	X	X	X	X
Main Condensator	X		X	X	X	X	X	X	X	X	X	X	X
Main Condensator Air Ejector	X								X	X	X	X	X
Circulating Water													
Condensate Demineralizer	X	X								X			X
Condensate and Feedwater	X		X	X		X	X	X	X	X	X	X	X
Unit and Preferred AC Power		X		X					X	X			X
Secondary AC Power	X	X										X	X
Auxiliary AC Power Distribution	X	X								X			X
Standby AC Power	X	X			X					X		X	
120 VAC Power													
DC Power													
Radioactive Waste													
- Liquid Radwaste	X				X					X			X
- Solid Radwaste													
- Gaseous Radwaste													X
- Augmented Offgas	X				X				X	X	X	X	X
Reactor Protection	X				X	X			X	X	X	X	X
Neutron Monitoring													
- Source Range	X	X	X					X	X	X	X	X	X
- Intermediate Range	X	X	X					X	X	X	X	X	X
- Local Range	X	X	X					X	X	X	X	X	X
- Average Range	X	X	X					X	X	X	X	X	X
- Rod Block Monitor		X								X			
Control Rod Drive	X	X	X	X	X	X	X	X	X	X			X
Nuclear Steam Pressure Relief	X	X	X	X	X	X	X	X	X	X	X	X	
Reactor Core Isolation Cooling	X	X	X	X		X	X	X	X	X		X	X

TABLE 2-11 (cont.)
 PILGRIM STATION SYSTEMS CROSS REFERENCED WITH THE STATION EOPs AND SOEs

SYSTEM	EOP								SOE				
	01	02	03	04	05	06	07	08	1	2	3	4	5
Primary Containment													
- Suppression Pool and Vent	X	X	X	X	X	X	X	X	X	X	X	X	X
- Drywell	X	X	X	X	X	X	X	X	X	X	X	X	X
- Venting and Vacuum Relief					X	X							X
- Cooling and Ventilation				X	X				X	X		X	X
- Atmospheric Control				X								X	X
Primary Containment and Reactor	X	X			X	X	X		X	X	X	X	X
Vessel Isolation													
Secondary Containment													
- Reactor Building Isolation				X	X	X				X	X	X	
- Standby Gas Treatment			X	X	X	X				X	X	X	X
Core Standby Cooling													
- High Pressure Coolant Injection	X	X	X	X	X	X	X	X	X	X	X	X	X
- Automatic Depressurization	X	X	X	X	X	X	X		X	X	X	X	
- Core Spray	X		X		X	X	X	X	X		X	X	X
- Low Pressure Coolant Injection(RHR)	X	X	X	X	X	X	X	X	X	X	X	X	X
Salt Service Water			X		X		X		X	X			X
Reactor Building Closed Cooling Water			X		X		X	X	X	X	X		X
Main Control Room Environmental Control					X					X	X	X	
Equipment Area Cooling													
- Residual Heat Removal													
- High Pressure Coolant Injection													
- Core Spray													
- Reactor Core Isolation Cooling													
- Control Rod Drive													
Standby Liquid Control	X	X	X	X	X	X	X	X	X				
Reactor Manual Control	X	X		X		X			X	X	X		
Refueling Interlocks													
Reactor Vessel Instrumentation	X	X	X	X	X	X	X	X	X	X	X	X	X
Process Computer													
- Reactor Core Performance									X				X
- Rod Worth Minimizer													X

TABLE 2-11 (cont.)
 PILGRIM STATION SYSTEMS CROSS REFERENCED WITH THE STATION EOPs AND SOEs

SYSTEM	EOP								SOE				
	01	02	03	04	05	06	07	08	1	2	3	4	5
Process Radiation Monitor													
- Mainsteam Line	X				X	X				X	X	X	
- Air Ejector Offgas					X								
- Mainstack				X	X				X			X	
- Refueling Ventilation Exhaust					X				X			X	
- Reactor Building Exhaust					X				X			X	
- Liquid Radwaste Discharge					X								
- Reactor Building Closed Cooling Water					X								
- Condensate Storage Inlet					X								
- Standby Gas Treatment Exhaust					X				X				
- Control Room Ventilation Intake					X								
- Drywell Atmosphere					X				X				
- Suppression Pool Atmosphere					X								
- Turbine Building Exhaust					X				X				
Area Radiation Monitor				X	X	X			X		X	X	
Turbine Building Closed Cooling Water			X		X		X	X		X			
Fire Protection			X				X	X					
HVAC													
New and Spent Fuel Storage													
Fuel Pool Cooling and Filtering													
Service and Instrument Air													
Makeup Water Treatment													
Potable and Sanitary Water													
Equipment and Floor Drainage	X		X			X				X	X	X	
Process Sampling	X				X	X						X	X
Communication	X	X	X	X	X	X	X		X	X	X	X	X
Station Lighting (Emergency)					X								

TABLE 2-12
SELECTED OPERATING EVENTS (SOEs) FOR THE SFTA

<u>SOE</u>	<u>TITLE</u> ⁽¹⁾
1	Anticipated Transient Without Scram (ATWS)
2	Small Break LOCA in Primary Containment with LOSP and Recovery
3	Small Break LOCA in Primary Containment with Loss of High Pressure Core Cooling Systems
4	Large Break LOCA in Primary Containment with LOSP
5	Plant Startup from Cold shutdown

1. Additional assumed failures in systems required to respond to the initiating event are shown on the data sheets for each SOE.

TABLE 2-13
OPERATOR TASK AND STEP SUMMARY

<u>SOE</u>	<u>No. of Operator Tasks</u>	<u>No. of Operator Steps</u>
1	50	229(2)
2	59	733
3	30	67(2)
4	39	266(2)
5	96	580

1. See Table 2-11 for SOE definition.
2. Does not include identical steps from identical tasks in SOE2.

TABLE 2-14

SOEs AND OPERATOR TASKS SELECTED FOR VALIDATION

SOE(1)	OPERATOR TASKS(2)
1	3,16,28,31,32,37,41,42
2	All (59 Tasks)
3	25, 28, 30
4	1.2, 12.2, 12.35, 15, 16, 18, 32, 38, 39, 40, 42.7, 44.05, 46.4
5	None

1. See Table 2-12 for SOE definition.
2. Tasks are identified in terms of operator step number (e.g. Task 3 is the task starting at step 3.00 in the designated SOE).

TABLE 2-15

HED NUMBER CODE INTERPRETATION

HED # = (first digit) (category) (three digits) (corrections)

First digit - NUREG 0700 Section 6 guideline number

Category - Category selected (See Section 2.2.10.3.1)

Three digit - A sequential number assigned to the HED

Correction method - The correction method selected

- .1 - Enhancement (interim)
- .2 - Enhancement (final)
- .3 - Design Change
- .4.1 - Design Improvement Program - Annunciator
- .4.2 - Design Improvement Program - Communications
- .4.3 - Design Improvement Program - Habitability
- .4.4 - Design Improvement Program - Panel Improvement
- .4.5 - Design Improvement Program - Labeling and Demarcation
- .4.6 - Design Improvement Program - Meter Scales
- .4.7 - Design Improvement Program - SPDS
- .5 - Panel Devices Relocation Program
- .6 - Operation Procedure Change
- .7 - Administrative Procedure Change
- .8 - Justification for Non-Corrective Actions

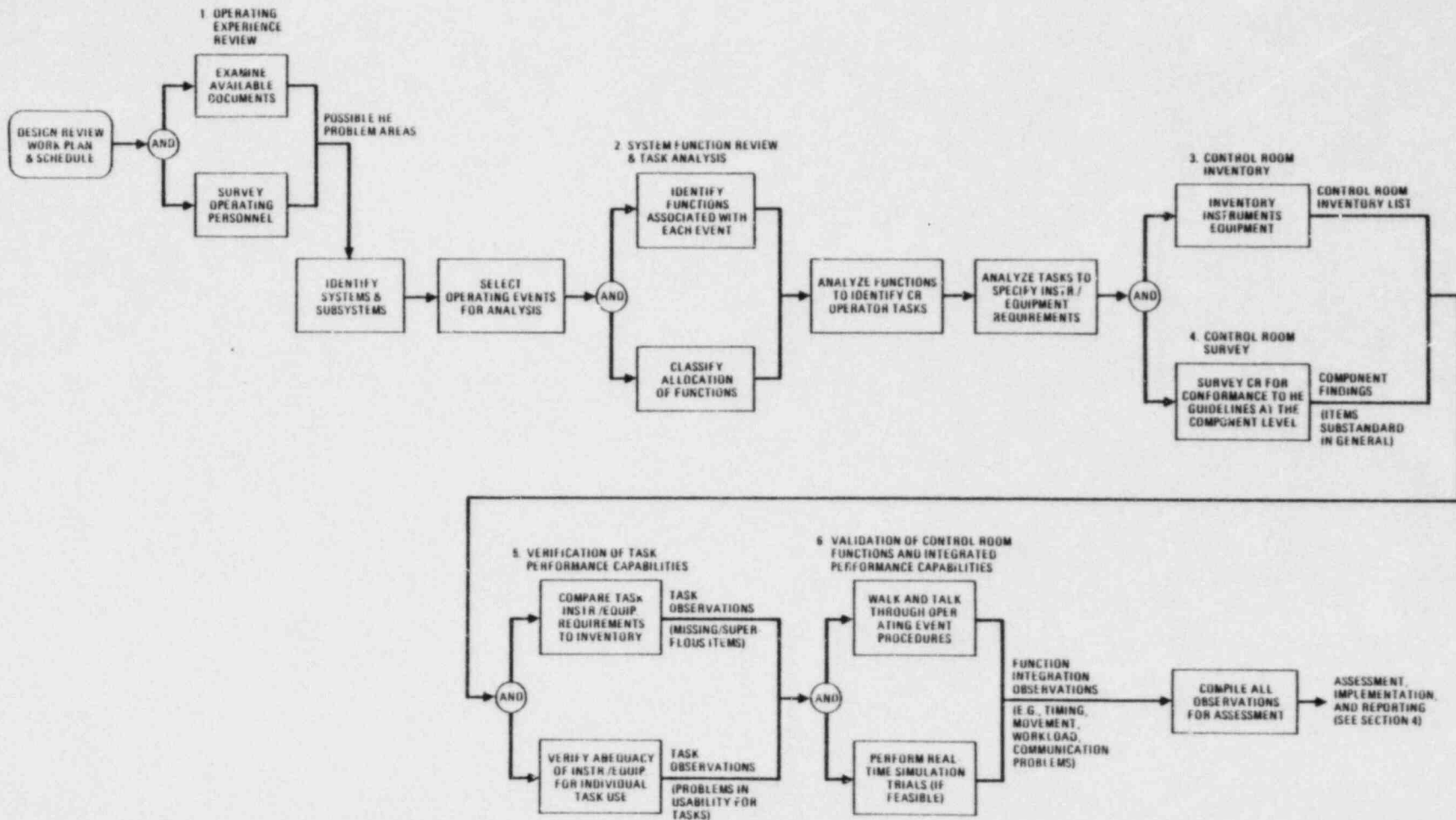


Figure 2-1 Overview of the DCRDR Process

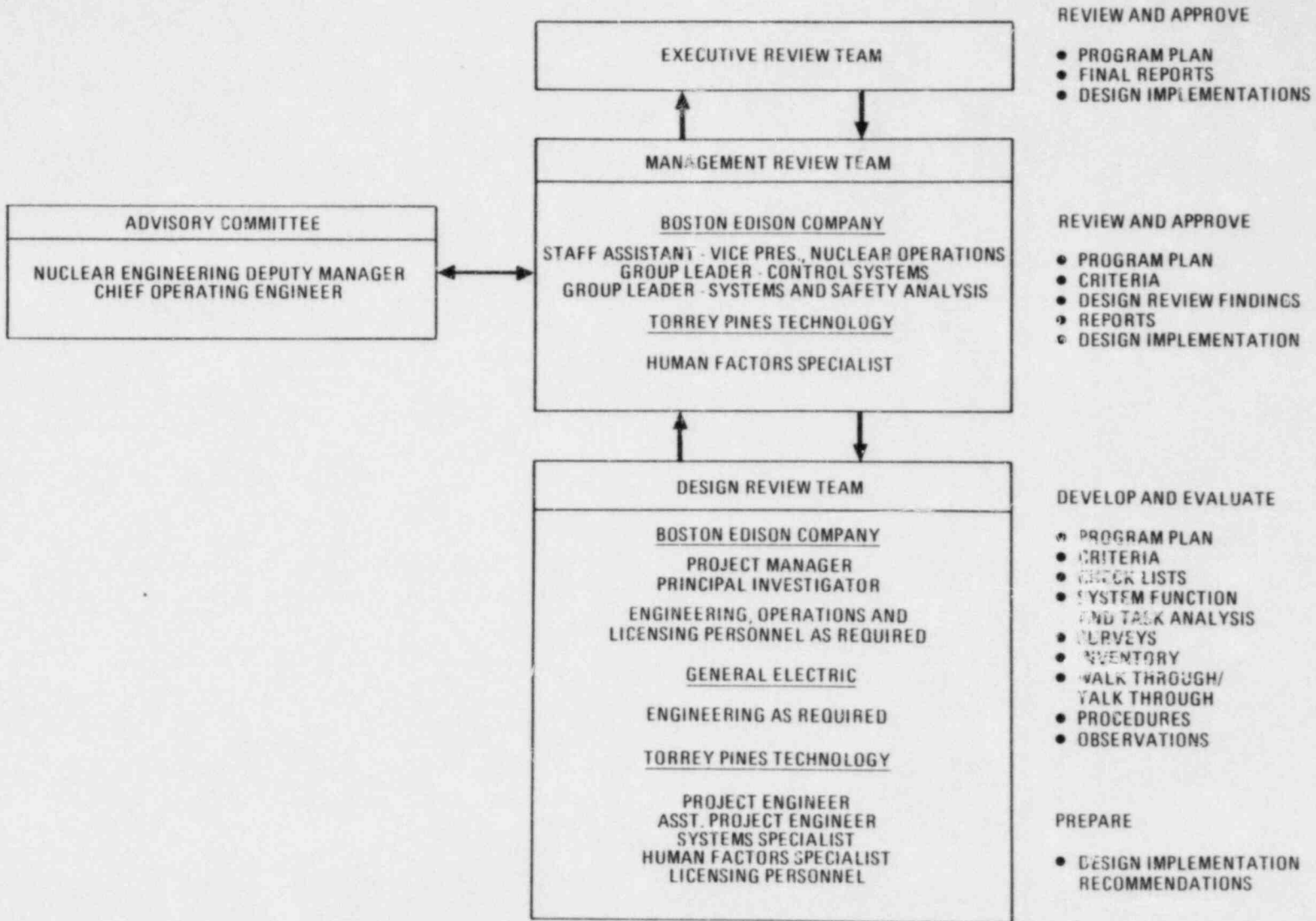


Figure 2-2 DCRDR Review Teams

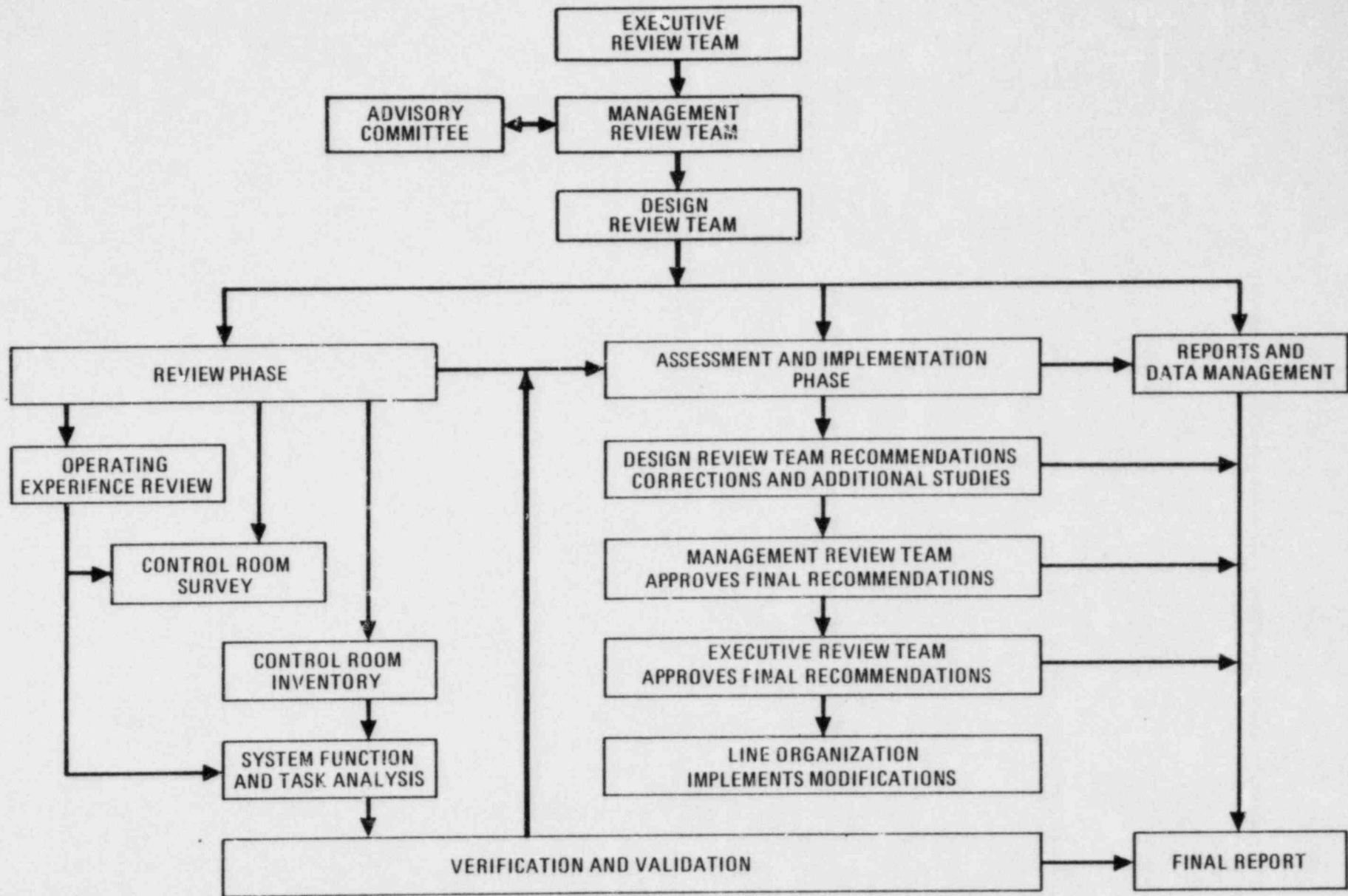


Figure 2-3 Formulation of DCRDR Task Structure

4.1.7/031584
RECO #71

2-59

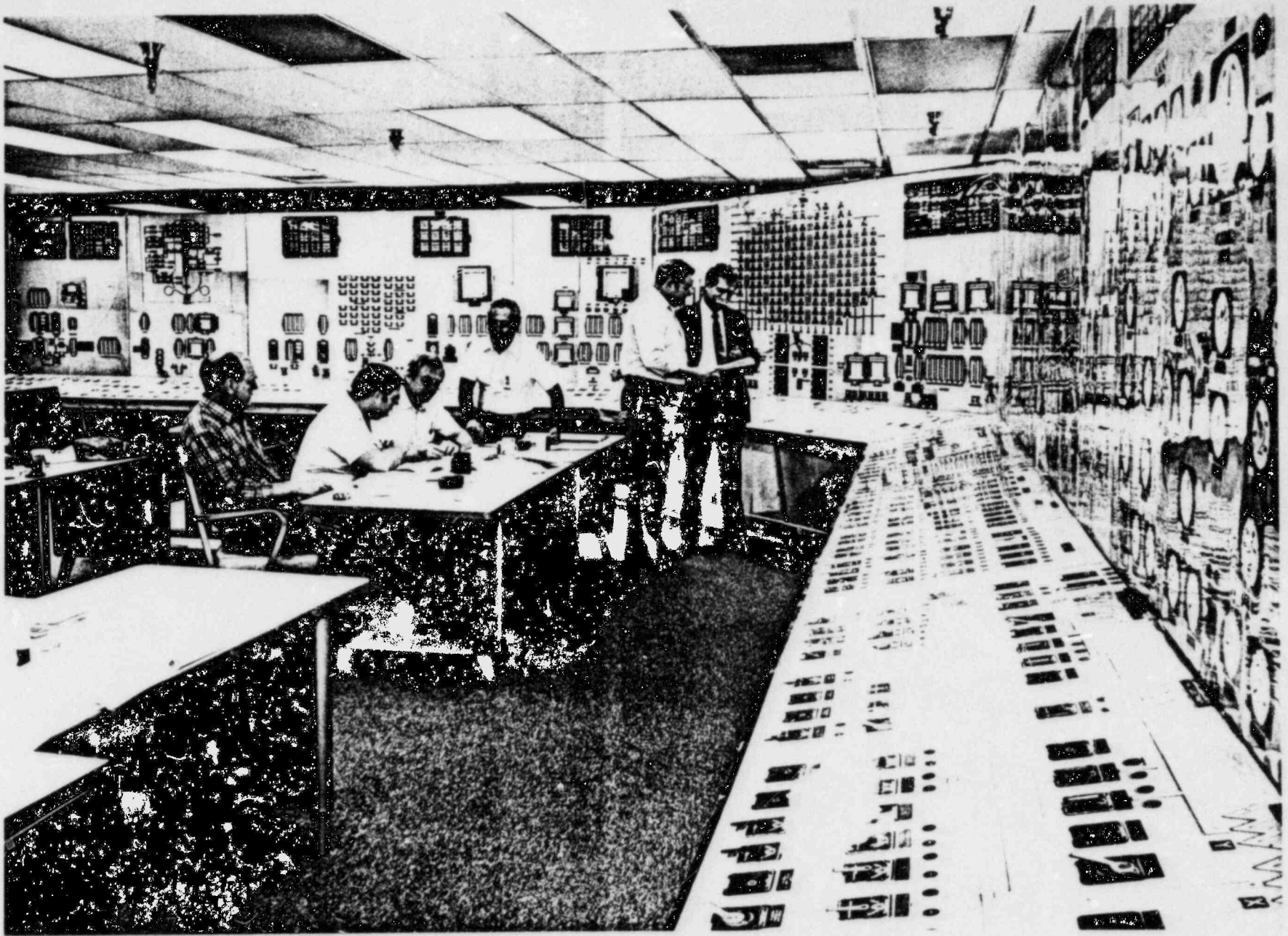


Figure 2-4. Full-Scale Mockup of Pilgrim Station Control Room

BOSTON EDISON COMPANY
 DETAILED CONTROL ROOM DESIGN REVIEW

CRITERIA MATRIX

6.2 Communications

NLREG-0700 GUIDELINE	CRITERIA			DATA COLLECTION METHOD			COMMENTS/REFERENCE
	0700	BWROG	INPO	OER	ORS	SFTA	
6.2.1 Voice Communications Syst							
6.2.1.6 Announcing Systems	X				X		
6.2.1.7 Point-to-Point Intercam Systems	X		X		X		6.2.1.7(a) Use INPO word list to check out intelligibility.
6.2.1.8 Emergency Communications	X				X		Will conduct a communications test and determine alternate communications modes.

Figure 2-5 Criteria Matrix (Sample)

SAMPLE
BIOGRAPHICAL DATA

The Torrey Pines Technology evaluator will remove this page after review.

Name _____

Position Title _____ Date _____

Time in this position _____ Years _____ Months _____

Total time at Pilgrim Station _____ Years _____ Months _____

Other experience:

Operator _____ Years _____ Months _____

Unit Supervisor _____ Years _____ Months _____

Shift Supervisor _____ Years _____ Months _____

Other experience _____ Years _____ Months _____

Military (nuclear) _____ Years _____ Months _____

Other plants _____ Years _____ Months _____

Position _____ Years _____ Months _____

Figure 2-6

A. WORK SPACE AND ENVIRONMENT

1. Do you have any difficulty locating systems, subsystems, or functional groupings of panel equipment?

No Yes (explain) _____

2. Do you have any difficulty locating individual devices within a system, subsystem, or functional grouping?

No Yes (explain) _____

3. Do you have any difficulty reading display devices?

No Yes (explain) _____

4. Do you have any difficulty operating controls?

No Yes (explain) _____

Figure 2-7. Examples from Operations Personnel Questionnaire

**SUPERVISORS (SHIFT, UNIT & ASSISTANTS)
AND WATCH ENGINEER**

1. Is the shift supervisor's office conveniently located in the primary operating area?

() Yes () No (explain) _____

2. Is the shift supervisor's office adequately sized to perform all the functions and actions required?

() Yes () No (explain) _____

3. Is the method for furnishing maintenance/test information to your operators adequate?

() Yes () No (explain) _____

Figure 2-7 (cont)

SHIFT TECHNICAL ADVISOR

1. Are there management policies or practices that unfavorable impact your work assignments?

No Yes (explain) _____

2. Do you have sufficient diagnostic tools to identify a malfunction?

Yes No (explain) _____

3. What information from the Safety Parameters Display System (SPDS) would be helpful to you for diagnosis, assessment and recommended action to maintain safe plant status and operation?

(Explain) _____

4. Do you plan to use the SPDS?

No Yes (explain) _____

Figure 2-7. (cont)

OPERATIONS MANAGEMENT

1. Do you have sufficient budget, facilities, equipment and personnel assigned to effectively staff and operate your Control Room?

Yes No (explain) (e.g., what added capabilities would you like to see?)

2. Does your Control Room staffing differ from that required in the technical specification?

No Yes (explain) _____

3. Do you consider the present procedures for handling sickness or other absences adequate?

Yes No (explain) _____

Figure 2-7. (cont)

INTERVIEWEE NUMBER SESSION

CATEGORY	INTERVIEWEE NUMBER SESSION													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A. WORKSPACE														
B. COMMUNICATIONS														
C. ANNUNCIATOR SYSTEMS														
D. CONTROLS														
E. VISUAL DISPLAYS														
F. LABELS & LOCATION AIDS														
G. PROCESS COMPUTERS														
H. PANEL LAYOUT														
I. CONTROL/DISPLAY INTEGRATION														
o MANAGEMENT														
o STA														

Figure 2-8

Categories Addressed During Interviews

GUIDELINE

6.2.1.1 GENERAL REQUIREMENTS FOR
 VOICE COMMUNICATION SYSTEMS

Generally there are six varieties of voice communication systems found in control rooms: Conventional-powered telephones, sound-powered telephones, walkie-talkie radio transceivers, fixed-band UHF transceivers, announcing systems, and point-to-point intercom systems. Human factors requirements specific to each type of voice communication system will be considered individually in Guidelines 6.2.1.2 through 6.2.1.7 while 6.2.1.8 will address voice communication by the operator wearing an emergency mask. The following requirements are relevant to communication systems in general.

- a. **INSTRUCTIONS**—Instructions should be provided for use of each communication system, including suggested alternatives if a system becomes inoperable.
- b. **PERIODIC MAINTENANCE TESTS**—These should be performed on all communication systems to ensure that the system is normally operative and effective under changes in ambient noise levels that may have occurred since the last check.
- c. **EMERGENCY MESSAGES**
 - (1) **OUTGOING**—Priority procedures should be established for the transmission of emergency messages from the control room by any of the communication systems.
 - (2) **INCOMING**—Procedures should be established for handling communications during an emergency and these procedures must be known by all operators.

COMPLIANCE CHECKLIST

N/A	Yes	No	Reference/Comment

Figure 2-9. Sample Compliance Checklist

2-69

OBSERVATION			TECHNICAL REVIEW	
				CHAIRMAN _____ DATE _____
PLANT: Pilgrim NPS	R. Sabeh EVALUATOR	HED#:	<input type="checkbox"/> Concur.	
TASK: Control Room Survey		HED#: 6.1.029	<input type="checkbox"/> Concur With Comment/Note.	
CL: 6.1	CL ITEM: 6.1.1.1b	DATE: 4/10/84	REV:	<input type="checkbox"/> Reevaluate & Resubmit for Following Reason:
CL TITLE: Control Room Workspace		HED CATEGORY:	Comment/Note/Reason: _____	
BOARD TITLE: Reactor Control		BOARD#: 905	_____	
HED DESCRIPTION			_____	
GUIDELINE- ACCESSIBILITY OF INSTRUMENT/EQUIPMENT (ARRANGED TO FACILITATE COVERAGE): Instrumentation requiring continuous monitoring by operator's during emergency operations located on back panels 915 and 917 are the Scram Selenoid lights. This observation is supported by OER-001.			_____	
<input type="checkbox"/> SUPPORT MATERIAL ATTACHED			_____	
POTENTIAL OPERATOR ERROR(S)			MANAGEMENT REVIEW	
Excessive operator movement results in a delay to respond to an emergency.			<input type="checkbox"/> Concur.	CHAIRMAN _____ DATE _____
			<input type="checkbox"/> Concur With Comment/Note.	
			<input type="checkbox"/> Reevaluate & Resubmit for Following Reason:	
RECOMMENDED REVISION			Comment/Note/Reason: _____	
Relocate the Scram Selenoid lights to the front of panel 905.			_____	
RECOMMENDED IMPLEMENTATION			_____	
} PRIOR TO OR AT NEXT REFUELING } AT CONVENIENT OUTAGE } AT EARLIEST OPPORTUNITY } NON-MANDATORY			_____	

Figure 2-11

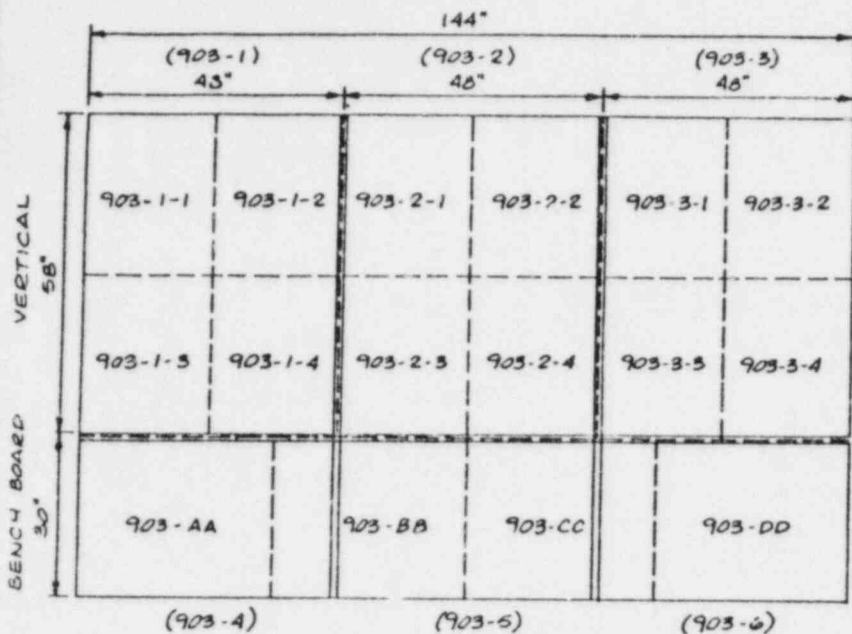
(Typical)
DCRDR CONTROL ROOM INVENTORY

DEVICE NO	INSTRUMENT NUMBER	SERVICE DESCRIPTION	SYSTEM NUMBER	MANUFACTURER MODEL	RANGE UNITS	MIN SCALE INCR	BOARD NUMBER	PANEL ID
128.	XAN-3	(TURBINE BENCH BOARD C2 ANNUNCIATORS)	42	PANALARM	-	-	C2	1A/1B
129.	ZI-3022	BYPASS VLVS OPENING JACK POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
130.	ZI-3021	MECH PRESS REG HND WHEEL POS	51		150-1050	50	C2	1A
131.	ZI-3020	MECH PRESS REG RELAY PISTON POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
132.	ZI-3014	ELECT PRESS REG SERVO MTR POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
133.	ZI-3013	PRESS CONTROL POS	51		910-1010 PSI	2	C2	1A
134.	ZI-3023	LOAD LIMIT PISTON POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
135.	ZI-3024	SPEED & LOAD CHANGER POS	51	FOXBORO	0-100 PERCENT	2	C2	1B
136.	PI-3049	STEAM CHEST PRESS	1	FOXBORO	0-2 PSIG X 1000	0.05	C2	1B
137.	PI-3052	TURB 1ST STAGE PRESS	1		0-900 PSIG	25	C2	1B
138.	XZ1-8	NO. 1 CNTR VLV ABOVE SEAT DRAIN	1		Q-R LITES	-	C2	1B
139.	XZI-9	NO. 2 CNTR VLV ABOVE SEAT DRAIN	1		Q-R LITES	-	C2	1B
140.	XZI-16	NO. 3 CNTR VLV ABOVE SEAT DRAIN	1		Q-R LITES	-	C2	1B

Figure 2-12. Sample Inventory List.

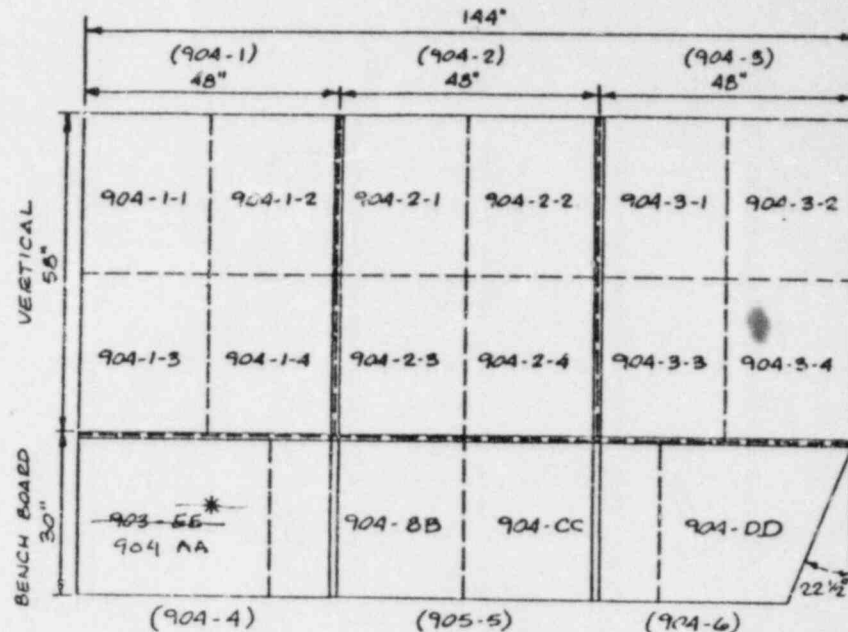
2-70

Figure 2-13 Sample Panel Area Designation
2-71



PANEL 903 REACTOR AND CONTAINMENT
COOLING AND ISOLATION
BENCH BOARD

NOTES: * - NOT PART OF PANEL 903.



PANEL 904 REACTOR WATER CLEAN UP
AND RECIRCULATION
BENCH BOARD

LEGEND

- || SUBPANEL CUT LINE
- ⋮ EDGE OF PHOTOGRAPH, TRIMMED
- (NUMBER) SUBPANEL DESIGNATION

SCALE: 1/2" = 1'-0"

CONTROL MODELS, INC.
P.O. BOX 1293
WAUCHULA, FL 33873
(813) 773-2135

CLIENT: G.A. TECHNOLOGIES, TORREY PINES DIV.
P.O. BOX 31608
SAN DIEGO, CA. 92138
(619) 455-2434
ERROL GAGNON

SITE: PILGRIM STATION
OWNER: BOSTON EDISON COMPANY
800 BOYLSTON ST.
BOSTON, MASS. 02199
(617) 424-2741 WARREN BABCOCK

PURCHASE
ORDER NO. SC 005252
DATE: OCTOBER 1983
PAGE 1 OF 7
TITLE: ITEM I

Figure 2-14 Photo of Control Panel

C2(1A)

XAN-31
1/22

INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR
INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR	INDICATOR

129 130 131 132 133

134 135

143

144

SFTA DATA RECORD

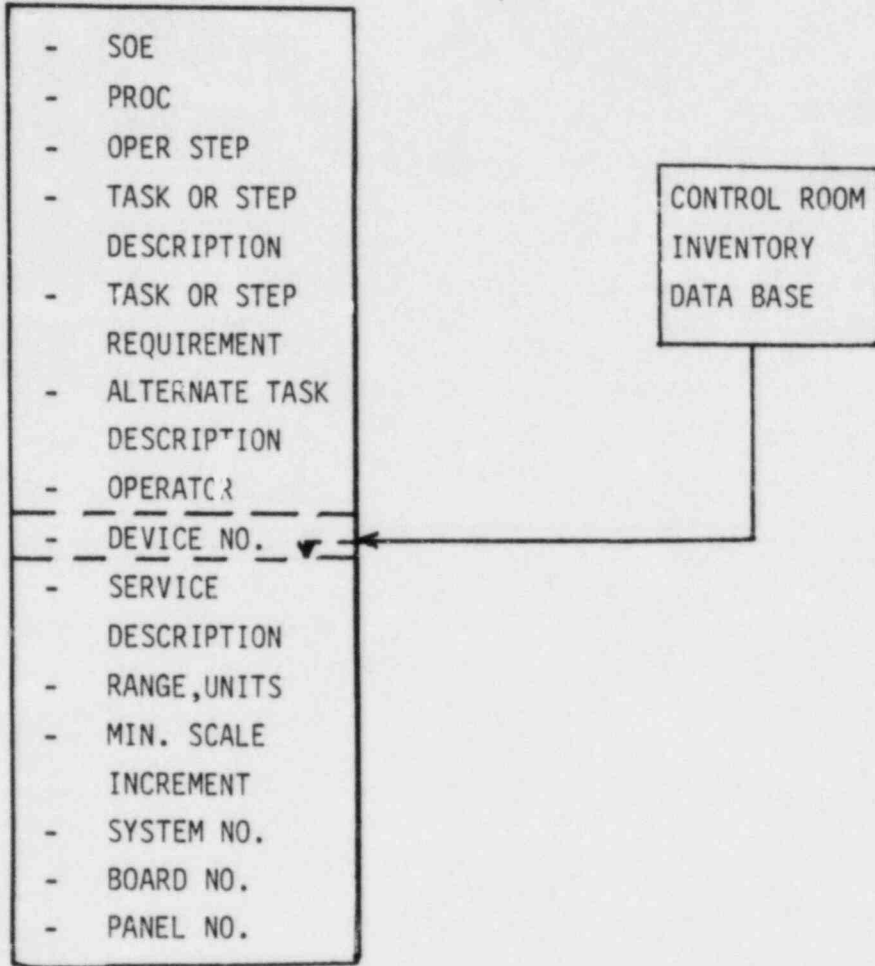
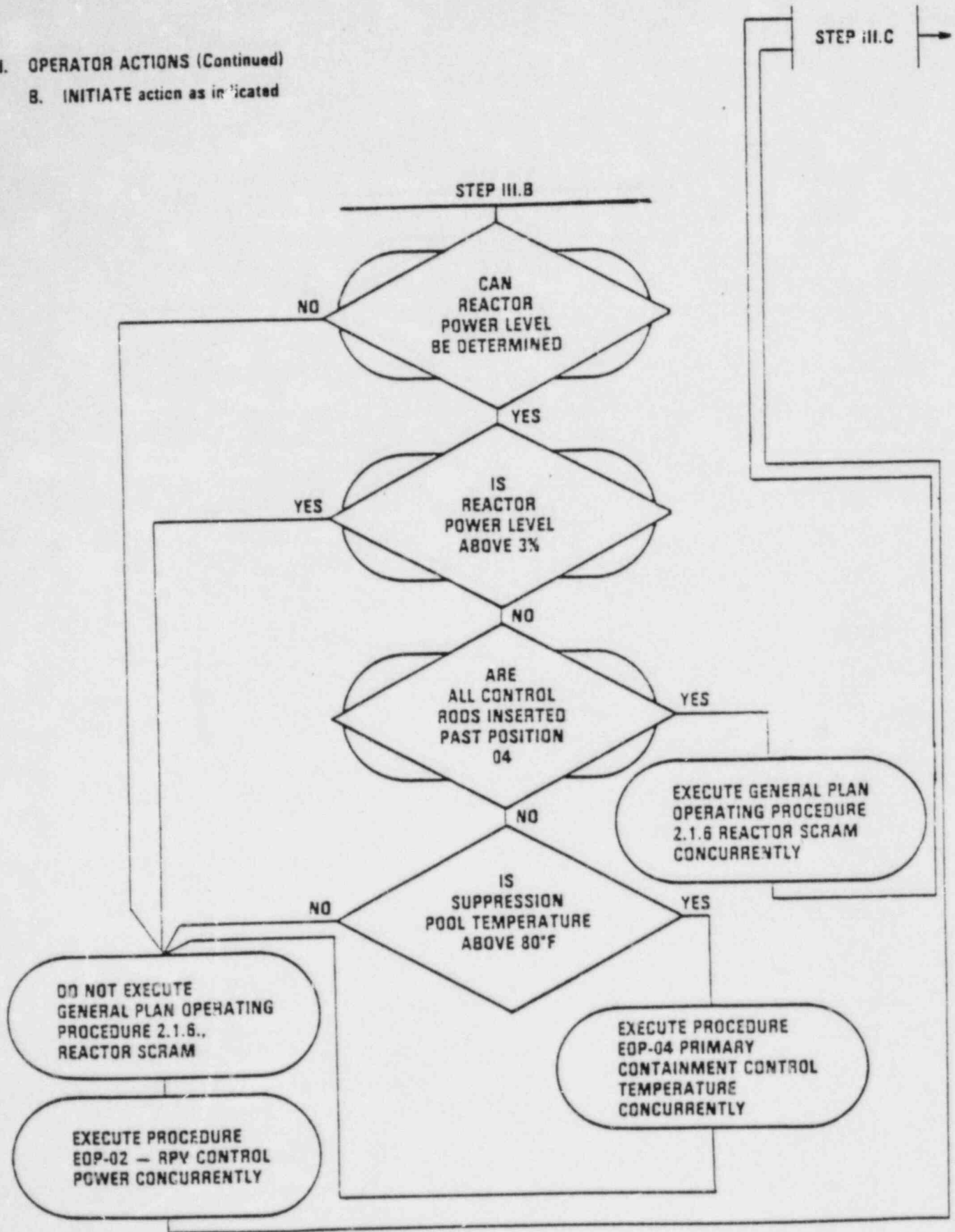


Figure 2-15. SFTA Data Base Record Definition

III. OPERATOR ACTIONS (Continued)

B. INITIATE action as indicated



EOP-01

Figure 2-16

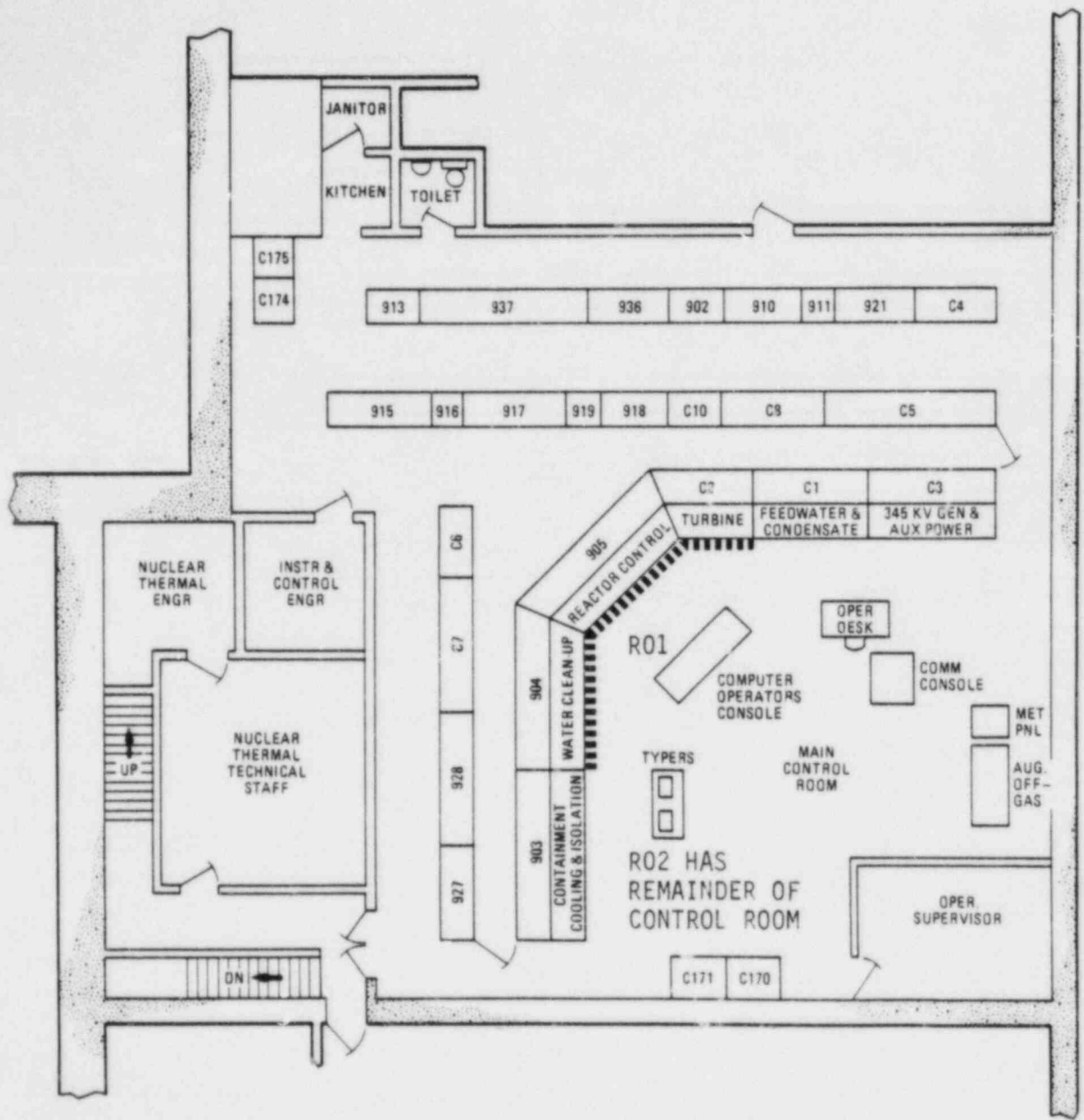


Figure 2-17. Operator Areas of Responsibility

SOE4: LARGE BREAK LOCA IN PRIMARY CONTAINMENT WITH LOSP

DATA SHEET #1: OPERATOR PRIMARY & ALTERNATE TASKS

SOE	PROC	OPER STEP	TASK or STEP DESCRIPTION	TASK or STEP REQUIREMENT	ALTERNATE TASK DESCRIPTION
4		.10	T: Monitor/adjust plant parameters during normal plant operation @ 100% power		
4	-	1.00	T: Respond to numerous alarms and systems auto actions for EOP entry conditions	See subtasks	See subtasks
4		1.05	ST: Determine RPV water level	RPV water level	Initiate RPV flooding (EOP-07)
4		1.20	ST: Determine DW pressure and temperature	DW pressure & temperature	Assume DW press & temp entry conditions exist
4		1.50	ST: Determine SP level	SP level	Assume SP level entry conditions exist
4	EOP-01	2.00	T: Verify Reactor scram	Rod position & scram system status	Initiate reactor power control thru RPV water level(EOP-02) & boron injection(EOP-08)
4	EOP-01	3.00	T: Verify reactor power indication	Reactor power, full, intermed. & lo range	Initiate reactor power control thru RPV water level(EOP-02) & boron injection(EOP-08)
4	EOP-01	4.00	T: Verify control rod position	Control rod position	Initiate reactor power control thru RPV water level(EOP-02) & boron injection(EOP-08)

Figure 2-18

SAMPLE

DCRDR - SFTA

SOE#1: LARGE BREAK LOCA IN PRIMARY CONTAINMENT WITH LOSP

DATA SHEET #2: OPERATOR STEPS IN TASK SEQUENCE

SOE	PROC	OPER STEP	TASK or STEP DESCRIPTION	TASK or STEP REQUIREMENT	DEVICE USED	ALTERNATE TASK or STEP DESCRIPTION	SYSTEM NO	BOARD NO	PANEL NO	OPER
4		.10	T: Monitor/adjust plant parameters during normal plant operation @ 100% power		0 -----					
4	-	1.00	T: Respond to numerous alarms and systems auto actions for EOP entry conditions	See subtasks	0 -----	See subtasks				
4		1.05	ST: Determine RPV water level	RPV water level	0 -----	Initiate RPV flooding (EOP-07)				
4		1.07	Observe RPV water level	< 136 INCHES above TAF	1174 -----		45	905	3-3	OP1
4		1.09	Observe RPV water level	< 136 inches above T/F	1173 -----		45	905	3-3	OP1
4		1.11	Observe RPV water level	< 136 INCHES above TAF	1332 -----		9	C171	B	OP2
4		1.13	Observe RPV water level	< 136 INCHES above TAF	439 -----		9	C170	B	OP2
4		1.20	ST: Determine DW pressure and temperature	DW pressure & temperature	0 -----	Assume DW press & temp entry conditions exist				

2-77

Figure 2-20.

PILGRIM NUCLEAR POWER STATION

DCRDR-SFTA (REV A, 5-23-84)

DATA SHEET #3: INFORMATION & CONTROL CAPABILITY, REQUIRED vs AVAILABLE
ALL SOEs

11-Jul-1984

Page 1

SOE	PKOC	OPER STEP	TASK or STEP DESCRIPTION	TASK or STEP REQUIREMENT	DEVICE NO	SERVICE DESCRIPTION, RANGE & UNITS	MIN SCALE INCR	SYSTEM NO	BOARD NO	PANEL NO	OPER
1	EOP-08	38.35	Observe RPV water level	Between 136 & 175" ATF	620.	VESSEL LEVEL A LOWER 0-400 -150 TO +150 INCH(ZERO 0 0 INCH ABOVE TOP OF FUEL)	20	45.7	903	1-4	OP2
4	EOP-07	30.75	Observe RPV water level	Above TAF	620.	VESSEL LEVEL A LOWER 0-400 -150 TO +150 INCH(ZERO 0 0 INCH ABOVE TOP OF FUEL)	20	45.7	903	1-4	OP2
3	EOP-01	27.10	Verify CS pump operating, Loop A	100 amps	621.	CORE SPRAY PUMP (CURRENT INDICATOR) LOOP A 0-150 AC AMPS	2	14A	903	1-4	OP2
4	EOP-01	18.60	Verify CS pump operating, loop A	100 amps	621.	CORE SPRAY PUMP (CURRENT INDICATOR) LOOP A 0-150 AC AMPS	2	14A	903	1-4	OP2
5	2.1.1	34.07	Monitor turbine control valve	Open	623.	(HPCI) TURBINE CONTROL VLV (POS) G-R LITES	-	23	903	2-3	OP2
5	2.1.1	34.19	Monitor turbine control valve	Closed	623.	(HPCI) TURBINE CONTROL VLV (POS) G-R LITES	-	23	903	2-3	OP2
2	PLQ	22.15	Place TEST POWER switch to ON	On	624.	(HPCI) TEST POWER (SUPPLY SWITCH) OFF-ON	-	23	903	2-3	OP2

SOE	PROC	OPER STEP	TASK or STEP DESCRIPTION	TASK or STEP REQUIREMENT	DEVICE NO	ALTERNATE TASK DESCRIPTION	SYSTEM NO	BOARD NO	PANEL NO	OPER
4		.10	T: Monitor/adjust plant parameters during normal plant operation @ 100% power		0 -----					
4	-	1.00	T: Respond to numerous alarms and systems auto actions for EOP entry conditions	See subtasks	0 -----	See subtasks				
4		1.05	ST: Determine RPV water level	RPV water level	0 -----	Initiate RPV flooding (EOP-07)				
4		1.07	Observe RPV water level	< 138 INCHES above TAF	1174 -----		45	905	3-3	OP1
4		1.09	Observe RPV water level	< 138 inches above TAF	1173 -----		45	905	3-3	OP1
4		1.17	Enter EOP-01		0 -----					
4		1.20	ST: Determine DW pressure and temperature	DW pressure & temperature	0 -----	Assume DW press & temp entry conditions exist				

2-79

Figure 2-22

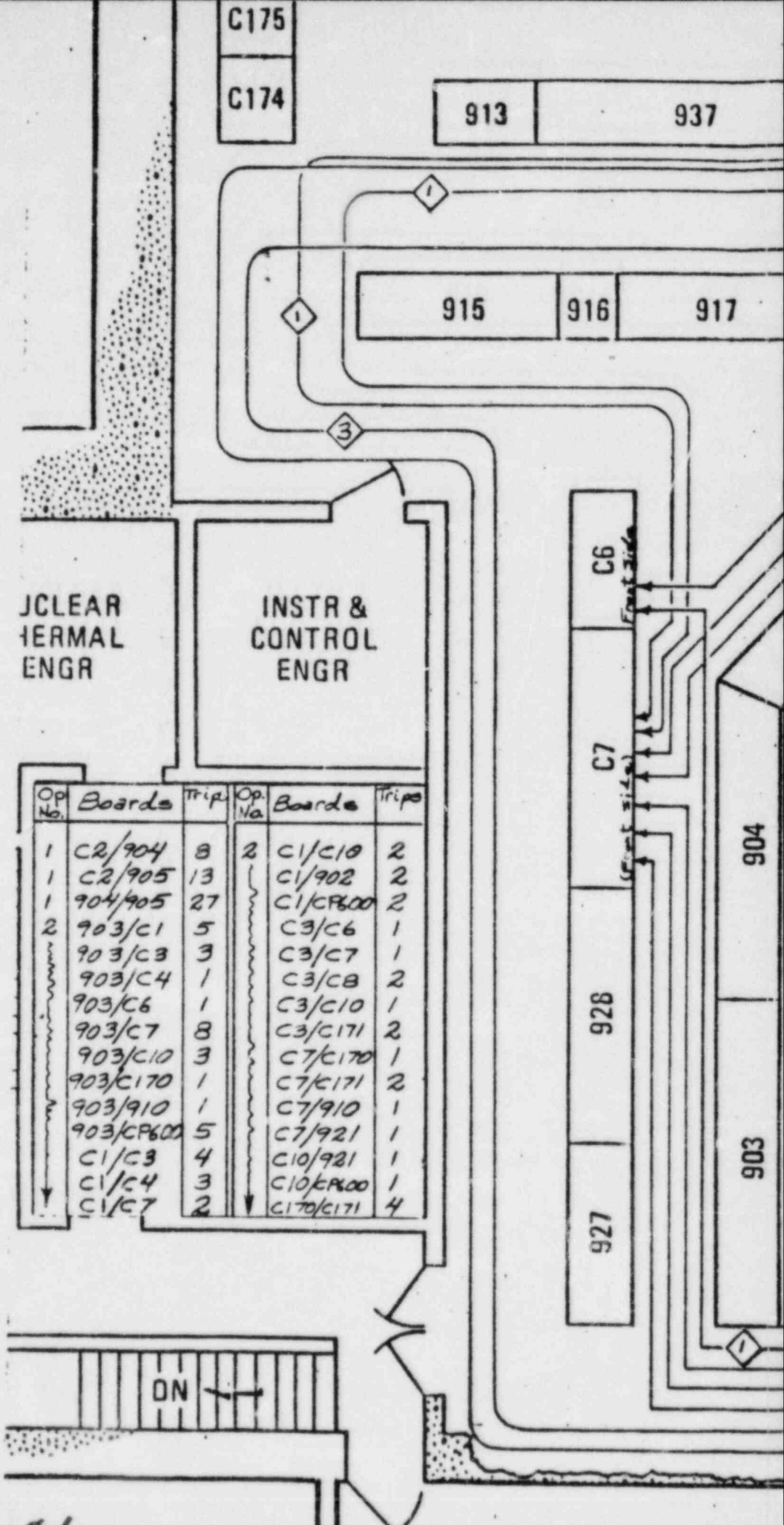
PIEPPV NUCLEAR POWER STATION
 DUNDR YFTA (REV A.6-23-84)
 DATA SHEET #5 OPERATOR #2 (OP2) STEPS IN TASK SEQUENCE
 SOE4: DESIGN BASES LOCA IN PRIMARY CONTAINMENT WITH LOSP

11-Jul-1984
 Page 1

SOE	PROC	OPER STEP	TASK or STEP DESCRIPTION	TASK or STEP REQUIREMENT	DEVICE NO	ALTERNATE TASK DESCRIPTION	SYSTEM NO	BOARD NO	PANEL NO	OPER
4		.10	T: Monitor/adjust plant parameters during normal plant operation @ 100% power		0	-----				
4	-	1.00	T: Respond to numerous alarms and systems auto actions for EOP entry conditions	See subtasks	0	-----				See subtasks
4		1.05	ST: Determine RPV water level	RPV water level	0	-----				initiate RPV flooding (EOP-07)
4		1.11	Observe RPV water level	< 136 INCHES above TAF	1332	-----	9	C171	B	OP2
4		1.13	Observe RPV water level	< 136 INCHES above TAF	439	-----	9	C170	B	OP2
4		1.17	Enter EOP-01		0	-----				
4		1.20	ST: Determine DW pressure and temperature	DW pressure & temperature	0	-----				Assume DW press & temp entry conditions exist

2-80

Also Available On Aperture Card



Op No.	Boards	Trips	Op No.	Boards	Trips
1	C2/904	8	2	C1/C10	2
1	C2/905	13		C1/902	2
1	904/905	27		C1/CP600	2
2	903/C1	5		C3/C6	1
	903/C3	3		C3/C7	1
	903/C4	1		C3/C8	2
	903/C6	1		C3/C10	1
	903/C7	8		C3/C171	2
	903/C10	3		C7/C170	1
	903/C170	1		C7/C171	2
	903/910	1		C7/910	1
	903/CP600	5		C7/921	1
	C1/C3	4		C10/921	1
	C1/C4	3		C10/CP600	1
	C1/C7	2		C170/C171	4

8409280249 -01

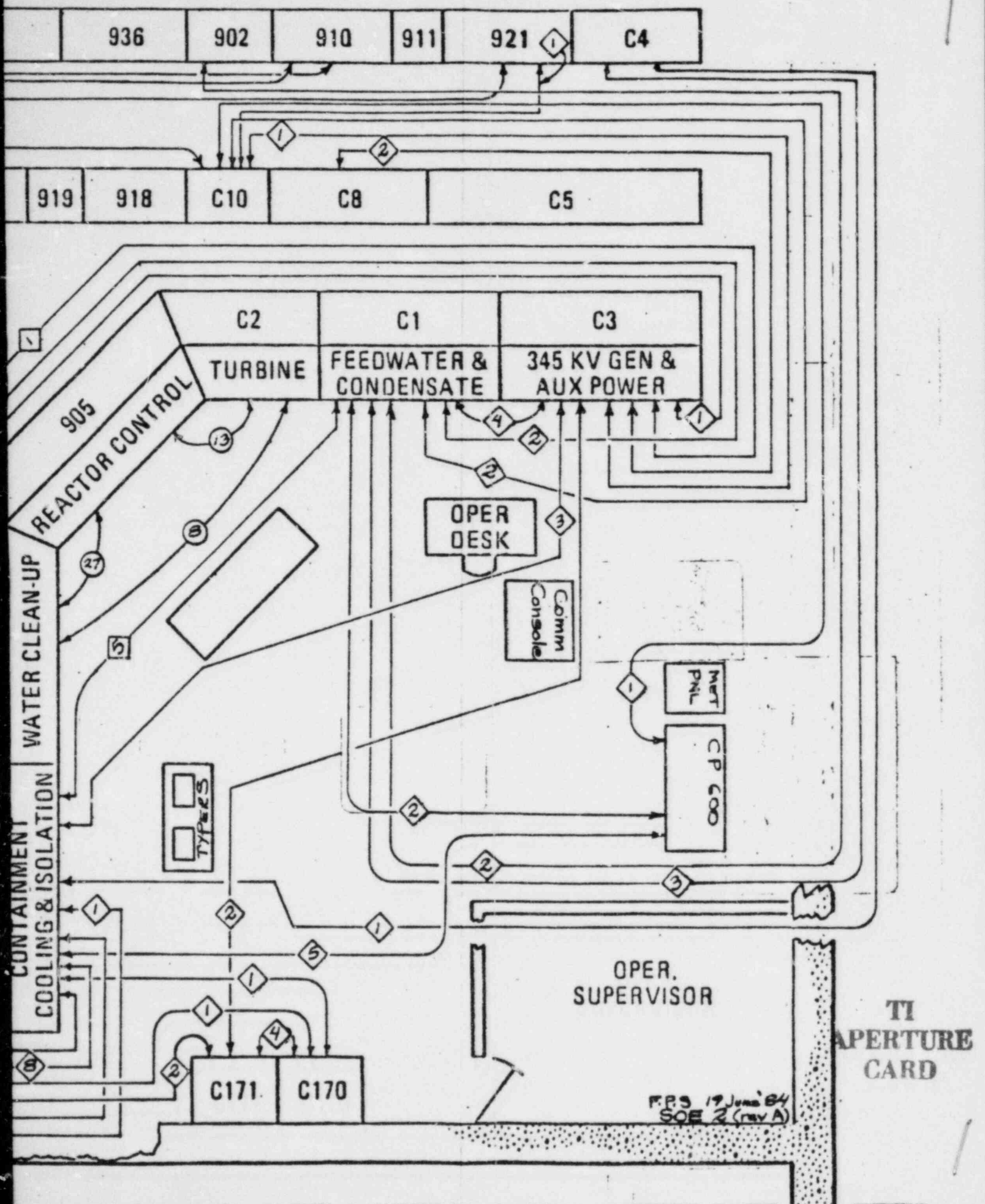
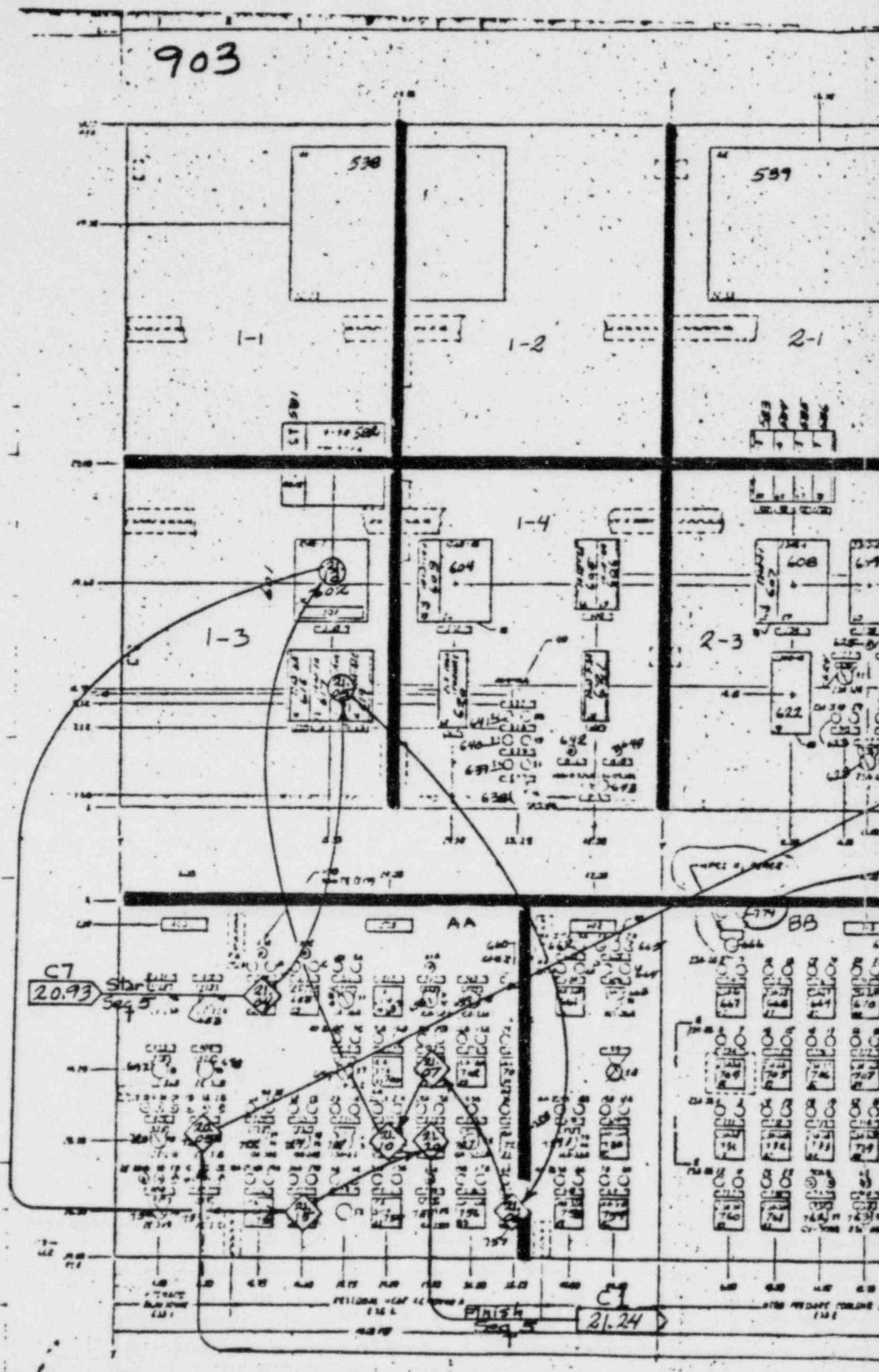


Figure 2-23.

Also Available On Aperture Card

903



4409280-249-02

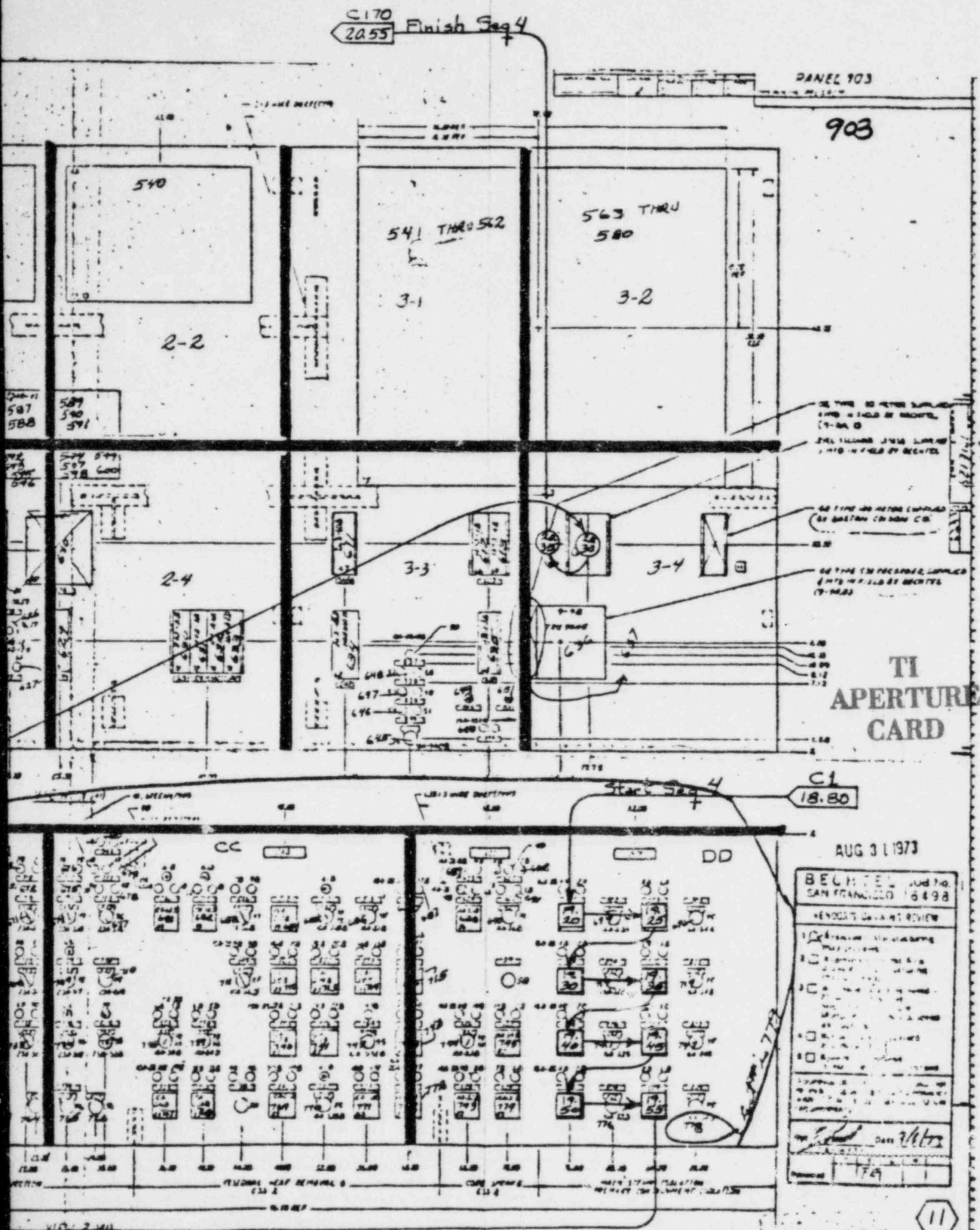


Figure 2-24.

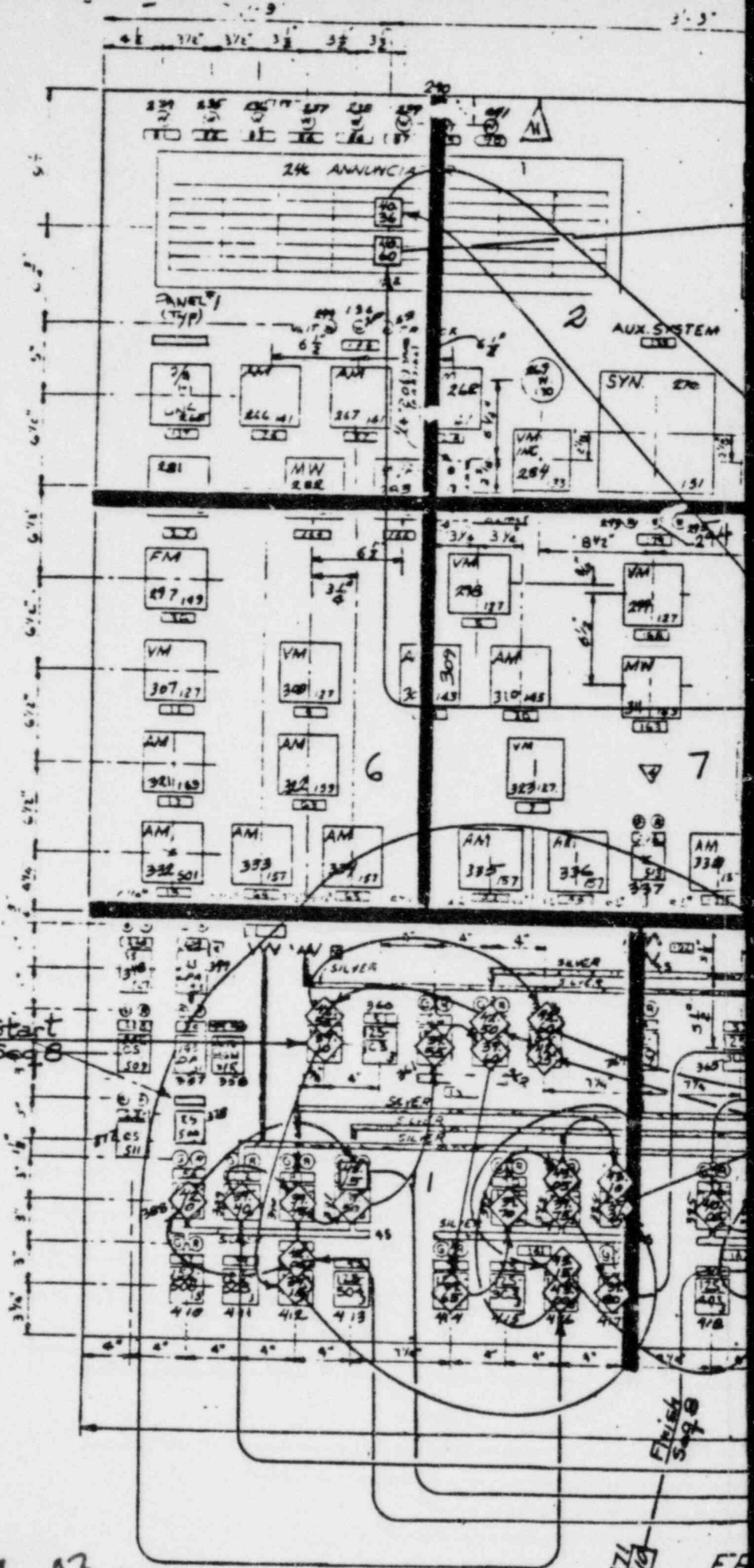
AUG 3 1973

BECHTEL and Co. SAN FRANCISCO 94133	
REVISIONS AND REVIEW	
1	Initial Design
2	Final Design
3	Production
4	As-Built
5	Final
6	Final
7	Final
8	Final
9	Final
10	Final
11	Final
12	Final
13	Final
14	Final
15	Final
16	Final
17	Final
18	Final
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87	Final
88	Final
89	Final
90	Final
91	Final
92	Final
93	Final
94	Final
95	Final
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97	Final
98	Final
99	Final
100	Final

Op #2
 F.P.S. 11 June 84
 Seq 4 #5 2-82

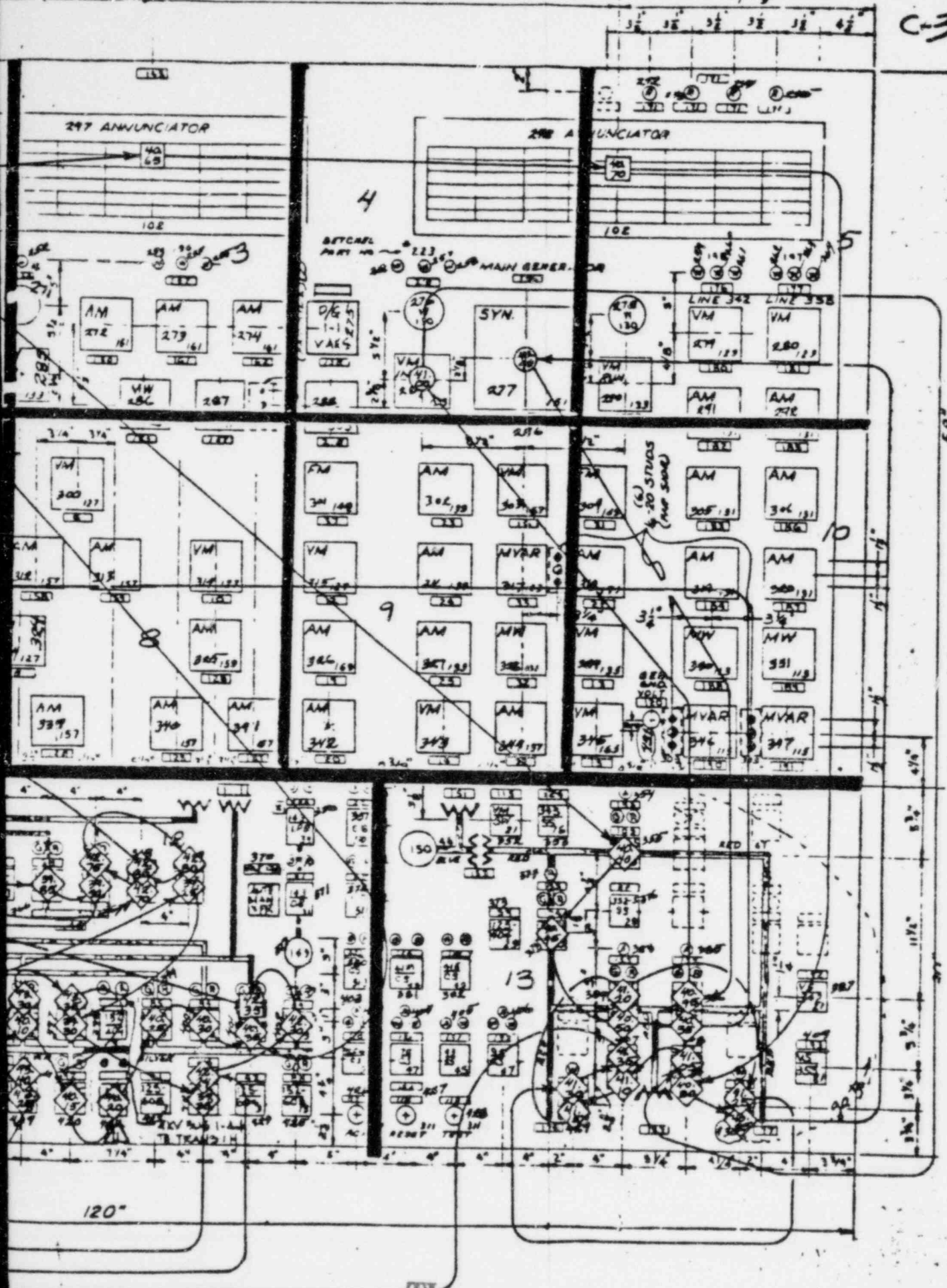
Also Available On
Aperture Card

C7
38.40 Start
Seq 8



8409280249-03

C171 45.10
FR EXPAND



FRONT VIEW C-3
 ED VIEWS A, B, C)

TH
 APERTURE
 CARD

Figure 2-24 (Cont'd).

of 2
 FR 12 June 57
 5048 2-83

6

OBSERVATION DATA

- PLANT
- TASK
- CL
- CL TITLE
- CL ITEM
- HED NO.
- HEO NO.
- HEO CATEGORY
- BOARD NO.
- BOARD TITLE
- EVALUATOR
- DATE
- REV
- HEO DESCRIPTION
- POTENTIAL OPERATOR ERROR
- RECOMMENDED REVISION

DCRDR HEO DISPOSITION LOG

Figure 2-26. Assesment Data Base Record Definition

R. Sabeh 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS

R. Sabeh
EVALUATOR

HED#: 1B015

TASK: Control Room Survey

HED#: 8.1.029

CL: 8.1 CL ITEM: 8.1.1.1b

DATE: 4/10/84 REV:

CL TITLE: Control Room Workspace

HED CATEGORY: B

BOARD TITLE: Reactor Control

BOARD#: 905

HED DESCRIPTION

GUIDELINE- - ACCESSIBILITY OF INSTRUMENT/EQUIPMENT (ARRANGED TO FACILITATE COVERAGE): Instrumentation requiring continuous monitoring by operator's during emergency operations located on back panels 916 and 917 are the Scram Solenoid lights and MSIV isolation lites (2).

This observation is supported by OER-001.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Excessive operator movement results in a delay to respond to an emergency.

RECOMMENDED REVISION

Relocate the Scram Solenoid lights and MSIV isolation lites to the front of panel 905.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

Design chg.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

MANAGEMENT REVIEW

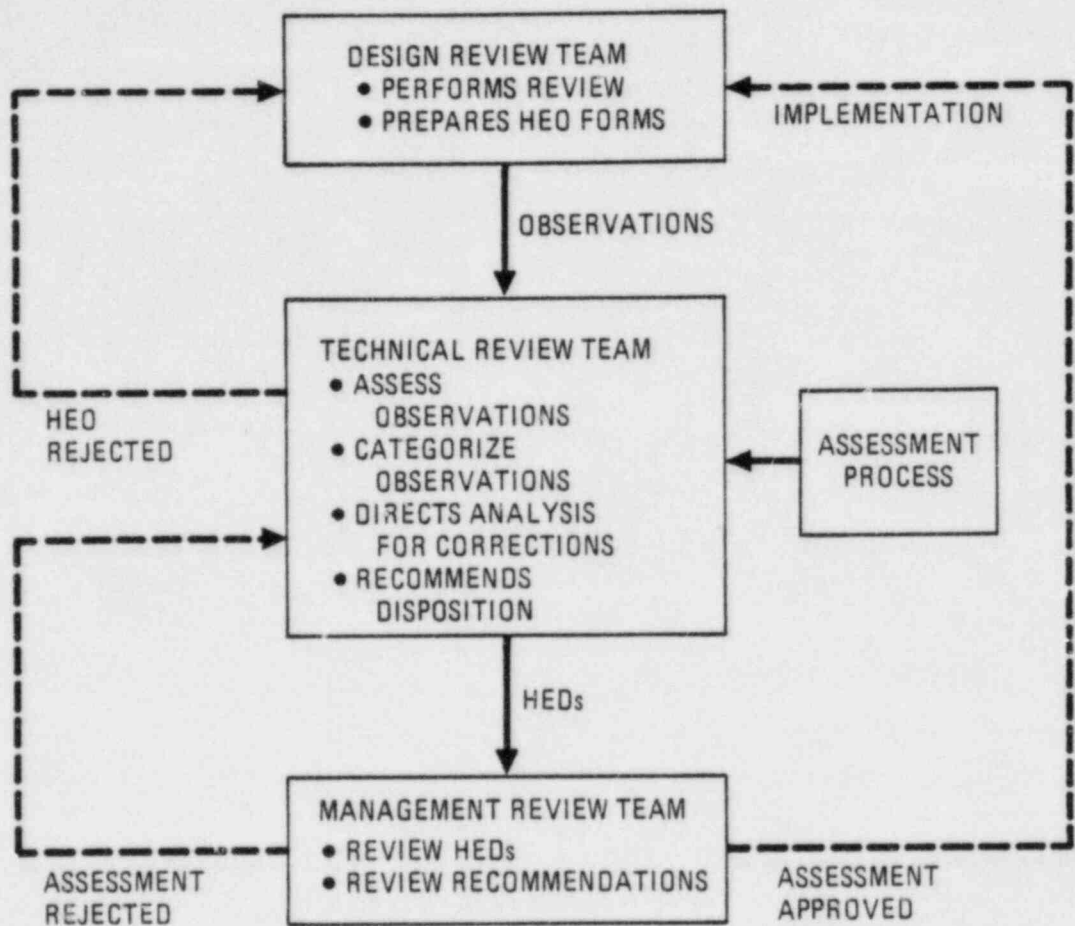
CHAIRMAN W. Babcock DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

New lights shall be added in parallel with old lights. Old lights shall be retained.

2-86

Figure 2-27



LEGEND:
 HEO - HUMAN ENGINEERING OBSERVATIONS
 HED - HUMAN ENGINEERING DISCREPANCY

Figure 2-28. Assessment Methodology

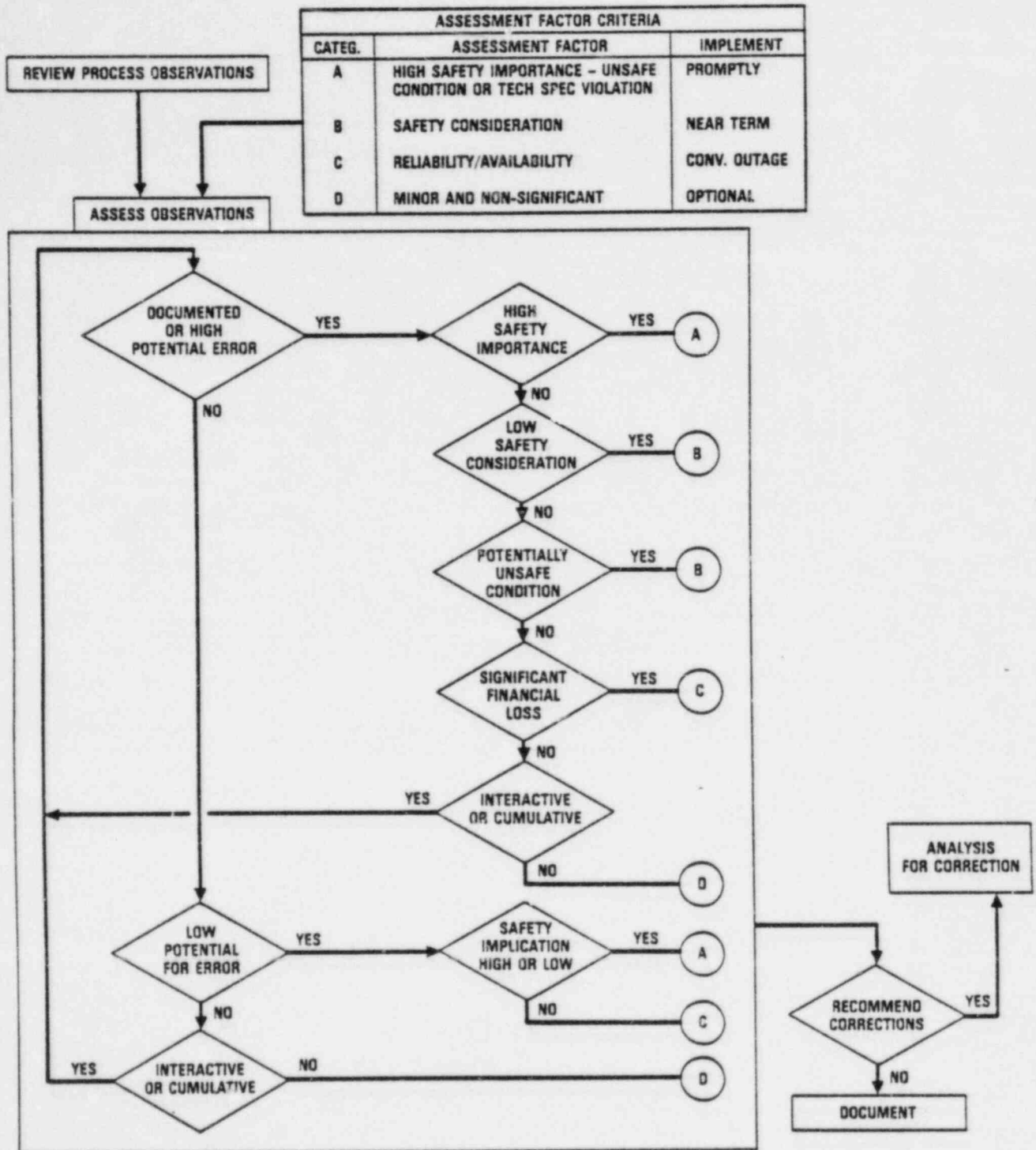


Figure 2-29 HEO Processing

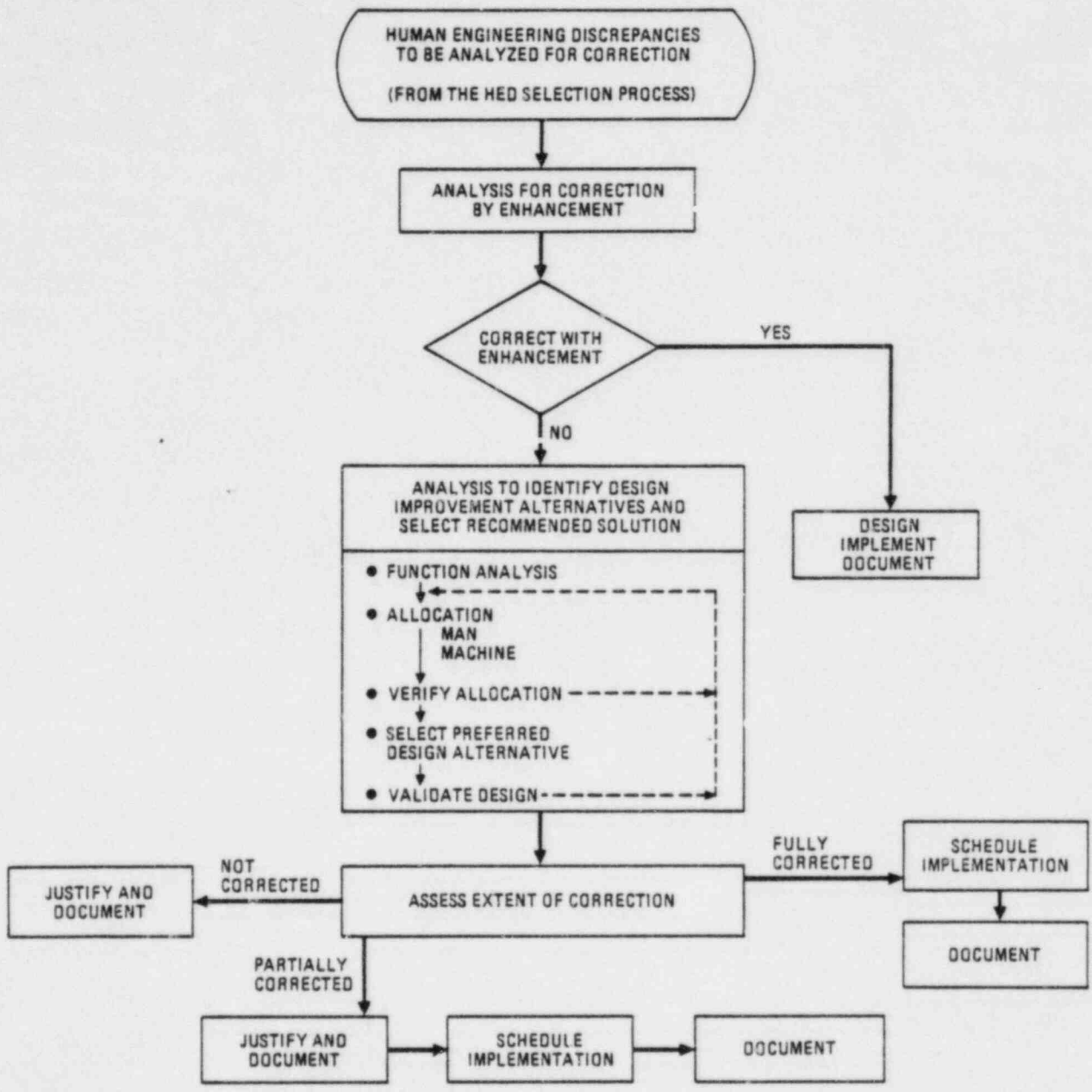


Figure 2-30 Selection of Design Improvements

3.0 DETAILED CONTROL ROOM DESIGN REVIEW RESULTS

3.1 HUMAN ENGINEERING OBSERVATION SUMMARY

The DCRDR of the Pilgrim Nuclear Power Station identified 202 HEOs summarized in Table 3-1. The format of the table is based on the following aspects of the DCRDR methodology (Section 2.2):

- o All of the HEOs were issued through one of the following phases:
 - Operating Experience Review
 - Control Room Survey
 - Verification/Validation

- o All three phases utilized the guidelines of NUREG-0700, Section 6, except for the personnel interview portion of the OER which followed the guidelines set in Section 3.3.2.

- o All HEOs were addressed in the categorization activity of the Assessment phase.

Prior to the DCRDR, the Pilgrim control room underwent a similar review by the BWR Owners Group.⁽¹⁾ The BWROG review identified 105 observations which is significantly less than the DCRDR (202 observations). This is primarily due to the differences in methodology and the fact that the BWROG checklist was prepared prior to the existence of NUREG-0700. In addition, the BWROG review did not include the "supplemental" checklist. All of the BWROG observations were identified in the DCRDR except for those that would be covered by deferred elements of the DCRDR, i.e. plant computer or were not in the scope of the DCRDR.

(1) BWR Owners Group, Control Room Improvements Committee, Human Factors Design Review of Pilgrim Control Room, Summary Report, (not dated)

A summary of the results of these two reviews is presented in Table 3-2. For the BWROG subject guidelines comparable to those of the DCRDR, the latter identified an additional 44 instances of non-compliance. Twenty-one of the BWROG observations resulted from guidelines not in the scope of the DCRDR or were deferred. Finally, the DCRDR identified 73 HEOs from guidelines not included in the BWROG review. Should any documented BWROG discrepancy not have been found by the DCRDR, it would have been added to the list of HEOs for review and assessment. However, no such discrepancies were found to exist.

From this comparison, it is evident that the DCRDR extended substantially beyond the BWROG review.

3.2 HUMAN ENGINEERING DISCREPANCY SUMMARY

HEO categories A, B, C in Table 3-1 were classified as HEDs, totalling 155, for which corrective actions must be identified and scheduled for implementation (see Section 4.0). Some of the HEOs were combined giving a total of 153 HEDs. The remaining 46 HEOs were classified as Category D, non-HEDs, for which implementation of corrective action is optional. Corrective action is being considered on the majority of these HEOs.

Major HEDs were considered to be:

- o Reactor water level and suppression pool water level instrument zero vs scale for functional range; (These values are EOP entry conditions and decision points and are therefore critical).
- o Recorders - inconsistent or missing scales and paper; unreliable causing frequent false alarms; difficult to read.
- o Instruments requiring frequent monitoring during accidents are located outside control room.
- o Existing drywell temperature indications not related to the 40 ft. point for EOP entry conditions and decision points.

- o Panel CP600 not arranged for sequential operations and lacks enhancement aids.
- o Panel C7 too cluttered resulting in insufficient spacing between controls; certain instruments on C7 appear to be needed on main panels.
- o Reactor mode switch lacks position detent.

The HEDs are summarized by type of corrective action in Section 4.0.

3.2.1 Summary Discussion Of Category "A" HEDS

As previously described, all identified HEDs were subjected to a systematic assessment process by the Technical Review Team and the Management Review Team. Eleven category "A" HEDs were originally defined by the Technical Review Team. Of these eleven, eight were retained for action by the Management Review Team and three were downgraded to category "D" (no action required).

Possible solutions to each of the active category "A" HEDs are discussed below. The downgraded HEDs are discussed in section 3.2.2.

- o HED #5A005.4.6 "Reactor Water Level Common Instrument Zero"

Instrumentation modifications to correct this HED have been designed and new instrument scales have been purchased. Work is scheduled for completion prior to plant start-up in October 1984. This HED will be resolved at that time.

- o HED #4A003.4.4 "Reactor Mode Switch"

This HED indicates a new reactor mode switch design is desirable. We intend to approach the original supplier of the switch, General Electric Co., to determine if they are interested in providing a

new design. Other suppliers will also be considered. We believe that a direct replacement of this switch will not resolve this HED. We anticipate that this HED will require significant effort to arrive at a satisfactory solution. We are aware of INPO reports on this subject and will follow this progress closely.

- o HED #5A004.5 "Post-Accident Monitoring Panels - Equipment Usability Problems

This HED, a solution to which involves a survey of the existing instrumentation design for these panels, has been assigned to the Design Improvement Program described in Section 4.1.1. The devices on these panels are not displayed in an easily understood manner.

- o HEDs # 8A006.5, 8A007.5, 8A008.5, "Vertical Panels CP600 and C7, Equipment Usability Problems"

These HEDs are essentially similar to HED #5A004 above. They have also been assigned to the Design Improvement Program.

- o HED #5A009, "Suppression Pool Water Level Common Instrument Zero

This HED has been assigned to the "Design Improvement Program (Meter Scales)" correction method. No technical difficulties are foreseen with the correction method. A common zero will be selected and all applicable instruments will be referenced to that zero.

- o HED #5A010.5, "Containment Atmosphere Temperature Indication"

The Emergency Operating Procedures require various containment atmosphere temperatures to be assessed during accident situations. These indications are not in the primary operating area and it is unclear to the operators which of the indications on the back panels are the required ones. The proper indicators will be moved to the main control panels. No technical difficulties are anticipated. This HED has been assigned to the "panel re-arrangement" correction method.

3.2.2 HEDs Downgraded to "No Action" (Category "D")

During the assessment process the Technical Review Team identified several HEDs whose categories were later reduced by the Management Review Team. A total of 19 HEDs were so downgraded. The HED categories were as follows:

- o Category "A" reduced to Category "D" - 3
- o Category "B" reduced to Category "D" - 14
- o Category "C" reduced to Category "D" - 2

All HEDs reduced in this manner are included with the original Category "D" HEDs in Appendix D. Only the original Category "A" HEDs will be discussed in this report.

3.2.2.1 Category "A" HEDs Downgraded to Category "D"

These discrepancies are listed by their original HED number as well as their present HED number.

- o HED #1A001 (HEO #6.1.009), "Protective Guard Rail at Benchboards"

A protective guard rail has already been installed at all benchboards (main panels) except C905. Panel C905 is designed as a "sit/stand" control panel. It is not believed that a guard rail at this panel will enhance operations and, indeed, may degrade operations at those times when an operator is seated. Investigation of operating history has not turned up any incident of accidental operation of controls due to lack of a guard rail. Therefore, this discrepancy was reduced to category "D".

- o HED #1A002 (HEO #6.1.012), "Lack of Annunciator Response Controls on Panels C904 and C1"

The Management Review Team believes that more than ten years of operation at Pilgrim Station has not demonstrated a need for more annunciator controls at the main panels. No LER exists which can be traced to such a need, nor was any complaint voiced by an operator during the OER phase of the DCRDR. During initial plant design, other configurations of annunciator controls were investigated. The present arrangement of four sets of controls is considered to be the most reasonable for the main bench boards.

- o HED #1A011 (HEO #6.1.033), "Drywell Sump Flow Indication"

The EOPs require DW sump flow to be monitored by the main control room operators. Although no such instruments exist in the main control room, the information is displayed in the rad waste control room, which is continually manned. The main control room operator can communicate with the rad waste operator to determine the flow at any time. The Management Review Team considers this to be satisfactory.

3.2.3 HEOs Upgraded From "No Action"

Three HEOs originally assigned to Category "D" were later upgraded either due to Management Review Team decision or by the Technical Review Team when other information related to the HEO became available. The reasons for upgrading these HEOs are described below:

- o HED #5A009.4.6, "Suppression Pool Water Level Common Instrument Zero"

Although no specific requirement for a common zero on these instruments exists, the Management Team believes that, in light of a similar change being installed for reactor water level instruments, this change should also be made. This change should improve the usability of the Post Accident Monitoring Panels.

- o HED #5B135.5, "Containment Oxygen Concentration Meter"

This discrepancy was initially assigned to Category "D" due to lack of clarity in the original HEO report. The HEO was tagged for future research by the Technical Review Team. Subsequently, discussions with operations personnel revealed the exact nature of the discrepancy, and the HEO was upgraded.

- o HED #1C025.3, "Overhead Computer TV Monitor"

This discrepancy was originally assigned to Category "D" because the Technical Review Team believed the monitor was already in the process of being replaced. It later turned out that the new plant computer project had replacement scheduled for December 31, 1986. The HEO was upgraded and is included in the schedule for replacement consistent with the new computer equipment.

TABLE 3-1
HUMAN ENGINEERING OBSERVATION SUMMARY

Review		Assessment							
Checklist/Guideline	No. of Observations	Phase ⁽¹⁾			Category				
		OER	CRS	V/V	A	B	C	D	
6.1 Control Room Workspace	34	-	30	4	0	12	8	14	
6.2 Communications	11	-	11	0	0	7	3	1	
6.3 Annunciator	27	-	27	0	0	22	1	4	
6.4 Controls	23	-	21	2	1	17	1	3	
6.5 Visual Displays	47	-	40	7	4	19	10	12	
6.6 Label and Location Aids	30	-	30	0	0	24	1	5	
6.7 Process Computers	Deferred ⁽³⁾	-							
6.8 Panel Layout	19	-	18	1	3	12	0	4	
6.9 Control-Display Integration	6	-	6	0	0	4	0	2	
Other ⁽²⁾	5	5	-	-	0	2	1	1	
Total ⁽⁴⁾	202	5	183	14	8	120	25	46	

1. OER: Operating Experience Review; CRS: Control Room Survey; V/V: Verification/Validation
2. Any observation from personnel interviews or plant operating experience is reported through the applicable checklist/guideline unless otherwise noted.
3. Deferred until plant process computer is installed.
4. The assessment totals do not agree with Table 4-1 because several HEDs were similar and were combined into one HED.

TABLE 3-2
BWROG VS DCRDR OBSERVATION SUMMARY

Subject	BWROG No. of Observations	DCRDR No. of Observations
Panel Layout	27	44
Instrumentation	28	46
Annunciator	12	16
Environment	8	13
Computer ⁽¹⁾	1	1
Procedures ⁽¹⁾	6	6
Maintenance ⁽¹⁾	2	2
Training ⁽¹⁾	0	0
Total	84	128
BWROG Guidelines Outside DCRDR Scope or Deferred ⁽²⁾		
	21	--
Total	105	128
NUREG-0700 Guidelines Not Included in BWROG Review		
	--	74
Total	105	202

(1) Includes only those Guidelines in the scope of the DCRDR and not deferred.

(2) Does not include BWROG "Supplement Checklist", which was not addressed in BWROG review.

4.0 DCRDR CONCLUSIONS

4.1 HED CORRECTIVE ACTION

Corrective action for all HEDs (153) identified in the DCRDR have been grouped by correction method categorized as defined in the assessment process (Section 2.2.10) and are summarized in Table 4-1. The specific HEDs assigned to each correction method are presented in Tables 4-2 through 4-6 which includes their description and implementation schedule. The complete HEDs are presented in Appendices A through C according to HED Category. The 46 HEDs assigned to Category D (no action) are presented in Appendix D.

4.1.1 Design Improvement Program

A Design Improvement Program (Table 4-4) has been devised to control the corrective design process for approximately 57% of the HEDs categorized for further action. The HEDs assigned to this Program are those which require correlation in order to assure an integrated corrective methodology. The Design Improvement Program will address HEDs in the following general subject groupings:

- o "Labels, Nameplates, Mimics and Demarcation".

Includes: Development of nameplate/label standards; hierarchical label schemes; abbreviation/acronym standards; design of mimics and operator aids; demarcation methods; color coordination.

- o "Communications"

Includes: Development of updated communications functional requirements; improvements to "GAI-tronics" internal page/phone system; design of new, dedicated communications console for main control room; survey of existing radio and conventional phone

systems to determine if these systems meet the functional requirements and recommendations for improvement.

o "Annunciator System"

A new annunciator system is required. The annunciator improvement program includes: Assessment of reliability/maintainability problems; development of functional requirements for new system; re-arrangement of alarm windows into better system-related groupings; design of new, more easily read window boxes; design of alarm priority system; consideration of the applicability of "first-out" capability; consideration of transfer of alarms to new plant computer/SPDS displays.

o "Control Room Habitability/Lighting/Environment"

Includes: Consideration of all HEDs which are not related to control panel design; HVAC system improvements; furniture replacements; systematic lighting upgrade to reduce glare from instrument faces; rest room/kitchen improvements; new floor covering; new storage areas; work station improvements.

o "Panel Improvements"

This phase is divided into two parts:

A. "Main Control Panel Improvements"

Includes: Development and coordination of improvements to correct HEDs related to main control panels (benchboards); display improvements; panel re-layouts; differentiation of controls; integration of other studies, such as "Annunciator System", into overall panel improvements; development of a "design manual" to control future modifications.

B. "Vertical Control Panel Improvements"

These panels are, in general, rated lower than the main control panels in compliance with human factors requirements. In addition, many of the vertical panels have presented reliability and maintainability problems. The improvement program will include for each vertical panel defined as part of the control room: Development of improvements for each HED related to that panel; incorporation of previously developed standards, such as labels, mimics and demarcation into vertical panel improvements; improvements to reliability/maintainability; location of instruments/controls (should be on main panels?); uniformity of hardware when compared to main panels; removal of superfluous devices; addition of operator aids for little-used systems.

o "Meter Scales"

This program will develop standards for improvement of meter and recorder scales. These standards will also be applicable to future improvements to meter and recorders and they will be included in the Design Manual to be developed during the Design Improvement Phase.

o "SPDS Integration"

This phase of the design improvement program will be initiated once the new plant computer project, which includes SPDS, finalizes its equipment and display requirements.

As described in a subsequent section of this chapter, work on some phases of the Design Improvement Program has already started. Schedules for completion of the Program are also presented elsewhere in this chapter.

4.1.2 HEDs not in Design Improvement Program

The remaining 43% of the HEDs are of such a nature as to be addressed individually. These HEDs are grouped as follows:

- o "Final Enhancements" (Table 4-2)
- o "Design Changes" (Table 4-3)
- o "Panel Devices Relocations" (Table 4-5)
- o "Procedure Changes" (Table 4-6)

Improvements related to these HEDs will be devised in conformance with the criteria developed by the Design Improvement Program. If it later appears that an HED belongs more properly in the improvements program, it will be re-assigned as required.

As a result of the above considerations, no HED existed which was deemed to require an "interim enhancement".

In support of the corrective actions necessary to bring all HEDs into compliance with the DCRDR guidelines, a Control Panel Design Manual will be developed (part of the Design Improvements Program) and the various phases of the DCRDR described in Section 2 will be repeated as necessary to assure no new HEDs have been generated as part of the improvements process.

4.2 IMPLEMENTATION STATUS

4.2.1 Control Room Improvements in Progress

In accordance with the requirements of NUREG-0700, paragraph 1.4.3, Boston Edison Company has begun certain control room improvements which do not interfere with other plant outage work and which are sufficiently independent in nature so as not to be affected by other DCRDR work. These improvements are:

- o Installation of new instrument scales for reactor water level displays, all referencing a common zero (HED #5A005.4.6).
- o Control room esthetic improvements have been initiated in the following areas: Painting of control panels as needed; new furniture; new floor covering; new kitchen equipment; some new computer interface equipment; general improvements to communications console. These items are related to HEDs #1B002.4.3 and 1B009.4.3. A new communications link to the watch engineers office is also included (related #HED 1B003.4.2).
- o Control panel re-arrangements and re-locations for those systems and/or devices having outstanding HEDs of this type are in the initial conceptual design process. At present, we are focusing on layout changes using similar hardware to that already in use. However, we expect that some layouts may require different hardware (miniaturization) than that now used. At the present time 42 HEDs are in this group. These HEDs are listed in Table 4-5.

4.2.2 Work Remaining to be Completed

The following activities remain to be completed to finish the DCRDR project.

4.2.2.1 Control Room Inventory

This phase is presently active and will remain active throughout the DCRDR project. Work remaining includes:

- o Complete all data for each inventory line item; some information related to manufacturers, model numbers, etc. is incomplete.
- o Add Class 1E data.
- o Add devices not included in original control room scope, but discovered during SFTA phase.
- o Correct data based on information discovered during other phases of project.
- o Revise as necessary when corrective actions are known and installed.

At the project's conclusion, the inventory will be used to update the plant instrument list and will be cross-checked with the control panel drawings.

4.2.2.2 System Function and Task Analysis (SFTA)

Results of the SFTA phase will be used as inputs to the corrective action/implementation phase of the project. This work includes -

- o Support HED corrective actions as required.
- o Revise data base as corrective actions become known.
- o Revise data base/perform new analyses as EOP validation continues.

- o Perform analyses to verify if improvements have solved previously-discovered discrepancies.

4.2.2.3 Verification/Validation

This phase requires that all corrective actions be known in order to be completed in a satisfactory manner. It has therefore not been initiated. The following work is envisioned:

- o Evaluate HED corrective actions as necessary.
- o Confirm SFTA revisions as required.
- o Evaluate time-dependent operator tasks when a simulator is available.

4.2.2.4 Control Room Survey

Because a new plant computer has been purchased, the control room survey portion related to computers was deferred. When this equipment is available, the following work will be completed:

- o Execute CRS checklist #6.7, "Process Computer".
- o Revise CRS checklist #6.1, "Control Room Workspace", as necessary.
- o Evaluate HEDs already existing which relate to plant computer equipment in relation to new plant computer equipment (See HED #1C025.3 for example).

4.2.2.5 Design Improvement Program

This program, described in Section 4.1.1 will begin shortly. It is required to assure an integrated corrective action program.

4.2.2.6 Procedures to Control Future Modifications

A methodology and approved procedure to control future modifications will be issued. These will use as a basis the "Control Room Design Manual" to be developed as part of the Design Improvement Program.

4.2.2.7 Detailed Engineering Design for Corrective Actions

Once HED corrective actions have been validated, detailed engineering design to implement the changes must be initiated.

TABLE 4-1

HED CORRECTION METHOD SUMMARY

CORRECTION METHOD	HED CATEGORY			TOTAL
	A	B	C	
Enhancement (Interim)	0	0	0	0
Enhancement (Final)	0	9	5	14
Design Change	0	1	3	4
Design Improvement Program				
Annunciator	0	22	1	23
Communications	0	5	2	7
Habitability	0	5	1	6
Panel Improvement	2	12	0	14
Labeling & Demarcation	0	27	3	30
Meter Scales	2	5	4	11
SPDS	0	0	0	0
Panel Devices Relocation Program	4	33	3	40
Operations Procedure Change	0	0	0	0
Administrative Procedure Change	0	1	3	4
Justification For No Corrective Action	0	0	0	0
TOTAL	8	120	25	153

TABLE 4-2
HED CORRECTION METHOD: ENHANCEMENT (Final)

HED	HED DESCRIPTION	CORRECTIVE ACTION
1B008.2	<p>USE OF PROCEDURES AND OTHER REFERENCE MATERIALS AT CONSOLES: No provision for use of procedures and other reference material at the consoles (benchboards).</p>	<p>Procure rolling bookcases for procedure storage and laydown.</p>
1B011.2	<p>VENTILATION (Air Quantity): Fresh air introduced into the control room is not adequate. This observation is supported by OER-006.</p>	<p>Rebalance HVAC system and require maintenance to survey the performance of the air conditioning system to insure introducing at least 15 cubic ft per minute, per occupant of outside air without adding drafts. (Operations to issue Maintenance request) See also HED# 0B123.4.3</p>
1B014.2	<p>AUDITORY ENVIRONMENT (Limit and Noise Distractions): The continuous background noise created by the pager system and printers is annoying and produces distractions to the operators. See sound survey record. This observation is supported by OER-007.</p>	<p>Install sound suppression floor covering in the operator area of the control room (e.g. carpeting). Page system being studied in communications program.</p>
2B017.2	<p>ANNOUNCING SYSTEM (Intelligibility and Coverage): Loud speaker voice messages cannot be heard in some rotating machinery areas, e.g., diesel generator space. Speaking from noisy areas masks the voice message. This observation is supported by OER-011.</p>	<p>Relocate communication link for the noisy areas and /or install noise reducing booths. Operations to determine areas of concern.</p>

TABLE 4-2
HED CORRECTION METHOD: ENHANCEMENT (Final)

HED	HED DESCRIPTION	CORRECTIVE ACTION
2B021.2	EMERGENCY COMMUNICATIONS (Equipment Usability and Voice Communications) Voice communications while wearing a face mask is unsatisfactory. This observation is supported by OER-008.	Investigate availability of specially designed high quality masks that permit communication when worn. Operations to procure as required.
2B022.2	FIXED BASE VHF TRANSCEIVERS (Procedures): Procedures are written for this system but not posted.	Post VHF transceiver procedures.
5B085.2	DIRECTIONALITY OF MOVEMENT AND NUMBERING WITH MOVING-POINTER METERS (vertical Straight Scales): Values increase in downward movement. Panel 903: #629. Panel 904: #833.	Revise scale to increase in an upward movement. Meters are upside down.
6B083.2	USE (Adjacent Devices): Panel C7 - #1433 covers labels on #1440. Assessment of this criteria is limited because the tags were removed during panel photography.	Procedure violation. Procedure instructs proper method of installing tag-outs so that adjacent devices or labels are not obscured. Operations has been informed of the violation.
9B106.2	GENERAL MOVEMENT RELATIONSHIPS (Rotary Controls): Panel 903: Control #626 increases clockwise, indicator #629 increases downward. Panel 904: Control #842 increases clockwise, indicator #833 increases downward.	See HED 5B085.2

HED	HED DESCRIPTION	CORRECTIVE ACTION
2C010.2	<p>SIGNAL INTENSITY (Comfort): The PAM alarm and fire alarm produce sounds that are a discomfort to the operator.</p>	<p>Modify the alarm intensity level and frequency to get the operator's attention and still not be a discomfort. Investigation shows that horns cannot be readjusted and must be replaced.</p>
2C011.2	<p>READABILITY (False Alarms): Fire alarm is activated by cigarette smoke in areas of the Administration Building, Control Room Annex and Security Alarm Station (SAS).</p>	<p>Replace with less sensitive alarms. Operations to provide list of areas of concern.</p>
4C013.2	<p>GENERAL PRINCIPLES (Compatibility with Emergency Gear): Operators have no experience using controls while dressed in protective clothing.</p>	<p>Provide operator training using protective equipment.</p>
5C017.2	<p>PRECAUTIONS TO ASSURE AVAILABILITY (Bulb Changing Hazard): Changing a light bulb on panel C3 caused a short and resulted in a "scram."</p>	<p>Provide an operator aid for replacing bulbs without shorting circuit.</p>
5C020.2	<p>USABILITY OF DISPLAYED VALUES (Scale Selection): The units on instruments #912 and 894 are worn away and one is replaced with tape.</p>	<p>Replace with readable scales.</p>

HED	HEC DESCRIPTION	CORRECTIVE ACTION
3B023.3	ALARM PARAMETER SELECTION (General Alarms): There are several alarms that require control room operators to direct auxiliary or equipment operators to various parts of the plant to identify trouble, e.g., C60 ventilation problem. This observation is supported by OER-047.	HOLD - FURTHER RESEARCH NEEDED. The intention is to provide the desired information into the control room. Each signal must be evaluated. At present no additional signals are required by operations. This HED will be considered with the annunciator improvement program.
1C004.3	OPERATOR PROTECTIVE EQUIPMENT (Types of Equipment): No protective equipment other than the Scott Air Paks are available in the control room.	Protective clothing needs have been addressed. Refer to HED 1C026.3 for air supply.
1C025.3	CONSISTENCY OF MANNING WITH EQUIPMENT LAYOUT (COVERAGE): The overhead TV monitor used to display computer generated data at the 905 panel is not located in a convenient position for operator viewing. This observation is supported by OER-002.	New plant computer will replace device to assure compliance.
1C026.3	OPERATOR PROTECTIVE EQUIPMENT (Expendables): There are no replacement air tanks that are readily available.	Limited supply of air tanks is available in the control room. New piped-in breathing air source is still being considered.

HED	HED DESCRIPTION	CORRECTIVE ACTION
1B005.4.1	<p>STAND-UP CONSOLE DIMENSIONS (Display Height and Orientation): Displays that exceed 80 in. in height include all the annunciator panels, containment isolation mimic and the upper portion of the rod indicator lights. These are: Panel 903: #538,539,540 and upper portion of the containment isolation mimic. Panel 904: #780,781,782 Panel 905: #1033,1034 and upper portion of the rod indicator lights. Panel C2: #128,149 Panel C1: #1,38 Panel C3: #234,235,236,237,238,239,240,241,242,243,244,245, 246,247,248</p>	<p>Investigate use of tilted windows for annunciators.</p>
3B024.4.1	<p>ALARM PARAMETER SELECTION (Multi-channel or Shared Alarms): There are at least 5 alarms that are shared: Panel 904: TORUS TROUGH ALARM HI/LO #782. Panel 904: RECIRC PUMP OIL LEVEL HI/LO #781. Panel 904: DRYWELL PRESSURE HI/LO #780. Panel 904: REACTOR WATER HI/LO LEVEL #1033. Panel C1: A/B/C SERVICE WATER PUMPS LOW DISCHARGE PRESSURE #38. This observation is supported by OER-014.</p>	<p>The annunciator tiles for at least these alarms will be split into separate annunciator tiles.</p>

TABLE 4-4A
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (ANNUNCIATOR)

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B025.4.1	<p>FIRST-OUT ANNUNCIATORS (Reactor System and Turbine Generator System): There is no first-out annunciator for either the reactor system or the turbine generator system. This observation is supported by OER-013.</p>	<p>Investigate a first-out annunciator capability for the reactor system and turbine generator system.</p>
3B026.4.1	<p>PRIORITIZATION (Levels of Priority): There is a lack of a systematic ann. prioritization scheme. The tiles that should be prioritized are: Panel 903: HPCI ISOLATED, OFF GAS TIME INITIATED. Panel 904: PCIC ISOLATED, CLEAN-UP HI TEMP, NONREGEN HX, DRYWELL PRESS. HI/LO - RECIRC M/G SET A GEN LOCKOUT, - RECIRC M/G SET B GEN LOCKOUT. Panel 905: Rx WATER HI/LO LEVEL, - Rx HI PRESS. Panel C1: RFP TRIP - A/B/C TRIP COND PUMP TRIP, - OFF-GAS LINE GAS FULLY OPEN, A OR B SEAWATER PUMP TRIP, - TBCCW PUMP TRIP Panel C2: TURBINE STM SEAL HDR LO PRESS, - INSTR. AIR OR N2 LVL TO DRYWELL Panel C3: INST POWER TRANSFER, - RFS M/G SET A BKR TRIP, - RPS M/G SET B BKR TRIP, - STATOR COOLING WATER. THIS OBSERVATION SUPPORTED BY OER-015.</p>	<p>Prioritize annunciator tiles using a color coding scheme.</p>
3B027.4.1	<p>CLEARED ALARMS (Auditory Signal): There is no distinct audible signal to distinguish cleared alarms from alerting alarms.</p>	<p>Provide a distinctively different audible signal for cleared alarms.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B028.4.1	<p>VISUAL ANNUNCIATOR PANELS (Location): Some annunciator tiles are on different panels than their controls (e.g., the OFFGAS TIMER tile is on Panel 903 with associated control on Panel C1). This observation is supported by OER-017.</p>	<p>Relocate the tiles to the same panel as the associated controls.</p>
3B029.4.1	<p>VISUAL ANNUNCIATOR PANELS (Labeling): Individual annunciator panels are not all labeled.</p>	<p>Provide panel labels for all unlabeled panels.</p>
3B030.4.1	<p>VISUAL ANNUNCIATOR PANELS (Lamp Replacement): Operators have reported being shocked while replacing bulbs as well as shorting out the entire annunciator panel. This observation is supported by OER-020.</p>	<p>Provide an operator aid for replacing lamps. Power disconnects are now being added.</p>
3B031.4.1	<p>VISUAL ALARM RECOGNITION AND IDENTIFICATION (Contrast Detectability): The opaque yellow annunciators on panel 905 (#1033) are difficult to distinguish between 'ON' and 'OFF' states. This observation is supported by the annunciator OER-049.</p>	<p>Decrease opacity of colored tiles to permit differentiation between 'ON' and 'OFF' states. The color coding scheme recommended for use in HED 3B028.4.1 should be used with these tiles.</p>

TABLE 4-4A
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (ANNUNCIATOR)

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B032.4.1	VISUAL ALARM RECOGNITION AND IDENTIFICATION ("Dark" Annunciator): Annunciators are lit to indicate equipment is out of service (continuous). This observation is in support of OER-019.	Provide a dark annunciator panel and a status board to identify out of service equipment.
3B033.4.1	ARRANGEMENT OF VISUAL ALARM TILES (Labeling of Axes): Annunciator panels are not labeled to conform with this criteria.	Label annunciator panel to conform with this guideline. The labels should identify the vertical and horizontal axes of the panel on the left and across the top for tile designation. The label size should conform to the criteria of 15 minutes of visual arc.
3B034.4.1	ARRANGEMENT OF VISUAL ALARM TILES (Pattern Recognition): There are 63 tiles on each annunciator panel of 905. This exceeds the maximum matrix density of 50 tiles suggested in the guideline criteria.	Reduce the number of annunciator tiles per panel on 905 or otherwise regroup the tiles.
3B035.4.1	ARRANGEMENT OF VISUAL ALARM TILES (Pattern Recognition): Tiles are not grouped by logical organization because of changes subsequent to the original design. This Observation is supported by OER-049.	A design improvement program will identify a logical organization for the annunciator panels.

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B038.4.1	<p>VISUAL TILE LEGENDS (Unambiguous and Abbreviations) Some contain excessive information and others contain insufficient information. In addition, abbreviations and acronyms are not used consistently on all times e.g., Delta-;/Diff Press, REAC/Reactor/Rx. This observation is supported by annunciator OER summary.</p>	<p>Relabel annunciator tiles for efficiency and consistency.</p>
3B037.4.1	<p>VISUAL TILE LEGENDS (Singularity and Specificity): Some tiles refer the operator to annunciator panels outside the main control area. In addition, there are tiles that alarm for two conditions, e.g., DRYWELL HI/LO. Also K COMPUTER alarm on panel 906 refers operator to computer on panel C7. This observation is supported by OER-014 and OER-17.</p>	<p>Identify tiles that should be split, color coded and relocated to the primary operating area.</p>
3B038.4.1	<p>VISUAL TILE READABILITY (Distance and Letter Dimensions and Spacing): The lettering size on the annunciator tiles do not conform to the guideline criteria. This observation is supported by OER-016.</p>	<p>Establish a letter size, type style and color contrast to conform with guideline criteria.</p>

TABLE 4-4A
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (ANNUNCIATOR)

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B039.4.1	VISUAL TILE READABILITY (Type Style): The letter type style and size differ on the annunciator lettering. This observation is supported by OER-018.	This HED should be considered with the recommendation suggested under HED 3B038.4.1.
3B040.4.1	VISUAL TILE READABILITY (Legend Contrast): There are several annunciator tiles that have light letters on dark background (panel 905 #1034). Other annunciators are labeled using dynotape (panel C3 #248 and panel 905 #1033).	This HED should be considered with the recommendation under HED 3B038.4.1.
3B043.4.1	CONTROL SET DESIGN (Positioning of Repetitive Groups etc.): All control set designs are not alike, e.g., Panel C7 has two sets, one horizontal and one vertical. Panel C8 only has two pushbuttons and C170 has three pushbuttons arranged in a triangular formation.	Reconfigure and code controls for consistency and ease of identification.
3B044.4.1	ARRANGEMENT OF VISUAL ALARM TILES (Out of Service Alarms etc): Tiles labeled for equipment that has not been used and will not be used are still included on the annunciator panels, e.g., PLANT HEAT EXCHANGERS A AND B. This observation is supported by OER-018.	Remove labels on inactive tiles.

HED	HED DESCRIPTION	CORRECTIVE ACTION
3B045.4.1	SIGNAL DETECTION (Intensity): There is a large discrepancy in the audible alarm intensities. The PAM panel alarm is too high and the alarm intensity on panels C1, C2 and C3 are too low. This observation is supported by OER-021.	The alarms should be adjusted to insure a nominal signal value of 10dB(A) above ambient noise.
3B047.4.1	SIGNAL DETECTION (Identification): The auditory alarm does not provide for workstation or system identification. This observation is supported by OER-019.	Install additional (possibly three) horns to provide localization cues to direct operators attention.
3C012.4.1	ALARM PARAMETER SELECTION (Multi-channel or Shared Alarms): The annunciator system does not have a reflash capability.	Provide an annunciator reflash capability.

TABLE 4-4B
 HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (COMMUNICATIONS)

HED	HED DESCRIPTION	CORRECTIVE ACTION
1B003.4.2	<p>SUPERVISOR ACCESS: Shift Supervisors' Office (Watch Engineer) does not permit prompt physical access to the control room. In addition, there is no dedicated communications link between these two spaces. This HED is supported by observations OER-005 AND OER-010.</p>	<p>Provide a dedicated communication link (intercom). A temporary communicative link is being added with capacity to upgrade to a permanent design.</p>
2B016.4.2	<p>CONVENTIONAL POWERED TELEPHONE SYSTEM (Handsets): The phones at the shift supervisor's workstation are not identified or coded by circuit or function. It should be noted that the communications equipment at this workstation is "jury rigged" and not functionally arranged. Some phones are inoperative and others broken or not connected to a live circuit. This observation is supported by OER-005.</p>	<p>Develop and install a set of integrated communications equipment based on the requirements of the control room operations. This HED should consider design of the shift supervisor's overall work station requirements. See HED 8.2.002.</p>
2B018.4.2	<p>ANNOUNCING SYSTEMS (Loudspeaker Volume): Speaker gain control can reduce volume below audible level. This observation is supported by OER-007.</p>	<p>A selective gain control should be installed at the shift supervisor's workstation. This observation supports HED 2C009.4.2. Add minimum volume stop.</p>
2B019.4.2	<p>ANNOUNCING SYSTEMS (Priority): Channel 3 is reserved for emergency or control room voice traffic but there is no priority procedure or capability for interrupting an announcement in progress.</p>	<p>An electronic system having the capability to seize or interrupt an announcement will be installed.</p>

TABLE 4-4B
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (COMMUNICATIONS)

HED	HED DESCRIPTION	CORRECTIVE ACTION
2B020.4.2	<p>POINT-TO-POINT INTERCOM SYSTEMS: There is no point-to-point intercom between the control room and the watch engineer's office. This observation is supported by DER-010.</p>	<p>Install a point-to-point intercom between the watch engineers office, the control room and the administrative assistants office. Include a gain control at each intercom unit. Refer to HED 1B003.4.2.</p>
2C009.4.2	<p>ANNOUNCING SYSTEM (General): The 5 voice channels are continuously in use. During plant shutdown, when contractors are at the plant, they generate nuisance sounds that interferes with control room communications. This observation is in support of DER-007.</p>	<p>Refer to HED 2B019.4.2. The new system in that HED has the capability to interrupt nuisance sounds.</p>
0C024.4.2	<p>DO ANY COMMUNICATIONS SYSTEMS INTERFERE WITH CONTROL ROOM OPERATIONS? General Requirements (Plug-in Jacks): There is an insufficient number of plug-in phone jack positions at the console panels (one at either end of the control room panels).</p>	<p>Install at least two (2) additional plug-in jack positions at the control panels.</p>

TABLE 4-4C
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (HABITABILITY)

HED	HED DESCRIPTION	CORRECTIVE ACTION
1B002.4.3	<p>FURNITURE AND EQUIPMENT LAYOUT: There is a limited amount of work space for the operator. The space available is used to hold two printers and a computer terminal. This observation is supported by OER-001.</p>	<p>Provide an adequate operator work station.</p>
1B009.4.3	<p>DESK DIMENSIONS: There is inadequate work station (space) to perform administrative tasks. This observation is supported by OER-001.</p>	<p>Provide operator with an adequate work station.</p>
1B013.4.3	<p>ILLUMINATION (Glare and Reflectance): Glare and reflectance on instrument faces is produced by the overhead light placement. This observation is supported by OER-003.</p>	<p>Overhead light covers should be replaced with "egg crate" type light covers or covers that control the unwanted dispersion of light. In addition provide controls to permit light level intensity adjustment for lights above the workstations.</p>

TABLE 4-4C
 HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (HABITABILITY)

HED	HED DESCRIPTION	CORRECTIVE ACTION
1B012.4.3	ILLUMINATION (Levels and Uniformity): The variability and control of lighting levels do not conform to the guideline criteria. See lighting survey - luminance record.	The light levels within the control room should be adjusted to conform with the guideline criteria. Include emergency lighting in program.
0B123.4.3	TEMPERATURE & HUMIDITY (Comfort Zone): Touching the instrument face cover can influence the instrument reading due to a static charge from friction of the operators feet on the floor	Raise humidity in the control room during the winter months and install antistatic carpeting. Refer to HED 1B011.2
1C006.4.3	PERSONAL STORAGE: No space is provided for personal storage.	Provide operators with personal storage facilities.

TABLE 4-4D
 HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (PANEL IMPROVEMENT)

HED	HED DESCRIPTION	CORRECTIVE ACTION
4A003.4.4	ROTARY SELECTOR CONTROLS (Positioning): No positive detent feedback for reactor mode switch on Panel 905 (#1284).	Replace switch with a positive detent switch or investigate new design. (See Section 3.2.1)
8A006.4.4	ENHANCEMENT RECOGNITION AND IDENTIFICATION Panels CP800,C7,C170,C171 lack operator enhancement aids. This observation is supported by OER-043.	Investigate the use of mimics, demarcation or other enhancement aids for instrument and control functional separation.
4B048.4.4	GENERAL PRINCIPALS (Human Suitability): All "J" handles are the same for pumps, valves and switches - some of two position, others are "jog" - poor discrimination by function or mode of operation. This observation is supported by OER-023.	Provide shape or color coding to discriminate function and mode of operation.

HED	HED DESCRIPTION	CORRECTIVE ACTION
4B051.4.4	<p>DIRECTION OF MOVEMENT (Cont.) Panel C7: Photos show that "J" handles #1413, 1448, 1454, 1455, 1477 have operator notation that indicates control movement violates population stereotype permanent labels on the controls. Panel C2: #192, 208, 207, 208, 215, 216 turn counterclockwise to raise and clockwise to lower. This observation is supported by OER-024.</p>	See below.
4B051.4.4	<p>DIRECTION OF MOVEMENT: Controls that violate population stereotype are: Panel 904: Rotary finger switches #945, 951, 952, 956 counterclockwise movement to open. Panel C3: Rotary handswitch #356, 372, 377, 380, 404, 406 counterclockwise to increase (raise). Panel C7: Rotary finger controls #1357, 1359, 1360, 1362, 1377, 1379, 1380, 1382, 1385, 1387, 1388, 1390, 1391, 1392, 1394, 1395, 1397, 1398, 1399 increase counterclockwise.</p>	Replace switches with types that meet the guideline.
4B052.4.4	<p>CODING OF CONTROLS (Consistency): There is a limited amount of color coding on the "J" jog controls. On panel C1 and C3 some controls are color coded but there is no consistent pattern throughout the control room. This observation is supported by OER-023.</p>	Code control handles for consistency.

HED	HED DESCRIPTION	CORRECTIVE ACTION
4B054.4.4	CODING OF CONTROLS (Shape Coding): Shape coding of controls is not used. The OER identified that the vacuum breakers and containment air valve controls were too close to each other and identical in shape making accidental activation possible on Panel C7. This observation is supported by OER-023.	Provide shape coding to differentiate breakers, valves and pumps on (controls #1478 and 1484). However, there appears to be many other controls that should be shape coded to improve discriminability.
4B055.4.4	CODING OF CONTROLS (Color Coding): Except for Panel C3 there is no color coding association between controls and displays. The color coded jog 'J' handles (green) do not adequately contrast with panel background.	Provide a coding scheme to relate controls to displays and improve color contrast of jog handles.
4B056.4.4	LEGEND PUSHBUTTONS (Discriminability): The rod selector pushbuttons on the bench board are the same in size and appearance as the legend displays on the vertical portion of this panel. In addition, there are other legend pushbuttons and legend labels on the vertical portion of panel 905 which are identical in size and shape.	Provide a coding scheme to discriminate legend lights from legend pushbuttons.
4B058.4.4	ROTARY SELECTOR CONTROLS (Position Indication): Controls on panel C1, #56 and 57 do not have position indicating line down the side of the rotary control knob. This condition may appear on other controls but could not be identified from the mockup photographs.	Provide a line down the side of each control knob.

TABLE 4-4D
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (PANEL IMPROVEMENT)

HED	HED DESCRIPTION	CORRECTIVE ACTION
4B059.4.4	<p>PREVENTION OF ACCIDENTAL ACTIVATION (Resistance to Movement): During the OER, operators reported that rod control switch #1268 and notch override switch #1261 have excessive spring loading. This observation is supported by OER-025.</p>	<p>Provide a different type handle (joystick) or reduce the separation and spring tension.</p>
4B131.4.4	<p>DIRECTION OF MOVEMENT: Switches 1434, 1435, 1436, 1443, and 1445 have "open" at the left position and "auto" at the right position. Switches 1400, 1401, 1402, 1403, 1404, 1405, 1406 and 1407 have "close" at the left position and "auto" at the right position. Other switches 1410 and 1411 have three labels and two function positions, i.e., "close-auto" and "open". The functional positions of the controls do not conform with convention.</p>	<p>Replace switches with ones that conform with convention, i.e., "auto" always at the center position with "close" always at the left position and "open" always at the right position.</p>
5B068.4.4	<p>CHARACTERISTICS AND PROBLEMS OF LIGHT INDICATORS (Precautions to Avoid Misinterpretation): The indicator lights above controls #206, 404, 406 have red lens on left and green lens on right (reversal from convention).</p>	<p>Reverse the lights to conform with convention.</p>
5B069.4.4	<p>COLOR CODING (Consistency of Meaning): BUS trouble lights on Panel C3 use amber and white covers with the same meaning.</p>	<p>Replace white covers with amber covers. Include all of C3.</p>

HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (PANEL IMPROVEMENT)

HED	HED DESCRIPTION	CORRECTIVE ACTION
98108.4.4	SINGLE CONTROL AND DISPLAY PAIRS (Association): The direction of movement of controls and light colors are not consistent with convention. Controls (e.g., #206, 207, 208, 215, 216) move counterclockwise to raise. Red/Green lights above controls #206, 404, 408 are reversed.	Reposition lights and change control movement to conform with convention.

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B111.4.5	<p>ZONE MARKINGS: The majority of instruments have no zone markings on the instrument faces to identify operating ranges, upper or lower limits and danger zones used throughout the control room. Existing markings were applied without use of a standard or criteria.</p>	<p>Investigate the use of zone markings for meter faces to enhance operator identification of operating ranges, limits and danger zones. Establish a standard.</p>
5B134.4.5	<p>USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion): The plaque, 2004, defining reactor power level vs. IRM channel range position specifies reactor power in KWT or MWT whereas operator decision points in the EOPs require % power. Thus the operator must work with 2 different sets of power units during emergency events.</p>	<p>Change reactor power units on 2004 to %.</p>
6B072.4.5	<p>NEED FOR LABELING: Labels on Panel CP800: #466, 465 missing. Panel C7: #1454, 1455, 1448 have operator notation to indicate the label is in error. Panel 903: #581 should be relabeled torus air temperature; #601, 610 have no label. Panel 903 and 904: #626 and 842 no direction for increase. This observation is supported by OER-037 and OER-042.</p>	<p>Install appropriate labels on instruments and controls. Include C170/171.</p>

TABLE 4-4E
 HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (LABELING & DEMARCATION)

HED	HED DESCRIPTION	CORRECTIVE ACTION
6B073.4.5	<p>HIERARCHICAL SCHEME: The limited hierarchical labeling does not adequately satisfy these guideline criteria. This observation is supported by OER-041.</p>	<p>A hierarchical labeling design will be developed to result in an improved overall labeling arrangement.</p>
6B074.4.5	<p>PLACEMENT (Normal Placement): Labels not placed above their associated controls are: Panel CP800: #472, 473, 500, 501, 527, 528, 518, 519, 529. Panel 903: #604, 608, 587, 592, 594, 599, 591. Panel 904: #1005, 1022, 836, 866, 868, 880. Panel 905: #1265, 1266, 1299, 1300, 1302, 1305, many pushbuttons. Panel C1: #26, 27, 46, 48, 56, 57. Panel C4: #1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528.</p>	<p>Relocate labels above controls and displays.</p>
6B075.4.5	<p>PLACEMENT (Panel Labeling): All display labels are placed below the instrument and does not conform to guideline criteria.</p>	<p>Relocate of labels relative to control room conventions.</p>
6B076.4.5	<p>CONSISTENCY (Internal Consistency and Consistency with Procedures): No standard list of abbreviations or acronyms is used on the labels, e.g., PREHEATER/PREHTR, BLOCK/BLK, HYDROGEN/H2 This observation is supported by OER-039.</p>	<p>Standardize the use of label terminology. Incorporate into the program recommended under HED 6B073.4.5. Include acronym list w/annunciators.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
6B077.4.5	<p>BREVITY: There is an inconsistency in labeling, Some labels use complete words for abbreviations that are in common usage by operators, e.g., RCS/Reactor Cooling System. This observation is supported by OER-039.</p>	<p>Reword labels using standard and common abbreviations and acronyms.</p>
6B078.4.5	<p>FUNCTIONAL GROUPS (Functional Relationship and Location): Controls for fast start-up test and fast injection procedures require a set of control actuations in sequential series. The controls associated with these sequential actions are scattered across the panel requiring the operator to search for proper controls in sequence. This observation is supported by OER-036.</p>	<p>Code the controls to provide the operator an aid for identifying the control sequence actions for fast startup. Add RCIC and/or RHR to study.</p>
6B079.4.5	<p>CONTROL POSITION LABELING (Direction): The direction of movement does not conform to convention on: Panel 903: #626, 599 Panel 904: #842, 945, 951, 952, 956 Panel C1: #45, 46, 48 (turn left to increase temperature) Panel C7: #1448, 1454, 1455, 1413; operator pencil markings indicate directions differ from labels Panel C3: #356, 372, 377, 380 This observation is supported by OER-024.</p>	<p>Change switch direction of movement to conform with convention and label appropriately. This observation is included under HED 4B051.5.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
6B080.4.5	<p>READABILITY (Character Height): Character heights are not consistent, e.g., Panel C3 - #411, 415, 421, 423. Also Panel C2: #146, 165. The smaller character size does not meet guideline criteria. This observation is supported by OER-038.</p>	<p>Standardize label sizes to be consistent with the hierarchical labeling scheme recommended under HED 6B073.4.5.</p>
6B081.4.5	<p>READABILITY (Contrast): All labels are white characters on black or dark background. This does not conform with the guideline criteria and contributes to the observation reported under HED 6.8.005 (HED 6C023.7)</p>	<p>Revise labels to use dark (black) characters on a light (white) background. This observation should be included with the program recommended in HED 6B073.4.5 and 6B079.4.5.</p>
6B082.4.5	<p>USE (Necessity and Human Factors Practices): Temporary labels have been on the panels for an extended period of time, e.g., many dynotape labels as on Panel C3: #246, 247, 248 annunciators or C170: #450, 451, 452, 453, 454, 455, 456, 457, 1340, 1341, 1342, 1343, 1344, 1345, 1347, 1338. On Panel C7 operators have penciled in label identification which conflicts with permanent label, e.g., #1454. This observation is supported by OER-040.</p>	<p>Provide permanent labels on indicators and controls.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
6B084.4.5	<p>DEMARCATON (Permanence): Stick-on tape is used for most of the demarcation lines on Panels #903, 904, C1, CP800 Board Title: Rx CLG, Rx Clnup, FW & Cond, AOG</p>	<p>Replace with a more permanent demarcation line. The favorable comments received during the OER suggests that the panels should include more demarcation.</p>
6B085.4.5	<p>COLOR: Colors are not associated with specific functions. Board Title: Rx CLG, Rx Clnup, FW & Cond, Electrical, PAM, Cntmt Vent Board No.: #903, 904, C1, C3, CP800, C7</p>	<p>Investigate the use of color to aid in function identification.</p>
6B086.4.5	<p>USE OF MIMICS (Color): The mimic lines on Panel C3 are not color discriminative.</p>	<p>Provide color discriminable mimic.</p>
6B087.4.5	<p>USE OF MIMICS (Color): Mimic lines on Panel C3 do not have adequate color contrast with the panel surface.</p>	<p>Provide color contrasting mimic lines. This HED should be considered with HED 6B086.4.5.</p>
6B088.4.5	<p>USE OF MIMICS (Color): The origin of all lines for the containment isolation mimic are not clear. This observation is supported by OER-044.</p>	<p>Correct mimic indicator lines and incorporate a set of lights to identify the type of isolation signal.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
88089.4.5	INTERNAL CONSISTENCY: The bus indicator numbers do not increase progressively (#240 out of sequence). In addition, two different colored light caps are used.	Renummer the bus indicators to increase progressively.
88090.4.5	CONSISTENCY (With Procedures): Panel 903: Containment spray Signal label #755 and 770 should be changed to Containment Spray Permissive. Panel 904: Displays 885,886,887 read lbs/hr times 10 to the 6th and Procedure 2284 (pg 18) indicates gal/min. Panel C2: #168 reads in mils; the instructions (2.2.99) reads in inches.	Change labels on these instruments.
88091.4.5	CONSISTENCY (Internal Consistency): Panel 904: Labels for 992 and 1008 are different but the controls perform the same function. Panel C3: Label wording on controls 429,430 is confusing to relate to control function.	Relabel controls to be consistent.
88092.4.5	NEED FOR LABELING: Panel C1: Labels for lights above #36 and 37 are missing. Panel C2: 4 lights associated with control #231 do not have labels. Panel 904: Labels on 888,913 are missing.	Install labels for these devices.

HED	HED DESCRIPTION	CORRECTIVE ACTION
68120.4.5	<p>CONTROL POSITION LABELING (POSITION): The functional control positions are worn off or have never been etched on the control plate (escutcheon) for a large number of switches.</p>	<p>Replace or etch control plates with functional control position (escutcheon).</p>
68121.4.5	<p>NEED FOR LABELING: There are 8 key control selector switches on each of the PAM panels C170 and C171. The system function for the use of these controls is not identified.</p>	<p>Install labeled name plates to identify valve functions.</p>
68125.4.5	<p>NEED FOR LABELING: The red and green lights associated with valve controls 720,721,750,751 indicate valve position command as opposed to valve position for all other valve controls in the control room. Valve position is indicated on panel C171, instrument 1338.</p>	<p>Provide labels indicating that the green lights are power available and red lights are solenoid valve open command.</p>

TABLE 4-4E
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (LABELING & DEMARCATION)

HED	HED DESCRIPTION	CORRECTIVE ACTION
8B099.4.5	ENHANCING RECOGNITION AND IDENTIFICATION (Spacing): Set of controls for recorders #1107/1100 and #1162/1163 are not separated to indicate boundaries.	Separate or provide demarcation between sets of controls.
8B100.4.5	ENHANCEMENT RECOGNITION AND IDENTIFICATION (Emergency Controls): No distinctive enhancements are used for emergency controls.	Provide enhancement recognition for emergency controls.
1C005.4.5	ILLUMINATION (Shadowing): Labels below instrumentation on vertical panels are shadowed. This is especially true for recorders which project beyond the panel surface.	Relocate labels above their associated instruments.

HED	HED DESCRIPTION	CORRECTIVE ACTION
5C015.4.5	SPECIFIC RECORDER TYPES (Continuous Recorders-Labeling): There is no recorder labeling on Panel CP600 - #466.	Label recorder #466 on panel CP600.
5C026.4.5	USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion): The plaque identifying reference RPV water levels for use with 1173 & 1174 (panel 905) contains arrows pointing to various positions on the scale of 1173 which differ from the stated level by ~8 inches. The scale pointer is between the arrows and scale easily allowing the incorrect association of the pointer with the arrows on the plaque.	Remove the arrows from the plaque to reduce and generalize the plaque/instrument scale relationship.

TABLE 4-4F
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (METER SCALES)

HED	HED DESCRIPTION	CORRECTIVE ACTION
5A005.4.6	<p>SCALE MARKINGS (Compatibility): The core water level display indicators on panels 903, 904, 905, 170 and 171 all differ.</p> <p>Panel 903: #620, 634 Panel 904: #882 Panel 905: #1173, 1174, 1183, 1186 Panel 170: #439 Panel 171: #1332 Board Title: Rx CLG, Rx Clnup, Rx Cont, PAM-A, PAM-B</p>	<p>Change scales to reference a common zero on all indicators.</p>
5A009.4.6	<p>USABILITY OF DISPLAY VALUES (Elimination of Operator Conversion): Recorders 439, 1429 and 615 display the same parameter but use different scales requiring conversion to compare. This observation is supported by OER-846.</p>	<p>Revise scales to reference a common zero. (See below)</p>
5A009.4.6	<p>USABILITY OF DISPLAYED VALUES (Scale Selection): SP level wide range devices (438, 439, 1331, 1332) and narrow range devices (615, 1429) have instrument zeros 133 inches apart and both are used for EOP entry conditions and decision point therein. This requires operators to work with 2 substantially different sets of SP level during emergency events.</p>	<ol style="list-style-type: none"> 1. Establish a common instrument zero for both wide and narrow range (but not such as to be confused with RPV level) or, 2. Restrict EOPs to wide range levels (if possible).

TABLE 4-4F
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (METER SCALES)

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B062.4.6	<p>CONTRAST: Indicators with white letters on black background are: Panel C3: #332, 342, 329, 318. Panel C7: 1459.</p>	<p>Establish standard instrument dials and replace instruments not in compliance with this standard.</p>
5B063.4.6	<p>PRINTING ON THE DISPLAY FACE (Provision of Needed Message): Parameter scales missing: Panel 903: #801, 804, 808, 810. Panel 904: #836, 880, 814, 912. Panel 905: #1302, 1303, 1305. Panel C2: #145, 146. Panel C1: #24, 25, 42, 47, 26, 27, 48, 46, 45. Panel C4: Foxboro indicators. Panel C170: #442, 443. Panel CP600: #466.</p>	<p>Label scale with parameter value. Delete 804, 808, 856, 1302, 1303, 1305, 26, 27, 45, 46 and 48.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B064.4.6	<p>SCALE MARKINGS: (Values Indicated by Unit Graduations): Scale graduation values that do not agree with guideline criteria for progression: Panel 903: #602, 831, 832, 833, 835, 583, 584, 586, 618, 619, 621. Panel 904: #829, 830, 831, 875, 876, 877, 878, 889, 890, 907, 908, 1025, 813. Panel 905: #1099, 1100, 1101, 1102, 1175, 1176, 1177, 1178, 1188, 1192, 1193, 1171, 1107, 1108, 1162. Panel C2: #130, 133, 136. Panel C1: #14, 15, 18, 19, 20, 25. Panel C3: #283, 287, 297, 301, 345. Panel CP600: #468, 469. Panel C7: #1367, 1368, 1369, 1374, 1375, 1358, 1378, 1386, 1393, 1384, 1430, 1361, 1381, 1389, 1396, 1383.</p>	<p>Revise scale values to conform with recommended graduation values identified in the guideline criteria.</p>
5B127.4.6	<p>USABILITY OF DISPLAYED VALUES (Scale Selection): RHR flow indicators 817, Loop A and 831, Loop B, and flow recorder 602, Loop A/B, all on panel 903, indicate the same flow within the same range but have different scale increments: o 817 & 831: 500 gpm increments o 602 : 200 gpm increments</p>	<p>Revise scales to have consistent increments.</p>

TABLE 4-4F
 HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (METER SCALES)

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B136.4.6	USABILITY OF DISPLAYED VALUES (Scale Range): The cooling water flow in the CRD hydraulic system is 785 gpm but the flow indicator range, 1191, is 0-50 gpm.	Problem has been related to faulty equipment now being repaired. No change to instrument required.
5C014.4.6	GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Scale Compatibility): Recorder scales and recorder paper that are not compatible are: Panel C170: #434, 439, 449. Panel C171: #1327, 1332, 1339. Panel 903: #615. Panel C1: #24, 25, 23. Panel C7: #1430. Panel CP902: Area Rad FR 705-4, AR 5075-A.	Install recorder paper compatible with recorder scale. Each recorder to be provided with a plate to identify the stock no. of the correct paper. Plate to be located inside recorder.
5C018.4.6	USABILITY OF DISPLAYED VALUES (Scale Selection): The scales on APRM meters #1162, 1163, 1107, 1108 on Panel 905 and #168 on Panel C2 do not provide the required precision. This observation is supported by OER-031.	Change scale and recorder sensitivity to provide needed accuracy.

HED	HED DESCRIPTION	CORRECTIVE ACTION
5C021.4.6	<p>USABILITY OF DISPLAYED VALUES (Scale Selection): The power value is shown in percent power to a level of 125 percent for #1120, 1122, 1124, 1126, 1128, 1130, 1132, 1134, 1145, 1147, 1149, 1151, 1153, 1155, 1157, and 1159. What does 125 percent refer to?</p>	<p>Identify the power unit parameter and range of scale.</p>
5C022.4.6	<p>SCALE MARKINGS (Use of Graduations): Scales with more than 9 graduations between numbers: Panel C170: #438, 449. Panel C171: #1339, 1331. Panel 903: #618, 619, 621, 583, 584, 632, 633, 635, 636, 582, 602. Panel 904: #829, 830, 861, 862, 863, 877, 889, 890, 907, 908. Panel 905: #1078, 1079, 1171, 1192, 1193. Panel C2: #133, 145. Panel CP600: #466, 468, 469, 477, 478. Panel C7: #1460.</p>	<p>Revise scale markings to conform with the guideline criteria of 9 graduations or less between numbers.</p>

TABLE 4-4G
HED CORRECTION METHOD: DESIGN IMPROVEMENT PROGRAM (SPDS)

HED	HED DESCRIPTION	CORRECTIVE ACTION
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No HED presently assigned to this program.

HED	HED DESCRIPTION	CORRECTIVE ACTION
5A004.5	<p>SCALE MARKINGS (Multi-scale Indicators); Recorders on these panels (434,439,441,444,448,449,1327,1332,1334, 1337,1339) have only one scale with three different colored pens. Further the metal pens tear the paper. This observation is supported by OER-029.</p>	<p>Provide three separate scales to coincide with the three pens and replace the metal tips with felt pen tips. Establish requirements for PAM recorders. See Attachment A for typical resolution.</p>
5A004.5	<p>DO THE CHART RECORDERS PRODUCE INFORMATION THAT IS EASY TO READ & USE? The GE Recorders are difficult to read and often fail. Recorder failure results in activating false annunciator alarms.</p>	<p>See above. See Attachment A for typical resolution.</p>
5A010.5	<p>COMPLETENESS OF INFORMATION: Monitoring the drywell (DW) temperature for EOP entry conditions and for decision points therein, requires the temperatures above & below the 40 ft. point in the DW. The DW temperature indicators/recorder 582,637 (panel 903) and "Plant Air Temperature Monitor," KAYE Assembly: 1376, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426 (panel C7), with multiple readout points, do not distinguish the temperatures relative to the 40 ft. point.</p>	<p>Provide DW temperature indicators in the primary operating area dedicated to above and below the 40 ft. point. See Attachment A for typical resolution.</p>
8A007.5	<p>LOGICAL ARRANGEMENT AND LAYOUT (Other Expectations): The arrangement of Panel CP600 is not arranged for sequential operations.</p>	<p>Relocate instruments and controls to permit sequential and efficient operation or provide a mimic as an operator aid. See Attachment A for typical resolution.</p>

TABLE 4-5
 HED CORRECTION METHOD: PANEL DEVICES RELOCATION PROGRAM

HED	HED DESCRIPTION	CORRECTIVE ACTION
8A008.5	SEPARATION OF CONTROLS: Panel C7: All controls are too close and too cluttered.	Redesign panel to permit adequate separation of controls. See Attachment A for typical resolution.
1B001.5	ACCESSIBILITY OF INSTRUMENT/EQUIPMENT Instrumentation requiring continuous monitoring by operators during emergency operations: Panel C7: Drywell temperatures, #1358, 1361 Containment purge and vent control, #1412,1413, 1447,1448,1449,1450,1451,1452,1453,1454, 1455,1456, 1472,1473 Torus temperature, #1427,1428	Rearrange C7 to be more useable or relocate the instruments and controls to the front panels. See Attachment A for typical resolution.
1B015.5	ACCESSIBILITY OF INSTRUMENT/EQUIPMENT (Arranged to facilitate coverage): Instrumentation requiring continuous monitoring by operator's during emergency operations located on back panels 915 and 917 are the scram solenoid lights and MSIV isolation lights(2). This observation is supported by OER-001.	Relocate the scram solenoid and MSIV isolation lights to the front of panel 905. See Attachment A for typical resolution.
1B128.5	ACCESSIBILITY OF INSTRUMENTATION/EQUIPMENT (Present in the Control Room): In executing the task "Start N2 Flow to DW for Additional Cooling" (4T:39.00), verification of N2 system pressure can only be done outside the control room.	Review instrumentation need for DW cooling. Note: Additional information indicates that monitoring N2 pressure may not be required. See Attachment A for typical resolution.

HED	HED DESCRIPTION	CORRECTIVE ACTION
4B049.5	<p>PREVENTION OF ACCIDENTAL ACTIVATION (Movable Covers or Guards): Panel C3: Switch #410 should be guarded. Back Panels: Instrument air nitrogen to drywell and FW heater block valves were identified during the OER as controls that should be guarded. This observation is supported by OER-028.</p>	<p>Provide a guard for switch #410. Also determine if guards are needed for switches #414, 417, 420, 421, 398 and the two controls on back panels identified during the OER. See Attachment A for typical resolution.</p>
4B050.5	<p>PREVENTION OF ACCIDENTAL ACTIVATION (Movable Covers or Guards): Protective covers on controls that interfere with adjacent controls: Panel C1: Control #122 interferes with control #107, 119 and 120. Panel C3: Control #425 interferes with control #403. Panel 904: Control #955 interferes with control #960.</p>	<p>Redesign protective covers for noninterference with adjacent controls. See Attachment A for typical resolution.</p>
4B053.5	<p>CODING OF CONTROLS (Location Coding): Mirror imaging of controls. Panel C3: Mirror image controls #348/351; 349/350; 350/372; 357/371; 358/370; 377/380; 378/379; 388/402. Panel C1: Mirror image controls #97/98; 99/100. This observation is supported by OER-045.</p>	<p>Relocate controls or provide operator demarcation enhancement. See Attachment A.</p>
4B057.5	<p>LEGEND PUSHBUTTONS (Barriers): No barriers provided for contiguous pushbuttons. Panel 905.</p>	<p>Install barriers between pushbuttons. See Attachment A for typical resolution.</p>

TABLE 4-5
 HED CORRECTION METHOD: PANEL DEVICES RELOCATION PROGRAM

HED	HED DESCRIPTION	CORRECTIVE ACTION
4B060.5	<p>GENERAL PRINCIPLES (Economy): Controls not used or not connected are: Panel 903: #638, 663, 677, 645, 690, 689 Panel 904: #927, 1023, 997, 1001, 1013, 1017 Panel 905: #1257 Panel C2: #221 Panel CP600: #512</p>	<p>Remove controls no longer in use. Research indicates that #221 is still connected. See Attachment A for typical resolution.</p>
4B115.5	<p>GENERAL PRINCIPLES (ADEQUACY): The pushbuttons #666 and 645 on panel 903 have a "cheater capability" to keep the pushbutton activated</p>	<p>Replace the pushbuttons #666 and 645 with controls that will perform the function with the required level of precision. See Attachment A for typical resolution.</p>
4B126.5	<p>CODING OF CONTROLS (Location Coding): Control 1301 is located on panel 905 with its associated system located on panel C1.</p>	<p>Investigate possibility of labeling error. Relocate control 1301 to panel C1 if labeling correct. See attachment A for typical resolution.</p>
4B132.5	<p>GENERAL PRINCIPLES (Human Suitability): In executing the task "Inhibit Auto ADS" (IT: 31.00), the operator must remember to reset ADS timer A, 653, and B, 698 (panel 903) within every 120 seconds. Failure to reset the timers could alter the plant response such as to erroneously indicate to the operator that additional failures have occurred and unnecessarily aggravate operator tasks.</p>	<p>1. Provide a operator controlled ADS timer "Inhibit" or 2. Provide a distinct audible warning in advance of the 120 second point. Note: Modifications to timer requirements may be in process. See Attachment A for typical resolution.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B061.5	<p>USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion): Instruments on panels requiring conversion are: Panel 903: #603,606,613 require multiplying by 5. Panel C2: #146 subtract value from 30. #147 multiply by 50 Panel CP600: #479 multiply value by 5 This observation is supported by OER-30 and OER-033.</p>	<p>Revise scales for direct reading or for conversion by factors of 10. See Attachment A for typical resolution.</p>
5B066.5	<p>GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Placement of Recorders): Recorders that must be verified and attended should be located in the primary operating area. Panels C7 and 902 both contain recorders. Recorder on panel C2 #165 should be on Panel 903. Board Title: Cntmt Vent,Turbine,Process Rad,Rx Clg.</p>	<p>Determine the need for operator verification and attention of the recorders on Panels C7 and 902. Relocate the needed recorders, if any, to the primary operating area. Relocate HPCI exhaust pressure from panel C2 to 903. See Attachment A for typical resolution.</p>
5B067.5	<p>INFORMATION TO BE DISPLAYED (Completeness of Information): FW heater block (dump) (10) valve position is needed on panel C1 as well as backpanel C4. This observation is supported by OER-034.</p>	<p>Install block valve position indicators on Panel C1. See Attachment A for typical resolution.</p>

TABLE 4-5
 HED CORRECTION METHOD: PANEL DEVICES RELOCATION PROGRAM

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B070.5	DISCRETE RECORDERS (Channel Selection Capability): Recorder #460 does not have the capability of selecting a single channel display.	Provide recorders with a single channel select capability. Investigate capability of slow/fast chart speed. See Attachment A for typical resolution.
5B071.5	INFORMATION TO BE DISPLAYED (Unnecessary Information): Indicator Lights #870 and 871 not needed or used.	Remove light indicators. See Attachment A for typical resolution.
5B110.5	USABILITY OF DISPLAYED VALUES (Scale Range): Recorder #145 uses dual pens and a dual scale for coarse and fine readings. The pointers are not identified or associated with either colored pen and reading accuracy is made difficult by the scale markings.	Each colored pen should be labeled with the parameter being measured and the scales redesigned to furnish the range and precision required for control room operation. See Attachment A for typical resolution.
5B119.5	READABILITY (CHARACTER HEIGHT): The character heights on meter #601 and 610 do not subtend a visual angle of 15 minutes of arc	Replace meters with standard type. See Attachment A for typical resolution.
5B124.5	INFORMATION TO BE DISPLAYED (Unnecessary Information): The amber lights on instruments 720,721,750,751 are disconnected and their function removed.	Remove the disconnected amber lights. See Attachment A for typical resolution.

HED	HED DESCRIPTION	CORRECTIVE ACTION
5B133.5	<p>INFORMATION TO BE DISPLAYED (Completeness of Information): Monitoring SP pressure for EOP entry and decision points therein requires a range of 0-60 psig. SP pressure is available on 862 (panel 904), having a range of -1.0 to +2.0 PSID, or by combining DW/SP Delta-P, 863 (panel 904), with DW pressure, 1329 or 1330 (panel C171).</p>	<p>Provide SP pressure indicators in the primary operating area consistent with EOP requirements. Determine optimum location. See Attachment A for typical resolution.</p>
5B135.5	<p>INFORMATION TO BE DISPLAYED (Completeness of Information): During the OER operators reported that they do not have feedback as to whether the torus or the drywell 0-2 concentration sample points are being monitored. This observation is supported by OER-027.</p>	<p>Provide a status light indication of the parameter being monitored. Add sample selector switch to C7. See Attachment A for typical resolution. Note: New equipment being installed which may resolve this HED.</p>
8B094.5	<p>STRINGS OR CLUSTERS OF SIMILAR COMPONENTS (String Length): Panel 904: 48 pairs of red/green indicator lights produce a display grouping which exceeds length criteria of 20 inches. Panel 905: Control rod matrix lights exceed maximum string length criteria of 20 inches.</p>	<p>Provide demarcation lines to reduce operator search time. See Attachment A for typical resolution.</p>

TABLE 4-5
 HED CORRECTION METHOD: PANEL DEVICES RELOCATION PROGRAM

HED	HED DESCRIPTION	CORRECTIVE ACTION
8B096.5	STRINGS OR CLUSTERS OR SIMILAR COMPONENTS (Number of Components): Components that exceed 5 in a row or column are: Panel 904: Secondary containment lights. panel 905: Control rod drive indicators 1187,1188,1189,1190,1191,1192,1193. Panel C3: Diesel generator indicators for A and b. Canal and Bridgewater line indicators. Panel C7: Controls #1474,1475,1476,1477,1478,1479,1480,1481,1482,1483,1484,1485,1486,1487,1488,1489,1485,1466,1467,1468,1469,1470,1471.	Provide demarcation lines to reduce operator search time. See Attachment A for a typical resolution.
8B097.5	MIRROR IMAGING: Panel C1: Loop A and B for RBCCW and TBCCW are mirror imaged. Panel C3: Diesel generator A and B controls are mirror imaged. Panel C3: UAT & startup transfer controls 359,369 are mirror imaged. Panel 905: #1107/1108 mirror imaged with 1102/1103 and their associated controls. This observation is supported by OER-045.	Relocate controls and displays to reduce probability of error or add demarcation. See Attachment A for a typical resolution.
8B098.5	SEQUENCE FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS (Functional Considerations): Cleanup controls #966, 967, 968, 969, 970, 971 separate controls #976, 977, 978, 979, 980, 981, 983, 984, 985, 986, 987, 988, 989, 990, 991. This observation is supported by OER-022.	Reposition cleanup controls 966 thru 971 to eliminate separation of systems. This HED is the same as HED 8.8.009. Consider 944,962,963,964 for relocation. See Attachment A for a typical resolution.

HED	HED DESCRIPTION	CORRECTIVE ACTION
88101.5	SEQUENCE, FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS (Sequence of Use): Operator must activate controls #768 and 753 on Panel 903 then go to Panel C1 to activate controls #101, 108, or 121, 124.	Relocate controls on panel C1 to Panel 903 or investigate procedure requirements. Note: Additional information indicates that these steps may not be necessary.
88102.5	SEQUENCE, FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS (Functional Considerations): Recorder 1171 on Panel 905 and recorders 814 and 898 on Panel 904 values must be taken along with TR263-104 on panel 921 every 15 minutes during heatup & cooldown. Instrument #814 on Panel 903 used with instruments #861, 862, 863 on Panel 904.	Investigate relocation of the recorder on Panel 921 to Panel 904. Relocate 814 on panel 904 with 861, 862, 863. Consult plant computer project. See Attachment A for typical resolution.
88103.5	LOGICAL ARRANGEMENT AND LAYOUT (Order and Labeling): Panel C2: #218, 219, 227, 228, 232, 233 are not arranged in a logical sequence. Panel 903: Controls #750 and 751 do not follow sequentially.	Reposition the controls into a logical sequence of left to right and top to bottom and reverse control locations on Panel 903. See Attachment A for typical resolution.
88105.5	SEQUENCE, FREQUENCY OF USE, AND FUNCTIONAL CONSIDERATIONS (Sequence): The Primary & Secondary containment isolation status lights are positioned right-to-left and labels numbered from bottom-to-top.	Reposition status lights & re-number labels to be used in a left-to-right and top-to-bottom sequence. See Attachment A for typical resolution.

TABLE 4-5
 HED CORRECTION METHOD: PANEL DEVICES RELOCATION PROGRAM

HED	HED DESCRIPTION	CORRECTIVE ACTION
8B122.5	<p>LAYOUT CONSISTENCY (REPEATED FUNCTIONS): The meters on HPCI and RCIC are not in the same sequence. Meter #585 and 586 on HPSI and 831 and 832 are reversed. The indicator lights for 138,139,140,141,150,151,152,153,154,155, 156,157,158,159,160,161,162,163 and 164 on panel C2 are not in the same layout as #2,3,4,5,6,7,8,9,10,11,12 and 13 on panel C1.</p>	<p>Relocate the meters so that the meter line up for RCIC is #829,832,831 and 830 with the line up for HPCI to be #584,585,586 and 583. Orient the indicator lights on panels C2 and C1 to be consistent See Attachment A for typical resolution.</p>
8B129.5	<p>SEQUENCE, FREQUENCY OF USE, AND FUNCTIONAL CONSIDERATIONS (Functional Considerations): On the suction line from the recirc loop for shutdown cooling using RHR, the inboard isolation valve control (703) is grouped with RHR loop A and the outboard valve (715) with loop B. These valves are not loop-dependent and are ~ 8 ft apart.</p>	<p>Investigate relocation to conform to guideline. Controls may be separated to prevent misoperation. See Attachment A for typical resolution.</p>
9B107.5	<p>SINGLE CONTROL AND DISPLAY PAIRS (Association): Control #1185 for recorders 1171 and 1172 and control 1196 for controllers #1299 and 1300 are not located so that association is apparent.</p>	<p>Relocate controls below the devices they are associated with. See Attachment A for typical resolution.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
90109.5	<p>SINGLE CONTROL AND DISPLAY PAIRS (Proximity): Indicator #168 and control #191 are not in close proximity to each other. Indicators #166 and 167 are distant from controls #229, 230, 231. Indicators #169, 170 are distant from controls #204, 205.</p>	<p>Relocate controls to meet guideline. See Attachment A for typical resolution.</p>
10003.5	<p>STAND-UP CONSOLE DIMENSIONS (Control Height): Controls that exceed 63 in. on the benchboard panels are: Panel 903: vibration meter subpanel #587,591,592,594,599. Controls that are located below 34 in. in height are: Panel 903: HPCI inverter (toggle switch) Panel 904: RCIC inverter (toggle switch)</p>	<p>Remove the vibration meter subpanel. Inverter controls are for maintenance only and will not be changed. See Attachment A for typical resolution.</p>
50018.5	<p>GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Use): Recorder #146 provides confusing values. This HED is supported by DER-030.</p>	<p>Replace recorder #146 with a vacuum pressure gauge. See Attachment A for typical resolution.</p>
50019.5	<p>GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Visibility): The channel being recorded cannot be determined without opening the door and advancing the paper on: Panel 904: #1025 Panel C1: #14 and 15</p>	<p>Replace recorders with those that provide easy identification of channel being monitored. See Attachment A for typical resolution.</p>

HED	HED DESCRIPTION	CORRECTIVE ACTION
0B113.7	HOW DO YOU MAINTAIN YOUR TECHNICAL PROFICIENCY? Lack of STA simulator training for retaining and updating technical proficiency.	When Boston Edison's simulator is operational, STA training will be initiated.
1C001.7	DOCUMENT ORGANIZATION AND STORAGE: Location aids to access appropriate procedures do not conform to guideline criteria to identify, distinguish and access documents. In addition, the documents are not protected against wear.	Provide improved procedure document identification, storage and protection against wear.
1C002.7	SPARE PARTS, OPERATING EXPENDABLES AND TOOLS: Spare parts are not readily accessible. The storage space is limited and there is no inventory accounting to ensure that an adequate supply of spares and expendables is readily available.	Storage space for spare parts is deemed adequate however an inventory accounting system will be instituted.
6C023.7	VISIBILITY (Cleaning): The number of labels obscured by dirt or foreign matter would indicate that no procedure for cleaning exists.	Establish a label cleaning procedure.

Doc. No. BECO/ESR-1
SEPTEMBER 1984
REV. 1
Appendices

Detailed Control Room Design Review

Executive Summary Report

Pilgrim Station



Doc. No. BECO/ESR-1
SEPTEMBER 1984
REV. 1
Appendices

Detailed Control Room Design Review

Executive Summary Report

Pilgrim Station



APPENDIX A

CATEGORY A HEDs

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W.Babin 4/13/84
R. Saboh 4-15-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.4 CL ITEM: 8.4.4.5b
 CL TITLE: Controls
 BOARD TITLE: Rx Cont

R. Saboh
EVALUATOR

HED#: 4A003
 HED#: 8.4.014
 DATE: 1-24-84 REV:
 HED CATEGORY: A
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- ROTARY SELECTOR CONTROLS (Positioning):
 No positive detent feedback for reactor mode switch on Panel 905 (#1284).

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of error in accurately controlling switch position.

RECOMMENDED REVISION

Replace switch with a positive detent switch.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

~~[] Des. Impr. Study~~
 [x] Panel Improvement Study (905)

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the design improvement study with 40048. Investigate different techniques to perform this function.

MANAGEMENT REVIEW

CHAIRMAN W.Babin DATE 5/20/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Suggest G.E. be solicited to see if they have a hardware solution to this problem.

Mgt. team agrees with technical review comment, except this should be studied with all other panel 905 HED's.

W. B. ...
 w/Beacock 9/16/84
 c/Drummond 9/16/84
 R. Sabeh 4-14-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

CHAIRMAN DOB ARNOLD DATE 4/16/84
 TECHNICAL REVIEW

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.1.5f DATE: 1-24-84 REV:
 CL TITLE: Visual Displays HED CATEGORY: A
 BOARD TITLE: PAM-A, PAM-B BOARD#: C178, C171

HED DESCRIPTION
 GUIDELINE- SCALE MARKINGS (Multi-scale Indicators):
 Recorders on these panels have only one scale with three different colored pens.
 Further the metal pens tear the paper.
 This observation is supported by DER-029.

(434, 439, 441, 444, 448,
 449, 1327, 1332, 1334,
 1337, 1337)

SUPPORT MATERIAL ATTACHED
 POTENTIAL OPERATOR ERROR(S)
 Increases the probability of misreading the parameter being recorded or trended.

RECOMMENDED DIVISION
 Provide three separate scales to coincide with the three pens and replace the metal tips with felt pen tips.

RECOMMENDED IMPLEMENTATION
 PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ES Des. improvement study.

OBSERVATION

EVALUATOR
R. Sabeh

HED#: 5A004 (sh.1)

HED#: 6.5.010

TECHNICAL REVIEW

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend a PAM panel study to determine label/scale/operational recorder hardware requirements. Certain equipment on this panel is being replaced. Tech spec requirements for this panel are in process of being issued. See also HEO # DER-001. WBT

MANAGEMENT REVIEW

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:
Concur with Tech. Review but with added comment:

As part of this PAM panel study, or the panel improvement study, a general assessment of recorders as to usability, maintenance, readability is to be made. Study should investigate state-of-art recorder hardware available. Both operations and plant I&C to have input/approval

HEO # DER-001

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WJ Babink 4/16/84
 of Bremner 4/16/84
 R Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.6 CL ITEM: 6.6.1.2b
 CL TITLE: Visual Displays
 BOARD TITLE: PAM, Rx CLG

R. Sabeh
 EVALUATOR

HEID#: SA-009 (sh.1)
 HEO#: 6.6.020
 DATE: 1-24-84 REV:
 HED CATEGORY: B A
 BOARD#: C170, 983

HEO DESCRIPTION

GUIDELINE- USABILITY OF DISPLAY VALUES (Elimination of Operator Conversion):
 Recorders #439 and #815 display the same parameter but use different scales
 requiring conversion to compare. 4/14/84
 This observation is supported by DER-848.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading and comparing
 scale values.

RECOMMENDED REVISION

Revise scale to same scales.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
 Concur With Comment/Note.
 ~~Reevaluate & Resubmit~~ for Following Reason:

Comment/Note/Reason: Recorder (Tor42 level) on 903 #613
 is compared against C7 #1429. Recorder
 on C170 & C171 (#439 and 1332) are compared
 against each other. Recorders on C-170 & 171 should
 not be checked against Recorders on C903 and C7

MANAGEMENT REVIEW

CHAIRMAN WJ Babink DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Upgrade to category "A". Panel improve-
 ment (meter scale) study to investig-
 ate which scales are best for all 4
 devices.

Combine with HEID # SA009
 (HEO# 6.5.042)

No action requested

Panel improvement study (meter scales)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*Ref Approved 2/16/84
 WTBubank 4/16/84
 J. Freeman 4/16/84
 R. Sabich 4-16-84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabich | HED#: 5A005
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.023
 CL: 8.5 | CL ITEM: 8.5.1.6d | DATE: 2-8-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: A
 BOARD TITLE: See Below | BOARD#: See Below

HED DESCRIPTION

GUIDELINE- SCALE MARKINGS (Compatibility).
 The core water level display indicators on panels 903, 904, 905, 170 and 171 all differ.
 Panel 903: #620, 634
 Panel 904: #882
 Panel 905: #1173, 1174, 1183, 1188
 Panel 170: #439
 Panel 171: #1332

Board Title: Rx CLG, Rx Clnup, Rx Cont, PAM-A, PAM-B

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in determining core water level.

RECOMMENDED REVISION

Change scales to the same scale range and values necessary to determine water level on all indicators.

RECOMMENDED IMPLEMENTATION

M PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

CB Des chg (in progress)

TECHNICAL REVIEW

CHAIRMAN ROB ARNOLD DATE 4/16/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Scalcs have different scales to address different operating conditions. A project is underway to give a common reference zero to all scales while maintaining individual functional span requirements.

Meters/recorders

MANAGEMENT REVIEW

CHAIRMAN WTBubank DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

-----OBSERVATION----- (DRAFT FORMAT) -----

PLANT: Legrim NPS
EVALUATOR: E. Gagnon/R. Sabeh
HED#:

TASK: Verif./Valid.
HEO: 6.5.042

CL: 6.5
CL-ITEMS: 6.5.1.2a
DATE: 6.1.84
REV:

CL TITLE: Visual Displays
HEO CATEGORY:

BOARD TITLE: Rx CLG, Cntmt Vent & PAM
BOARD#: 903, C7, C170, C171

Torus water

HEO DESCRIPTION VALUES

- GUIDELINE- (MA) USABILITY OF DISPLAYED (SCALE SELECTION):
- (MB) ~~SP~~ level wide range devices (438, 439, 1331, 1332)
- (MC) and narrow range devices (615, 1429) have instrument
- (NA) zeros 133 inches apart and both are used for EOP entry
- (NB) conditions and decision point therein. This requires
- (NC) operators to work with 2 substantially different sets of SP
- (OA) level during emergency events.
- (OB)
- (OC)
- (PA)
- (PE)

POTENTIAL OPERATOR ERROR(S)

- (QA) Increase the time and probability of error in reading
- (QB) the SP level during emergency events which could result in
- (QC) critical safety functions not being maintained.
- (RA)
- (RB)

RECOMMENDED REVISION

- (SA)
- (SB) 1. Establish a common instrument zero for both wide and narrow
- (SC) range (but not such as to be confused with RPV level) or,
- (TA) 2. Restrict EOPs to wide range levels (if possible).
- (TB)
- (TC)
- (JA)
- (UB)

WK 6/15/84
 W.B. Subert 6/15/84
 S. L. VNA 6/15/84
 C. Brennan 6/15/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

EVALUATOR: _____
 TOPIC: _____
 HEAD: SA-009 (sh.2)
 HEAD: 6.5.042
 DATE: 6/1/84
 REV: _____
 CL: _____
 CL IYDH: _____
 CL TITLE: _____
 CONTROL BOARD LOCATION: _____
 HEO CATEGORY: A

HEO DESCRIPTION

GUIDELINE

Concur with recommended revision.
 The AIT also recommends that the
 common instrument zero system
 should be included in the
 HF design assessment for
 panels C170/171.

AIT REVIEW

Concur.

Concur With Comment/Note.

Do Not Concur For Following Reasons:

CHAIRMAN S. L. VNA DATE 6/15/84

RECOMMENDER IMPLEMENTATION

- PRIOR TO OR AT NEXT REFUELING
- AT CONVENIENT OUTAGE
- AT EARLIEST OPPORTUNITY
- NON-MANDATORY

MANAGEMENT REVIEW

Concur.

Concur With Comment/Note.

Do Not Concur For Following Reason:

CHAIRMAN W.B. Subert DATE 6/7/84

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

SUGGESTED CORRECTIVE ACTION

[X] DESIGN IMPROVEMENT STUDY (C170/171)

Figure 6-1. Human Engineering Observation Assessment.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W Babcock 4/12/84
R Sabeh 7-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.1.3a,b
 CL TITLE: Panel Layout
 BOARD TITLE: AOG, CWTHT VENT, PAN ch. A & B

R. Sabeh
EVALUATOR

HEO#: 8A00C
 HEO#: 6.8.008
 DATE: 2-7-04 REV:
 HEO CATEGORY: A
 BOARD#: CP800, C7, C170, C171

HEO DESCRIPTION

GUIDELINE- ENHANCEMENT RECOGNITION AND IDENTIFICATION
 The CP800 panel lacks operator enhancement aids.
 This observation is supported by OER-043.
 Add panels C170, C171 and C7

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Difficulty in performing panel operations, increases the response time and probability of error for control selection and activation.

RECOMMENDED REVISION

Investigate the use of mimics, demarcation or other enhancement aids for instrument and control functional separation.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/29/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend a design improvement study with the objective of determining what enhancements are necessary or desirable, what equipment is unused, inoperative, or incorrect, and, for C7, what controls/instru. should be moved to the main control boards.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

-----OBSERVATION----- (DRAFT FORMAT) -----

PLANT EVALUATOR HED
Pilgrim NPS E.Gagnon/R.Sabeh

TASK: HEO
Verif./Valid. 6.5.044

CL: CL-ITEMS DATE: REV:
6.5 6.5.1.1.b 6/4/84

CL TITLE: HEO CATEGORY:
Visual Displays

BOARD TITLE: BOARD#:
Rx CLG and CNTMT VENT & ISO 903,C7

HEO DESCRIPTION

GUIDELINE- (MA) COMPLETENESS OF INFORMATION:

- (MB) Monitoring the drywell (DW) temperature for EOP entry conditions and for
- (MC) decision points therein, requires the temperatures above & below the 40 ft.
- (NA) point in the DW. The DW temperature indicators 582 ^{recor 418} 537 (panel 903) and
- (NB) "Plant air Temperature Monitor," KAYE Assembly: 1376, 1418, 1419, 1420, 1421,
- (NC) 1422, 1423, 1424, 1425, 1426 (panel C7), with multiple readout points, do not
- (CA) distinguish the temperatures relative to the 40 ft. point.
- (OB) *λ*
- (OC)
- (PA)
- (PB)

POTENTIAL OPERATOR ERROR(S)

- (QA) Increase the time and probability of error in determining the DW temperature
- (QB) during emergency events leading to critical safety functions not being
- (QC) maintained.
- (RA)
- (RB)

RECOMMENDED REVISION

- (SA) Provide DW temperature indicators in the primary operating area dedicated
- (SB) to above and below the 40 ft. point.
- (SC)
- (TA)
- (TB)
- (TC)
- (UA)
- (UB)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. J. ... 6/5/84
S. F. Luna 6/5/84
DATE 6/5/84

OBSERVATION

EVALUATOR: [] TOPIC: []

HEAD: 5A 010

HEOR: 6.5.044

DATE: 6/1/84 REV: []

HEO CATEGORY: A

TASK: []

CL: [] CL ITEM: []

CL TITLE: []

CONTROL BOARD LOCATION: []

HEO DESCRIPTION

GUIDELINE: []

The AET recommends the use of one meter and selector switch for multiple signal input for a door hot ft and a meter on a switch for blow Hoff. This recommendation to be included in the panel improvement (See attached sketch)

RECOMMENDED IMPLEMENTATION

- [] PRIOR TO OR AT NEXT REFUELING
[] AT CONVENIENT OUTAGE
[X] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

POTENTIAL OPERATOR ERROR(S)

[X] SUPPORT MATERIAL ATTACHED

MANAGEMENT REVIEW

- [X] Concur.
[] Concur With Comment/Note.
[] Do Not Concur for Following Reason:

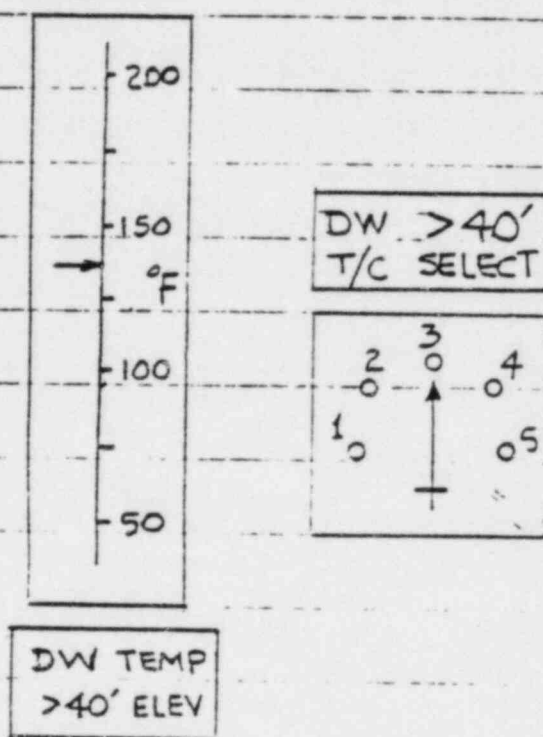
CHAIRMAN W. Baber, K. DATE 6/7/84

SUGGESTED CORRECTIVE ACTION

[X] PANEL IMPROVEMENT STUDY. (703, C7)

Figure 6-1. Human Engineering Observation Assessment.

Typical DW Temperature indicator with multiple inputs



Sketch for HED # SA010
HEO # 6.5.044

Pilgrim NPS

6/11/84

WZ

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W Sabeh 4/17/84
of Brennan 4/17/84
R Sabeh 4-17-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8
 CL TITLE: Panel Layout
 BOARD TITLE: AOG

R. Sabeh
 EVALUATOR

HEO#: 8A007
 HEO#: 6.8.013
 DATE: 2-8-84
 HEO CATEGORY: A
 BOARD#: CP600

HEO DESCRIPTION

GUIDELINE- LOGICAL ARRANGEMENT AND LAYOUT (Other Expectations):
 The arrangement of Panel CP600 is not arranged for sequential operations.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time, confusion and probability of error in operation of Panel CP600.

RECOMMENDED REVISION

Relocate instruments and controls to permit sequential and efficient operation or provide a mimic as an operator aid.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Des. Impr. Study.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: See 8A006. Include in that design improvement study.

MANAGEMENT REVIEW

CHAIRMAN W Sabeh DATE 5/23/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 W. Beckwith 4/17/84
 R. Sabeh 4/17/84
 Resubm 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.3.1
 CL TITLE: Panel Layout
 BOARD TITLE: Cntmt Vent

R. Sabeh
 EVALUATOR

HED#: 8A008
 HEO#: 8.8.014
 DATE: 2-8-84 REV:
 HED CATEGORY: A
 BOARD#: C7

HED DESCRIPTION

GUIDELINE- SEPARATION OF CONTROLS:
 All controls are too close and too cluttered.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in activating controls.

RECOMMENDED REVISION

Redesign panel to permit adequate separation of controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: See 8A006. Include in that design improvement study

MANAGEMENT REVIEW

CHAIRMAN W. Beckwith DATE 5/22/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W. Balink 5/18/84
of Bremen 4/18/84
R. Sabeh 4-18-84*

OBSERVATION

PLANT: Pilgrim NPS
TASK: DER
CL: Questionnaire CL ITEM: E8
CL TITLE: Visual Displays
BOARD TITLE: NA

R. Sabeh
EVALUATOR

HED#: SA004(sh.2)
HED#: DER-091
DATE: 1-4-84 REV:
HED CATEGORY: A
GRADE: NA

HED DESCRIPTION

GUIDELINE- DO THE CHART RECORDERS PRODUCE INFORMATION THAT IS EASY TO READ & USE?
The GE Recorders are difficult to read and often fail.
Recorder failure results in activating false annunciator alarms.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Operator reading accuracy and speed are degraded.
False alarms degrade operator responsiveness to actual alarms.

RECOMMENDED REVISION

Procure reliable and readable recorders

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] No action required

[X] Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
 Concur With Comment/Note.
 Do not agree
~~Reevaluate & Resubmit~~ for Following Reason:

Comment/Note/Reason: Believe this refers to GE type HG recorders, which have been replaced

MANAGEMENT REVIEW

CHAIRMAN W. Balink DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Upgrade to category "A" & combine with HED # SA004. (HED # 6.5.016), which covers recorder studies.

APPENDIX B

CATEGORY B HEDs

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.1 CL ITEM: 8.1.1.1b
 CL TITLE: Control Room Workspace
 BOARD TITLE: Contmt Vent.

R. Sabah
 EVALUATOR

HED#: 1B001
 HED#: 6.1.001
 DATE: 2-18-84 REV:
 HED CATEGORY: B
 BOARD#: C7, 915 & 917

HED DESCRIPTION

GUIDELINE- ACCESSIBILITY OF INSTRUMENT/EQUIPMENT
 Instrumentation requiring continuous monitoring by operators during emergency operations: Panel C7: Drywell temperatures, #1358, 1361 Containment purge and vent control, #1412, 1413, 1447, 1448, 1449, 1450, 1451, #452, 1453, 1454, 1455, 1456, 1472, 1473 Torus temperature, #1427, 1428
 Panels 915, 917: Scram solenoid lights - Now on HEO 6.1.29
 Overhead monitor - cannot be conveniently viewed by the panel 905 operator. This observation is supported by OER-001 and OER-002 - Now on HEO 6.1.30

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Excessive operator movement results in a delay to respond to an emergency.

SUGGESTED OWM 6-21-4

RECOMMENDED REVISION

Relocate the instruments and controls to the front panels.
 Adjust overhead monitor for convenient operator viewing.
 Relocate Scram solenoid lights to 905

RECOMMENDED IMPLEMENTATION

- [] PRIOR TO OR AT NEXT REFUELING
- [] AT CONVENIENT OUTAGE
- [] AT EARLIEST OPPORTUNITY
- [] NON-MANDATORY

[x] Des. Impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- [] Concur.
- [x] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Revise to say overhead TV monitor, change "continuously" to "frequently" split into 3 HEOs. Recommending a study to determine what devices should be on front panels. See HEO # 6.1.029 and 6.1.030 for "scram solenoid lights" and "overhead TV monitor".

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/18/84

- [x] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Bal 4/10/84
Bob Arnold 4/11/84
W. Bal 4/10/84
Bob Arnold

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.1.3e(2)
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. SAREH
 EVALUATOR
R. Sareh

HED#: 18002
 HED#: 6.1.002
 DATE: 2-10-84 REV:
 HED CATEGORY: B
 BOARD#: NA NEAR 905

HED DESCRIPTION

GUIDELINE- FURNITURE AND EQUIPMENT LAYOUT:
 There is a limited amount of work space for the operator.
 The space available is used to hold two printers and a
 computer terminal.
 This observation is supported by OER-001.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in operator performing control room functions and increases the probability of error.

RECOMMENDED REVISION

Provide an adequate operator work station.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY CONSISTENT WITH NEW PLANT COMPUTER SCHEDULE
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend a study to consider interaction of operator work station and ^{new} plant computer equipment location.

MANAGEMENT REVIEW

CHAIRMAN W. Bal DATE 5/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

CORRECTIVE ACTION: ENHANCEMENT DESIGN CHANGE DESIGN IMPROVEMENT STUDY PROCEDURE CHANGE

4/10/84

R. Sabeh 4-10-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.1.6a&b
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 1B003
 HED#: 6.1.007
 DATE: 1/28/84 REV:
 HEO CATEGORY: B
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- SUPERVISOR ACCESS:
 Shift Supervisors' Office (Watch Engineer) does not permit prompt physical access to the control room. In addition, there is no dedicated communications link between these two spaces.
 This HEO is supported by observations OER-005 AND OER-010.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in performing direct supervisory functions.

RECOMMENDED REVISION

Relocate the shift supervisors' office within the control room or provide a dedicated communication link (Intercom). The dedicated Intercom recommendation is covered under HEO 6.2.007.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Change "shift supervisors office" to "watch engineer's office" SSC office will not be relocated. Communications link will be installed per 6.2.007. Do at earliest opportunity.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 6/10/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Mgt. Team recommends commo. link to be designed as part of Communications study per HED # 2B016.

~~[] DESIGN CHANGE~~

[x] DESIGN IMPROVEMENT STUDY

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1301-2200 4/10/84
 WTBarnett 2/10/84
 R. Sabeh 4-10-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.2e(1)(a)
 CL TITLE: Control Room Workspace
 BOARD TITLE: All benchboards

R. Sabeh
 EVALUATOR

HED#: 1300 165 nst
 HEO#: 6.1.011
 DATE: 2-3-84 REV:
 HEO CATEGORY: B
 BOARD#: 903,04,06,C1,2,3

HEO DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS (Display Height and Orientation):
 Displays that exceed 60 in. in height include all the annunciator panels, containment isolation mimic and the upper portion of the rod indicator lights. These are:
 Panel 903: 538,539,540 and upper portion of the containment isolation mimic.
 Panel 904: 780,781,782
 Panel 905: 1033,1034 and upper portion of the rod indicator lights.
 Panel C2: 128,149
 Panel C1: 1,38
 Panel C3: 234,235,236,237,238,239,240,241,242,243,244,245,246,247,248
 SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Difficult to see by the 5th percentile female operator and will increase the probability of reading errors.

RECOMMENDED REVISION

Tilt the upper portion of the vertical panels forward at least 15 degrees.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY CONSISTENT WITH ANNUNCIATOR STUDY
 NON-MANDATORY

DES. IMP. STUDY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Panel change would require a seismic recalculation. As part of the annunciator study, investigate the use of window boxes which have the individual windows tilted within the box.

MANAGEMENT REVIEW

CHAIRMAN WT Barnett DATE 5/18/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: As part of Annunciator Study, this problem should be considered for correction. Given the panel dimensions, it may not be possible to correct.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 1B008
 TASK: Control Room Survey | EVALUATOR | HED#: 6.1.016
 CL: 6.1 | CL ITEM: 6.1.2.6 | DATE: 1-23-84 | REV:
 CL TITLE: Control Room Workspace | HEO CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HEO DESCRIPTION

GUIDELINE- USE OF PROCEDURES AND OTHER REFERENCE MATERIALS AT CONSOLES:
 No provision for use of procedures and other reference material at the consoles
 (benchboards).

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time for accomplishing procedures and the potential for accidental activation of benchboard controls.

RECOMMENDED REVISION

Procure rolling bookcases for procedure storage and laydown.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN *Bob Arnold* DATE *4/11/84*

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN *WT Sabeh* DATE *5/18/84*

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1001 W... 1/11/84
u... 4/11
R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.1 CL ITEM: 6.1.2.7a,b,c
CL TITLE: Control Room Workspace
BOARD TITLE: NA
R. Sabeh EVALUATOR
HED#: 1B009
HED#: 6.1.016
DATE: 1-23-84 REV:
HED CATEGORY: B
BOARD#: NA

HED DESCRIPTION

GUIDELINE- DESK DIMENSIONS:
There is inadequate work station (space) to perform administrative tasks.
This observation is supported by OER-001.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in performing administrative functions.

RECOMMENDED REVISION

Provide operator with an adequate work station.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY CONSISTENT WITH NEW PLANT COMPUTER SCHED.
NON-MANDATORY

EA DES. IMP. STUDY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Combine implementation with 1B002. Study will integrate work station needs with new plant computer needs.

MANAGEMENT REVIEW

CHAIRMAN WT Balenke DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WT Babcock 4/11/84
R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.1 CL ITEM: 8.1.5.2a
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. Sabeh
EVALUATOR

HED#: 1B011
 HED#: 8.1.019
 DATE: 1-23-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VENTILATION (Air Quantity):
 Fresh air introduced into the control room is not adequate.
 This observation is supported by OER-008.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The lack of sufficient fresh air reduces operator performance and alertness.

RECOMMENDED REVISION

Require maintenance to survey the performance of the air conditioning system to insure introducing at least 15 cubic ft per minute, per occupant of outside air without adding drafts.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[x] Design Imp. Study~~
 [x] Other (maintenance request)

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend maintenance/
engineering conduct study to verify system
meets design req'ts. for air flow,
humidity control, temperature, pressuriz-
ation, etc.

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Nuclear Operations to issue a maintenance
request to re-calibrate and/or re-balance
HVAC system, to include air flow
req'ts., humidity req'ts., temp. req'ts.,
etc. If system cannot be restored
to proper operation, then a study
should be initiated via ESR to
NED.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1200 armed 7/11/84
 W Babink 11/11/84

R Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 1B012
 TASK: Control Room Survey | EVALUATOR | HED#: 6.1.020
 CL: 6.1 | CL ITEM: 6.1.5.3a,b | DATE: 1-23-84 | REV:
 CL TITLE: Control Room Workspace | HED CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- ILLUMINATION (Levels and Uniformity):
 The variability and control of lighting levels do not conform to the guideline
 criteria.
 See lighting survey - luminance record.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The variable light levels interferes with operator performance

RECOMMENDED REVISION

The light levels within the control room should be adjusted to conform with
 the guideline criteria.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] DESIGN IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN Bob Arabio DATE 4/11/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend lighting improve-
ment study be conducted by engineering,
to improve lighting.

MANAGEMENT REVIEW

CHAIRMAN WT Babink DATE 5/18/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include emergency lighting in
assessment.

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.5.3f,g
 CL TITLE: Control Room Workspace
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 1B013
 HED#: 6.1.022
 DATE: 1-23-84 REV:
 HED CATEGORY: B
 BOARD#: All

HED DESCRIPTION

GUIDELINE- ILLUMINATION (Glare and Reflectance):
 Glare and reflectance on instrument faces is produced by the overhead light placement.
 This observation is supported by OER-003.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time to read displays and the probability of display reading errors.

RECOMMENDED REVISION

Overhead light covers should be replaced with "egg crate" type light covers or covers that control the unwanted dispersion of light. In addition provide controls to permit light level intensity adjustment for lights above the workstations.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] DES. IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend lighting design improvement study to be combined with 1B012

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

321 k 1/84
 B. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.5.5b,c,d
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HEO#: 1B014
 HEO#: 6.1.023
 DATE: 1-23-84 REV:
 HEO CATEGORY: B
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- AUDITORY ENVIRONMENT (Limit and Noise Distractions):
 The continuous background noise created by the pager system and printers is annoying and produces distractions to the operators. See sound survey record. This observation is supported by OER-007.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The continuous noise degrades operator performance and interferes with operator intercommunications.

RECOMMENDED REVISION

Install sound suppression floor covering in the operator area of the control room (e.g. carpeting).

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY CONSISTENT WITH NEW PLANT COMPUTER
 [] NON-MANDATORY

[x] ENHANCEMENT

TECHNICAL REVIEW

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Requires integration with new plant computer.

CHAIRMAN BOB ARNOLD DATE 4/11/84

MANAGEMENT REVIEW

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: ① Page system "noise" being studied in Communications Study as a separate issue. See HEO # 2B016.

② Plant computer project shall consider noise produced by printers and shall reduce noise to lowest realistic value.

CHAIRMAN W. Belenok DATE 5/10/84

W. Sabeh 4/11/84
R. Sabeh 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim
TASK: Control Room Survey
CL: 0.1 CL ITEM: 0.1.1.1b
CL TITLE: Control Room Workspace
BOARD TITLE: Reactor Control
R. Sabeh EVALUATOR
HED#: 1B015
HED#: 0.1.029
DATE: 4/10/84 REV:
HED CATEGORY: B
BOARD#: 005

HED DESCRIPTION

GUIDELINE - ~~OUTLINE~~ - ACCESSIBILITY OF INSTRUMENT/EQUIPMENT (ARRANGED TO FACILITATE COVERAGE):
Instrumentation requiring continuous monitoring by operator's during emergency operations located on back panels 915 and 917 are the Scram Solenoid lights and MSIV isolation lites (2).
This observation is supported by OER-001.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Excessive operator movement results in a delay to respond to an emergency.

RECOMMENDED REVISION

Relocate the Scram Solenoid lights and MSIV isolation lites to the front of panel 005.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Ex Design chg.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:
New lights shall be added in parallel with old lights. Old lights shall be retained.

-----OBSERVATION----- (DRAFT FORMAT) -----

PLANT	EVALUATOR	HED#:	
Pilgrim NFS	E. Gagnon/R. Sabeh		
TASK:	HEO		
Verif/Valid.	6.1.031		
CL:	CL-ITEMS	DATE:	REV:
6.1	6.1.1.1a	6/1/84	
CL TITLE:	HEO CATEGORY:		
Control Room Workspace			
BOARD TITLE:	BOARD#:		
N/A	N/A NCR		

HEO DESCRIPTION

- GUIDELINE- (MA) ACCESSIBILITY OF INSTRUMENTATION/EQUIPMENT
- (MB) (PRESENT IN THE CONTROL ROOM)
- (MC) In executing the task "start N2 flow to DW for
- (NA) additional cooling" (4T:39.00), verification of
- (NB) N2 system pressure can only be done outside
- (NC) the control room.
- (OA)
- (OB)
- (OC)
- (PA)
- (PB)

POTENTIAL OPERATOR ERROR(S)

- (QA) Delay in determining N2 system status leading to
- (QB) uncertainty that ~~maximizes~~ *the* DW cooling is occurring.
- (QC)
- (RA)
- (RB)

RECOMMENDED REVISION

- (SA) Provide N2 system pressure indication in
- (SB) the control room.
- (SC)
- (TA)
- (TB)
- (TC)
- (UA)
- (UB)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Beuk 6/5/84
 4/5/84
 6/5/84

OBSERVATION

EVALUATOR	TOPIC	HED#1: 1B12A
		HED#2: 61.031
TASK:		DATE: 6/1/84 REV:
CL:	CL ITEM:	HED CATEGORY:
CL TITLE:		
CONTROL BOARD LOCATION		

HED DESCRIPTION

OUTLINE-

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

SUGGESTED CORRECTIVE ACTION

2nd Mgt Team meeting 9/10/84: Additional information indicates that monitoring N₂ pressure may not be required. Investigate EOP requirements & background as to why this step is required. Do not reduce to cat. D. WTB.

DESIGN IMPROVEMENT STUDY

AIT REVIEW

CHAIRMAN S. Luna DATE 6/5/84

Concur.

Concur With Comment/Note.

Do Not Concur for Following Reasons:

necessarily

The AIT does not concur because:

1. Pressure gage will not indicate the flow of N₂
2. The intended result reading DW is easily observed on panel C7.

The AIT recommends further review with

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REQUIRING

AT CONVENIENT OUTAGE

AT EARLIEST OPPORTUNITY

NON-MANDATORY

MANAGEMENT REVIEW

CHAIRMAN W. Beuk DATE 6/7/84

Concur.

Concur With Comment/Note.

Do Not Concur for Following Reason:

Des. improvement study to be coordinated with EOP used in SARA effort. There might be an EOP revision necessary because of this HED or its solution.

The panel design improvement assessment effort.

Figure 6-1. Human Engineering Observation Assessment.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/11/84
 W. Babcock 5/11/84
 R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.2 CL ITEM: 6.2.1.2b(7)
 CL TITLE: Communications
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 2B016
 HEO#: 6.2.001
 DATE: 1-26-84 REV:
 HEO CATEGORY: B
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- CONVENTIONAL POWERED TELEPHONE SYSTEM (Handsets):
 The phones at the shift supervisor's workstation are not identified or coded by circuit or function.
 It should be noted that the communications equipment at this workstation is "jury rigged" and not functionally arranged. Some phones are inoperative and others broken or not connected to a live circuit.
 This observation is supported by OER-006.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay and error in responding to incoming calls and delay in completing outgoing calls.

RECOMMENDED REVISION

Develop and install a set of integrated communications equipment based on the requirements of the control room operations. This HEO should consider design of the shift supervisor's overall work station requirements. See HEO 6.2.002.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY CONSISTENT WITH COMPUTER PROJECT
 NON-MANDATORY

DES IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Reassess study to develop functional communication requirements. Study will determine work station ergonomics design. This may require coordination with computer projects.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.2 CL ITEM: 6.2.1.0a(2)
 CL TITLE: Communications
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 28017
 HED#: 6.2.003
 DATE: 1-26-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- ANNOUNCING SYSTEM (Intelligibility and Coverage):
 Loud speaker voice messages cannot be heard in some rotating machinery areas, e.g., diesel generator space. Speaking from noisy areas masks the voice message. This observation is supported by OER-011.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Voice messages may be missed, not understood or not transmitted intelligibly.

RECOMMENDED REVISION

Provide a backup communication link for the noisy areas and/or install and install noise reducing booths.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Admin Enhancement

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/04

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Request Operations dept. to determine areas of concern by survey. After survey completion, design changes will be implemented if required.

MANAGEMENT REVIEW

CHAIRMAN WT Babink DATE 5/18/04

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

1207 Umarat 4/11/84
WTB with 4/11/84
R. Sabeh 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.2 CL ITEM: 6.2.1.6a(2)
CL TITLE: Communications
BOARD TITLE: NA
HEO: 2 B O 1 R
HEO#: 6.2.006
DATE: 1-26-84
REV: 1
HEO CATEGORY: B
BOARD#: NA

HEO DESCRIPTION

GUIDELINE- ANNOUNCING SYSTEMS (Loudspeaker Volume):
Speaker gain control can reduce volume below audible level.
This observation is supported by DER-007.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Reduces ability to receive voice traffic on all channels.

RECOMMENDED REVISION

A selective gain control should be installed at the shift supervisor's workstation. This observation supports IEO 6.2.004.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONVENIENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

CES Design Impr. Study
Study

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

CHAIRMAN BOO ARABLO DATE 4/11/84

Comment/Note/Reason: Recommend study to develop communications functional requirements, in conjunction with 2 B O 1 R

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

CHAIRMAN WTB DATE 5/18/84

Comment/Note/Reason:

Minimum volume stop should be added to gain control. This should be set to ensure volume can't be reduced to inaudible level.

WISCONSIN 7/11/84
Sabeh 7-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

TECHNICAL REVIEW
CHAIRMAN BOB ARELLO DATE 4/1/84
 Concur.
 Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Suggested revision is not technically feasible with present system. Recommend combining with communication study described in ZD016.

MANAGEMENT REVIEW
CHAIRMAN W Babcock DATE 5/10/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason:

OBSERVATION
PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.2 CL ITEM: 6.2.1.0f DATE: 1-28-84 REV:
EVALUATOR: R. Sabeh HED#: ZB019
HED#: 6.2.008

CL TITLE: Communications HED CATEGORY: B
BOARD TITLE: NA BOARD#: NA

HED DESCRIPTION
GUIDELINE- ANNOUNCING SYSTEMS (Priority):
Channel 3 is reserved for emergency or control room voice traffic but there is no priority procedure or capability for interrupting an announcement in progress.

[] SUPPORT MATERIAL ATTACHED
POTENTIAL GENERATOR ERROR(S)
Reduces ability to receive or transmit priority voice traffic.

RECOMMENDED REVISION
Initiate a priority procedure or capability to seize or interrupt an announcement in progress.

RECOMMENDED IMPLEMENTATION
PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
NON-MANDATORY

[X] Design Impr. Study.

Not Started 4/11/84
Zag - 9/11/84
Rabeel 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.2
CL ITEM: 6.2.1.7
CL TITLE: Communications
BOARD TITLE: NA

R. Sabeh
EVALUATOR

HEID#: 23020
HEID#: 6.2.007
DATE: 1-26-84
HEO CATEGORY: B
BOARD#: NA

HEO DESCRIPTION

GUIDELINE- POINT-TO-POINT INTERCOM SYSTEMS:
There is no point-to-point intercom between the control room and the watch engineer's office.
This observation is supported by OER-010.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in receiving or sending a voice message between these workstations.

RECOMMENDED REVISION

Install a point-to-point intercom between the watch engineers office, the control room and the administrative assistants office. Include a gain control at each intercom unit.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[X] AT CONVENIENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

[X] Design Impr. Study

TECHNICAL REVIEW

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Combine with Communication functional study described in 2B016.

CHAIRMAN BOB ARNOLD DATE 4/11/84

MANAGEMENT REVIEW

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

CHAIRMAN W. Babcock DATE 5/13/84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.2 CL ITEM: 6.2.1.8b,c
 CL TITLE: Communications
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 2B021
 HED#: 6.2.008
 DATE: 1-28-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

OUTLINE- EMERGENCY COMMUNICATIONS (Equipment Usability and Voice Communications)
 Voice communications while wearing a face mask is unsatisfactory.
 This observation is supported by OER-008.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Inability to transmit voice messages.

RECOMMENDED REVISION

Procure specially designed high quality masks that permit communication when worn.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Babuck DATE 5/18/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

*Operations will research this issue
 and buy equipment as required.
 Refer to DHEO # 6.4.002*

Change to "At earliest opportunity."

[x] Enhancement.

W. Sabah 1/11/84
W. Sabah 9/10/84
R. Sabah 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NFS
TASK: Control Room Survey
CL: 6.2
CL ITEM: 6.2.1.5c
CL TITLE: Communications
BOARD TITLE: NA

EVALUATOR
R. Sabah

HED#: 25022
HEO#: 6.2.011
DATE: 2-8-84
HEO CATEGORY: B
BOARD#: NA

CHAIRMAN Bob Arnold DATE 4/1/84

TECHNICAL REVIEW
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Post procedure on performance aid over VHF radio

HED DESCRIPTION

GUIDELINE- FIXED BASE VHF TRANSCIVERS (Procedures):
Procedures are written for this system but not posted.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)
Increased time to operate system.

RECOMMENDED REVISION

Post VHF transceiver procedures.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

ENHANCEMENT

MANAGEMENT REVIEW

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason:

CHAIRMAN W. Sabah DATE 5/18/84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
EVALUATOR: R. Sebel

IRTH: 3 B o 2 3
IRIJ: 0 3 001

CL: 0.3 CL ITEM: 0.3.1.2b(1,2) DATE: 1-23-84 REV:

CL TITLE: Annunciator Warning System IED CATEGORY: B

BOARD TITLE: NA BOARD: NA

IED DESCRIPTION

GUIDELINE- ALARM PARAMETER SELECTION (General Alarms):
There are several alarms that require control room operators to direct auxiliary or equipment operators to various parts of the plant to identify trouble, e.g., CO₂ ventilation problems.
This observation is supported by DER-047.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to identify the specific problem. Increases the probability of error in problem interpretation by a second operator. Delays corrective action.

RECOMMENDED REVISION

Provide direct input to control room of critical information from remote locations.

RECOMMENDED IMPLEMENTATION

[X] PRIORITY OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

Design Implementation Study

[X] DESIGN CHANGE

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Request operations dept to develop a list of specific alarms wanted on control room alarm panels. Engineering to analyze the listed alarms for feasibility of installation.

CHAIRMAN: Bob Aevold DATE: 5/11/84

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Nuc. Operations to define signals wanted in an Engineering Services Request. Then Nuc. Engineering will attempt to integrate these alarm signals into the new plant computer. Schedule to be consistent with new plant computer project.

CHAIRMAN: W Babcock DATE: 5/18/84

2nd Mgt. Team meeting 9/10/84: This HED to be put on hold until new annunciator design is started. New signal inputs may appear then. There is no known need at this time.

W Babcock.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Observation 1111
 i Sab 4/1/84
 Resub 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3
 CL TITLE: Annunciator Warning System
 BOARD TITLE: RAD Rcrd, Rx Clnup, Rx Cont

R. Sabeh
 EVALUATOR

HED#: 3A024
 HEO#: 6.3.002
 DATE: 1-23-84
 HED CATEGORY: B
 BOARD#: 002, 004, 005

HED DESCRIPTION

GUIDELINE- ALARM PARAMETER SELECTION (Multi-channel or Shared Alarms):
 There are at least 5 alarms that are shared:
 Panel 004: TORUS THROUGH ALARM HI/LO #782.
 Panel 004: RECIRC PUMP OIL LEVEL HI/LO #781. *TROV Sit*
 Panel 004: DRYWELL PRESSURE HI/LO #780.
 Panel 004: REACTOR WATER HI/LO LEVEL #1033.
 Panel C1: A/B/C SERVICE WATER PUMPS LOW DISCHARGE PRESSURE #38.
 This observation is supported by OER-014.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of operator error in determining alarm state.

RECOMMENDED REVISION

The annunciator tiles for at least these alarms should be split into separate annunciator tiles and color coded.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Design improvement study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/1/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend a design improvement study be done to encompass all areas of annunciator design including this HED.

MANAGEMENT REVIEW

CHAIRMAN W Babink DATE 5/18/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: In addition to the above, coordinate with the panel improvement study to determine if problem can be solved by adding zone indication (HI or LOW) to meter scales, if there are meters for these parameters. Also, new plant computer may be able to accept these signals.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.3
 CL TITLE: Annunciator Warning Systems
 BOARD TITLE: Rx Cont, Turbine

R. Sabeh
 EVALUATOR

HED#: 3B025
 HED#: 8.3.004
 DATE: 2-3-84
 REV:
 HED CATEGORY: B
 BOARD#: 905, C2

HED DESCRIPTION

GUIDELINE- FIRST-OUT ANNUNCIATORS (Reactor System and Turbine Generator System):
 There is no first-out annunciator for either the reactor system or the turbine generator system.
 This observation is supported by OPR-013.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time required for identifying the initiating event.

RECOMMENDED REVISION

Provide a first-out annunciator capability for the reactor system and turbine generator system.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

EX Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend inclusion in the annunciator study with HED 3B024.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Babcock 4/11/84
 Bab 4/11/84
 R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3
 CL TITLE: Annunciator Warning Systems
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 3B026
 HED#: 6.3.006
 DATE: 2-3-84
 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- PRIORITIZATION (Levels of Priority):
 There is a lack of a systematic ann. prioritization scheme. The tiles that should be prioritized are: Panel 903: HPCI ISOLATED, OFF GAS TIMER INITIATED.
 Panel 904: PCIC ISOLATED, CLEAN-UP HI TEMP, NONREGEN HX, DRYWELL PRESS.
 HI/LO - RECIRC M/Q SET A GEN LOCKOUT, - RECIRC M/Q SET B GEN LOCKOUT.
 Panel 905: Rx WATER HI/LO LEVEL, - Rx HI PRESS.
 Panel C1: RFP TRIP - A/B/C TRIP COND PUMP TRIP, - OFF-GAS LINE GAS FULLY OPEN, A OR B SEAWATER PUMP TRIP, - TBCCW PUMP TRIP
 Panel C2: TURBINE STM SEAL HDR LO PRESS, - INSTR. AIR OR N2 LVL TO DRYWELL
 Panel C3: INST POWER TRANSFER, - RFS M/Q SET A BKR TRIP, - RPS M/Q SET B BKR TRIP, - STATOR COOLING WATER. THIS OBSERVATION SUPPORTED BY OER-015.
 SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to responding to a priority alarm.

RECOMMENDED REVISION

Prioritize annunciator tiles using a color coding scheme.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN: Bob Ainsworth DATE 4/14/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator study with HED 3B02A

MANAGEMENT REVIEW

CHAIRMAN: W. Babcock DATE 5/13/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrimage NPS
 TASK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.1.5a
 CL TITLE: Annunciator Warning Systems
 BOARD TITLE: NA

CHAIRMAN: BOB ARNOLD DATE: 4/11/84

TECHNICAL REVIEW
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Annunciator study with SBOZA.

MANAGEMENT REVIEW
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

POTENTIAL OPERATOR ERROR(S)
 Degraded operator performance in confirming cleared alarms or responding to new alerting alarms.

[] SUPPORT MATERIAL ATTACHED
 RECOMMENDED REVISION
 Provide a distinctively different audible signal for cleared alarms.

RECOMMENDED IMPLEMENTATION
 PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Design Impr. Study

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1000-urnman 4/11/84
 73 - 11/11/87
 R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.3.1a
 CL TITLE: Annunciator Warning Systems
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 38028
 HED#: 6.3.087
 DATE: 1/23/84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL ANNUNCIATOR PANELS (Location):
 Some annunciator tiles are on different panels than their controls (e.g., the
 OFFGAS TIMER tile is on Panel 903 with associated control on Panel C1).
 This observation is supported by OER-017.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in responding to annunciator alarm and source of potential error.

RECOMMENDED REVISION

Relocate the tiles to the same panel as the associated controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Design Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/11/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the
annunciator study with 38024.

MANAGEMENT REVIEW

CHAIRMAN W. Babink DATE 5/10/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

W. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NFS
 TASK: Control Room Survey
 CL: 6.3
 CL ITEM: 6.3.3.1b(1,2)
 CL TITLE: Annunciator Warning Systems
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 30029
 HED#: 6.3.008
 DATE: 1/23/84
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL ANNUNCIATOR PANELS (Labeling):
 Individual annunciator panels are not all labeled.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in operator response.

RECOMMENDED REVISION

Provide panel labels for all unlabeled panels.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Design Impr. Study

TECHNICAL REVIEW

[] Concur.
 [X] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Exclude with Annunciator Study
 and HED 30024

MANAGEMENT REVIEW

[X] Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

CHAIRMAN W. Sabeh DATE 5/18/84

CHAIRMAN BOB ARNOLD DATE 4/11/84

Mr. O... 2/12/84
WT Babcock 4/12/84
R. Sabeh 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.3
CL ITEM: 6.3.3.1c(2,3)
CL TITLE: Annunciator Warning System
BOARD TITLE: NA
HED#: 3 B 0 3 0
HED#: 6.3.009
DATE: 1/23/84
REV: B
IED CATEGORY: B
BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL ANNUNCIATOR PANELS (Lamp Replacement):
Operators have reported being shocked while replacing bulbs as well as shorting out the entire annunciator panel.
This observation is supported by OER-028.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Equipment failure and shock hazard to operators, degrading performance.

RECOMMENDED REVISION

Provide an operator aid for replacing lamps.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

LJ Des. Impr. Study

TECHNICAL REVIEW

[] Concur.
 Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Include with the Annunciator Study with 3002A.

CHAIRMAN BOB ARNOLD DATE 4/12/84

MANAGEMENT REVIEW

[] Concur.
 Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Research into new hardware should include this issue.

CHAIRMAN WT Babcock DATE 5/18/84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh
 TASK: Control Room Survey | EVALUATOR
 CL: 6.3 | CL ITEM: 6.3.3.2d | HED#: 3B031
 HED#: 6.3.010
 DATE: 1/23/84 | REV:
 CL TITLE: Annunciator Warning System | HED CATEGORY: B
 BOARD TITLE: Rx Cont. | BOARD#: 906

HED DESCRIPTION

GUIDELINE- VISUAL ALARM RECOGNITION AND IDENTIFICATION (Contrast Detectability):
 The opaque yellow annunciators on panel 906 (#1033) are difficult to distinguish
 between 'ON' and 'OFF' states. This observation is supported by the annunciator
 DER-049.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Error or delay in responding to an alarm state.

RECOMMENDED REVISION

Reduce the density level of colored tiles to permit differentiation between
 'ON' and 'OFF' states. Yellow, the color coding scheme recommended for use
 in HED 6.3.005, should be used with these tiles.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~Enhancement~~
 DESIGN IMPROVEMENT STUDY.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Add to annunciator
 study, which will develop tile
 color standards.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1306 unrec'd 4/12/84
 R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh EVALUATOR | HED#: 3B032
 TASK: Control Room Survey | | HED#: 6.3.011
 CL: 6.3 | CL ITEM: 6.3.3.2e | DATE: 1-23-84 | REV:
 CL TITLE: Annunciator Warning System | HED CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL ALARM RECOGNITION AND IDENTIFICATION ("Dark" Annunciator)
 Annunciators are lit to indicate equipment is out of service (continuous). This observation is in support of OER-019.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error resulting from misinterpreting lit annunciator.

RECOMMENDED REVISION

Provide a dark annunciator panel and a status board to identify out of service equipment.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des Impr Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with Annunciator Study with 3B024

MANAGEMENT REVIEW

CHAIRMAN WT Babuk DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TACK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.3.3c
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HEO#: 3B033
 HEO#: 6.3.012
 DATE: 1-23-84 REV:
 HEO CATEGORY: B
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- ARRANGEMENT OF VISUAL ALARM TILES (Labeling of Axes):
 Annunciator panels are not labeled to conform with this criteria.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to respond and the probability of error when referencing an annunciator tile.

RECOMMENDED REVISION

Label annunciator panel to conform with this guideline. The labels should identify the vertical and horizontal axes of the panel on the left and across the top for tile designation. The label size should conform to the criteria of 15 minutes of visual arc.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with Annunciator Study with 3B021. Note: Annunciator Response Procedure assumes that this guideline is implemented.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1011
Feb 1 4 1984
Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3
 CL TITLE: Annunciator Warning System
 BOARD TITLE: RX Cont.

R. Sabeh
 EVALUATOR

HED#: 3B034
 HED#: 6.3.013
 DATE: 1-23-84
 HED CATEGORY: B
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- ARRANGEMENT OF VISUAL ALARM TITLES (Pattern Recognition):
 There are 63 tiles on each annunciator panel of 905. This exceeds the maximum matrix density of 60 tiles suggested in the guideline criteria.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases search time to identify specific tile.

RECOMMENDED REVISION

Reduce the number of annunciator tiles per panel on 905.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the Annunciator Study with 3B024.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 3B0345
 TASK: Control Room Survey | EVALUATOR | HED#: 6.3.014
 CL: 6.3 | CL ITEM: 6.3.3.3d(2) | DATE: 1-23-84 | REV:
 CL TITLE: Annunciator Warning System | HED CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- ARRANGEMENT OF VISUAL ALARM TILES (Pattern Recognition):
 Tiles are not grouped by logical organization because of changes subsequent to the original design.
 This Observation is supported by DER-049.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases search time to identify alarm condition for appropriate action.

RECOMMENDED REVISION

Conduct a study to identify a logical organization for the annunciator panels.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

Ex Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the Annunciator Study with 3B024.

MANAGEMENT REVIEW

CHAIRMAN WT Sabeh DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. B. ... 4/11/84
 R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.3.4a,d
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 3B03B6
 HED#: 6.3.015
 DATE: 1-23-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL TILE LEGENDS (Unambiguous; and Abbreviations)
 Some contain excessive information and others contain insufficient information. In addition, abbreviations and acronyms are not used consistently on all times e.g., Delta-; /Diff Press, REAC/Reactor/Rx. This observation is supported by annunciator DER summary.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to identify specific alarm message.

RECOMMENDED REVISION

Study annunciator tile legend to determine relabeling for efficiency and consistency.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des Impr Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- [] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with Annunciator Study with 3B024

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/84

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.3 CL ITEM: 8.3.3.4b,c
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 3B0367
 HED#: 8.3.018
 DATE: 1-23-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL TILE LEGENDS (Singularity and Specificity):
 Some tiles refer the operator to annunciator panels outside the main control area. In addition, there are tiles that alarm for two conditions, e.g., DRYWELL HI/L.O. Also K COMPUTER alarm on panel 906 refers operator to computer on panel C7.
 This observation is supported by OER-014 and OER-17.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to identify alarm message.

RECOMMENDED REVISION

Study annunciator warning system to identify tiles that should be split, color coded and relocated to the primary operating area.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Des Impr Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 3B024

MANAGEMENT REVIEW

CHAIRMAN W. Balant DATE 5/18/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4/12/84
 W. Sabeh 4/12/84
 R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 3B038
 HED#: 6.3.017
 DATE: 1-23-84
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- VISUAL TILE READABILITY (Distance and Letter Dimensions and Spacing):
 The lettering size on the annunciator tiles do not conform to the guideline criteria.
 This observation is supported by DER-016.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to respond and the probability of error in reading alarm messages.

RECOMMENDED REVISION

Establish a letter size, type style and color contrast to conform with guideline criteria.
 0

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Des Impr Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 3B024

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/89

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Rebeh v. 12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NFS

R. Sabeh
EVALUATOR

HEID#: 3B039

TASK: Control Room Survey

HEID#: 6.3.018

CL: 6.3 CL ITEM: 6.3.3.5b

DATE: 1-23-84 REV:

CL TITLE: Annunciator Warning System

HEO CATEGORY: B

BOARD TITLE: NA

BOARD#: NA

HEO DESCRIPTION

GUIDELINE- VISUAL TILE READABILITY (Type Style):
The letter type style and size differ on the annunciator lettering.
This observation is supported by DER-018.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Produces operator reading difficulty and results in increased time to read tile message.

RECOMMENDED REVISION

This HEO should be considered with the recommendation suggested under HEO 6.3.017.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[] Des Impr. Study

TECHNICAL REVIEW

[] Concur.

Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with Annunciator Study with 3B024

CHAIRMAN BOB ARNOLD

DATE 4/12/84

MANAGEMENT REVIEW

Concur.

[] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN W. Babcock

DATE 5/18/84

1800 mm 11/1/14
R Babul 4-13-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL. 6.3
CL ITEM: 6.3.3.5c
CL TITLE: Annunciator Warning System
BOARD TITLE: NA

R. Sabeh
EVALUATOR

HEO#: 303940
HEO#: 6.3.019
DATE: 1-23-84
HEO CATEGORY: B
BOARD#: NA

HEO DESCRIPTION

GUIDELINE- VISUAL TILE READABILITY (Legend Contrast):
There are several annunciator tiles that have light letters on dark background (panel 905 #1034). Other annunciators are labelled using dynatope (panel C3 #248 and panel 905 #1033).

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and probability of error in reading annunciator message.

RECOMMENDED REVISION

This HEO should be considered with the recommendation under HEO 6.3.017.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

C3 Des Impr Study

TECHNICAL REVIEW

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 38024

CHAIRMAN BOB ARNOLD DATE 4/10/14

MANAGEMENT REVIEW

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

CHAIRMAN WT Babul DATE 5/18/84

4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NFS
TASK: Control Room Survey
CL: 6.3
CL ITEM: 6.3.4.2a,b
CL TITLE: Annunciator Warning System
BOARD TITLE: NA

HED#: 3B043
HED#: 6.3.022
DATE: 1-23-84
HED CATEGORY: P
BOARD#: NA

CHAIRMAN BOB ARNOLD
DATE: 5/12/84

HED DESCRIPTION

GUIDELINE- CONTROL SET DESIGN (Positioning of Repetitive Groups etc.):
All control set designs are not alike, e.g., Panel C7 has two sets, one horizontal and one vertical. Panel C8 only has two pushbuttons and C17B has three pushbuttons arranged in a triangular formation.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to respond and the probability of error in operator response.

RECOMMENDED REVISION

Reconfigure and code controls for consistency and ease of identification.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

D-3 Des Impr Study

TECHNICAL REVIEW

[] Concur.
[X] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Include with Annunciator Study with 3B024

MANAGEMENT REVIEW

[X] Concur.
[] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason:

CHAIRMAN WTB
DATE 5/18/84

1200-1111 9/12/84
w. Sabab 7/14/84
R. Sabab 4-13-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS

R. Sabab
EVALUATOR

HEID#: 38044

TASK: Control Room Survey

HEID#: 6.3.023

CL: 6.3 CL ITEM: 6.3.3.3e,f

DATE: 1-23-84 REV:

CL TITLE: Annunciator Warning System

HEID CATEGORY: B

BOARD TITLE: NA

BOARD#: NA

HEID DESCRIPTION

GUIDELINE- ARRANGEMENT OF VISUAL ALARM TILES (Out of Service Alarms etc):
Tiles labeled for equipment that has not been used and will not be used are still
included on the annunciator panels, e.g., PLANT HEAT EXCHANGERS A AND B.
This observation is supported by OER-018.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Excessive information is detrimental to operator performance.

RECOMMENDED REVISION

Remove labels on inactive tiles.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

ESJ Des Impr Study

TECHNICAL REVIEW

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 38024

CHAIRMAN BOB ARNOLD

DATE 4/12/84

MANAGEMENT REVIEW

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN w Sabab

DATE 5/18/84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh
 TASK: Control Room Survey | EVALUATOR
 CL: 8.3 | CL ITEM: 8.3.2.1a | HED#: 3B045
 HED#: 8.3.024
 DATE: 1-23-84 | REV:
 CL TITLE: Annunciator Warning System | HED CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- SINGLE DETECTION (Intensity):
 There is a large discrepancy in the annunciator alarm intensities. The PAM panel alarm is too high and the alarm intensity on panels C1, C2 and C3 are too low. This observation is supported by OER-021.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The PAM alarm is distracting and the C1, C2 and C3 alarms could be missed.

RECOMMENDED REVISION

The alarms should be adjusted to insure a nominal signal value of 10dB(A) above ambient noise.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

E&I Des Impr Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 3B024.

MANAGEMENT REVIEW

CHAIRMAN WT Zalunick DATE 5/18/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1287 unrec'd 7/10/84
 W. Sabeh 7/14/84
 R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 3B047
 TASK: Control Room Survey | EVALUATOR | HED#: 6.3.027
 CL: 6.3 | CL ITEM: 6.3.2.1f | DATE: 2-7-84 | REV:
 CL TITLE: Annunciator Warning System | HEO CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HEO DESCRIPTION

GUIDELINE- SIGNAL DETECTION (Identification):
 The auditory alarm does not provide for workstation or system identification.
 This observation is supported by OER-019.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and probability of error in responding to an alarm.

RECOMMENDED REVISION

Install additional (possibly three) horns to provide localization cues to direct operators attention.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [x] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

D3 Des. Impr Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 3B024

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

R. Sabeh 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4
 CL ITEM: 6.4.1.1c(1)
 CL TITLE: Controls
 BOARD TITLE: All

CHAIRMAN Bob Arnold DATE 4/12/84
 TECHNICAL REVIEW
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in Panel Improvement design study.

HED DESCRIPTION

GUIDELINE- GENERAL PRINCIPALS (Human Suitability):
 All "j" handles are the same for pumps, valves and switches - some of two position, others are "jog" - poor discrimination by function or mode of operation. This observation is supported by DER-023.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and probability of error in selection and actuating the proper control.

RECOMMENDED REVISION

Provide shape or color coding to discriminate function and mode of operation.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ES Des. Impr. Study

MANAGEMENT REVIEW

CHAIRMAN W Sabeh DATE 5/22/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

over issue 9/12/84
W. Sabeh 4/11/84
R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 8.4
CL TITLE: Controls
BOARD TITLE: Electrical

R. Sabeh
EVALUATOR

HED#: 4B049
HED#: 8.4.003
DATE: 1-24-84
REV:
HED CATEGORY: B
BOARD#: C3

HED DESCRIPTION

GUIDELINE- PREVENTION OF ACCIDENTAL ACTIVATION (Movable Covers or Guards):
Panel C3: Switch #410 should be guarded.
Back Panels: Instrument air nitrogen to drywell and FW heater block valves were identified during the OER as controls that should be guarded.
This observation is supported by OER-026.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Controls are susceptible to accidental activation.

RECOMMENDED REVISION

Provide a guard for switch #410. Also determine if guards are needed for switches switches #414, 417, 420, 421, 398 and the two controls on back panels identified during the OER.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Panel Improvement Study with 4B048. Note that study should determine if other controls are in this category, and should recommend design of control guard device.

MANAGEMENT REVIEW

CHAIRMAN WT Sabeh DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 4B050
 TASK: Control Room Survey | EVALUATOR | HED#: 8.4.004
 CL: 8.4 | CL ITEM: 8.4.1.2c(3) | DATE: 1-24-84 | REV:
 CL TITLE: Controls | HED CATEGORY: B
 BOARD TITLE: FW & Con, Electrical, Rx Cleanup | BOARD#: C1, C3, 904

HED DESCRIPTION

GUIDELINE- PREVENTION OF ACCIDENTAL ACTIVATION (Movable Covers or Guards):
 Protective covers on controls that interfere with adjacent controls:
 Panel C1: Control #122 interferes with control #107, 119 and 120.
 Panel C3: Control #426 interferes with control #403.
 Panel 904: Control #965 interferes with control #960.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Results in interference with the activation of blocked controls.

RECOMMENDED REVISION

Redesign protective covers for noninterference with adjacent controls.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

See Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- [] Concur.
- Concur With Comment/Note.
- [] Re-evaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with HED 4B019. ^{8 MAT} ₆₋₂₁₋₄

MANAGEMENT REVIEW

CHAIRMAN WT Sabeh DATE 5/24/84

- Concur.
- [] Concur With Comment/Note.
- [] Re-evaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

3rd 6 4 '84
R Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.2.1
 CL TITLE: Controls
 BOARD TITLE: Rx Cinup, Electrical, Contnt Vent

R. Sabeh
EVALUATOR

HED#: 4B051
 HED#: 6.4.005/A
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: 904, C3, C7

HED DESCRIPTION

GUIDELINE- DIRECTION OF MOVEMENT:
 Controls that violate population stereotype are:
 Panel 904: Rotary finger switches #945, 951, 952, 956 counterclockwise movement to open.
 Panel C3: Rotary handswitch #358, 372, 377, 388, 404, 408 counterclockwise to increase (raise).
 Panel C7: Rotary finger controls #1357, 1359, 1368, 1362, 1377, 1379, 1388, 1382, 1385, 1387, 1388, 1398, 1391, 1392, 1394, 1395, 1397, 1398, 1399 increase counterclockwise.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of error in adjusting controls.

RECOMMENDED REVISION

Change the direction of control movement to conform with population stereotype.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel Improvement Study with 4B048.

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/22/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 4B051
 TASK: Control Room Survey | EVALUATOR | HED#: 6.4.005/B
 CL: 6.4 | CL ITEM: 6.4.2.1 | DATE: 1-24-94 | REV:
 CL TITLE: Controls | HED CATEGORY:
 BOARD TITLE: See 6.4.005/A | BOARD#: See 6.4.005/A

HED DESCRIPTION

GUIDELINE- DIRECTION OF MOVEMENT (Cont.)
 Panel C7: Photos show that "J" handles #1413, 1448, 1454, 1455, 1477 have operator notation that indicates control movement violates population stereotype permanent labels on the controls.
 Panel C2: #192, 206, 207, 208, 215, 216 turn counterclockwise to raise and clockwise to lower.
 This observation is supported by OER-024.

SUPPGT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

See 6.4.005/A

RECOMMENDED REVISION

See 6.4.005/A

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/94

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: See 6.4.005A for comments

MANAGEMENT REVIEW

CHAIRMAN WZabulok DATE 5/22/94

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: See 6.4.005A

HAWAII ENGINEERING OBSERVATION ASSESSMENT

1201 Arnold 4/12/84
 - R Sabeh 4/12/84
 R Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.4 CL ITEM: 6.4.2.2a
 CL TITLE: Controls
 BOARD TITLE: All

EVALUATOR: R. Sabeh
 HED#: 48052
 HFO#: 8.4.008
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: All

HED DESCRIPTION

GUIDELINE- CODING OF CONTROLS (Consistency):
 There is a limited amount of color coding on the "J" jog controls. On panel C1 and C3 some controls are color coded but there is no consistent pattern throughout the control room.
 This observation is supported by OER-023.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time necessary to discriminate and identify controls.

RECOMMENDED REVISION

Code control handles for consistency.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in Panel Impr. Study with 48048.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

W. Sabeh 4-13-84
R. Sabeh 4-13-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS

EVALUATOR: R. Sabeh

HED#: 4553

TASK: Control Room Survey

HED#: 6.4.087

CL: 6.4 CL ITEM: 6.4.2.2^h

DATE: 1-24-84 REV:

CL TITLE: Controls

HED CATEGORY: B3

BOARD TITLE: FW & Cond., Electrical

BOARD#: C1, C3

HED DESCRIPTION

GUIDELINE- CODING OF CONTROLS (Location Coding):

Mirror Imaging of controls.
Panel C3: Mirror Image controls #348/361; 349/360; 366/372; 367/371; 369/370;
377/380; 378/379; 385/402.
Panel C1: Mirror Image controls #97/98; 99/100.
This observation is supported by OER-845.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and the probability of error for control response.

RECOMMENDED REVISION

Relocate controls or provide operator demarcation enhancement.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

L3 Design Improvement Study

TECHNICAL REVIEW

[] Concur.

Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Exclude in the panel improvement study with 48048.*

CHAIRMAN BOB ARNOLD DATE 4/13/84

MANAGEMENT REVIEW

Concur.

[] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN W. Sabeh DATE 5/22/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

12 of 1000 1/13/84
 w/ Bob + k 1/13/84
 R. Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.2.2d,e
 CL TITLE: Controls
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 4B054
 HEO#: 6.4.008
 DATE: 1-24-84 REV:
 HEO CATEGORY: B
 BOARD#: All

HEO DESCRIPTION

GUIDELINE- CODING OF CONTROLS (Shape Coding):
 Shape coding of controls is not used. The EOR identified that the vacuum breakers and containment air valve controls were too close to each other and identical in shape making accidental activation possible on Panel C7.
 This observation is supported by OER-023.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time and the probability of error for control activation.

RECOMMENDED REVISION

Provide shape coding to differentiate breakers, valves and pumps on (controls #1478 and 1484). However, there appears to be many other controls that should be shape coded to improve discriminability.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

EOI Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study with 4B048

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4/13/84
R. Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4
 CL TITLE: Controls
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 4B055
 HED#: 6.4.009
 DATE: 1-24-84
 HED CATEGORY: B
 BOARD#: All

CL ITEM: 6.4.2.2f(2,3)
 REV:

HED DESCRIPTION

GUIDELINE- CODING OF CONTROLS (Color Coding):
 Except for Panel C3 there is no color coding association between controls and displays. The color coded jog "J" handles (green) do not adequately contrast with panel background.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in relating controls with their associated displays.

RECOMMENDED REVISION

Provide a coding scheme to relate controls to displays and improve color contrast of jog handles.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/13/84

- [] Concur.
- [x] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study with 4B048

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- [x] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. H. ... 4/13/84
 'Be' ... 4/13/84
 R. Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.3.3a
 CL TITLE: Controls
 BOARD TITLE: Rx Cont

EVALUATOR: R. Sabeh
 HED#: 4B056
 HED#: 6.4.011
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- LEGEND PUSHBUTTONS (Discriminability):
 The rod selector pushbuttons on the bench board are the same in size and appearance as the legend displays on the vertical portion of this panel. In addition, there are other legend pushbuttons and legend labels on the vertical portion of panel 905 which are identical in size and shape.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in control activation.

RECOMMENDED REVISION

Provide a coding scheme to discriminate legend lights from legend pushbuttons.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des Impr Study

TECHNICAL REVIEW

CHAIRMAN DOB ARNOLD DATE 4/13/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study with 4B048.

MANAGEMENT REVIEW

CHAIRMAN W. Babink DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

BSabel 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.4
CL ITEM: 6.4.3.3d
CL TITLE: Controls
BOARD TITLE: Mx Rx Ctl

HEID: 48057
HEID: 6.4.013
DATE: 1-24-84
REV:
HEID CATEGORY: B
BOARD#: M-705

CHAIRMAN BOB ARNOLD
DATE 4/13/84

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: *Exclude in panel improvement study with 4B048*

HEO DESCRIPTION

GUIDELINE- LEGEND PUSHBUTTONS (Barriers):
No barriers provided for contiguous pushbuttons.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of accidental activation of adjacent pushbuttons.

RECOMMENDED REVISION

Install barriers between pushbuttons.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT HEO, REFUELING AT CONVENIENT OUTAGE AT EARLIEST OPPORTUNITY NON-MANDATORY

EO Des Impr Study

MANAGEMENT REVIEW

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN *W Sabank* DATE *5/22/84*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Final '2' 1/4
 W Babcock 4/13/84
 R Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.4.6d(1)
 CL TITLE: Controls
 BOARD TITLE: FW & Cond

R. Sabeh
 EVALUATOR

HED#: 4B058
 HED#: 6.4.016
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: C1

HED DESCRIPTION

GUIDELINE- ROTARY SELECTOR CONTROLS (Position Indication):
 Controls on panel C1, #68 and 67 do not have position indicating line down the side of the rotary control knob. This condition may appear on other controls but could not be identified from the mockup photographs.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of alignment error on control positioning.

RECOMMENDED REVISION

Provide a line down the side of each control knob.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/13/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study with 4B048. These two instruments are scheduled for removal. This is a generic issue, in that some arrows, in controls are no longer painted, are dirty, etc. Full investigation of this problem may ^{relate to} concern other criteria.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/24/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

W Babcock 4/13/89
R Sabeh 4-13-89

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 4B059
 TASK: Control Room Survey | EVALUATOR | HED#: 6.4.018
 CL: 6.4 | CL ITEM: 6.4.1.2e | DATE: 1-24-84 | REV:
 CL TITLE: Controls | HED CATEGORY: B
 BOARD TITLE: Rx Control | BOARD#: 905

HED DESCRIPTION

GUIDELINE- PREVENTION OF ACCIDENTAL ACTIVATION (Resistance to Movement):
 During the OER, operators reported that rod control switch #1268 and notch
 override switch #1261 have excessive spring loading.
 This observation is supported by OER-025.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The strong spring tension and the side separation could produce operator
 fatigue and result in degraded performance.

RECOMMENDED REVISION

Provide a different type handle (joystick) or reduce the separation and spring
 tension.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

DES Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Panel improvement
study with 4B048. Investigate methods for
reducing operator fatigue as well as hardware
replacement, ie perhaps move the sov controls
closer.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/89

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Bob Arnold 4/13/84
 WJZabank 9/13/84
 R. Sabeh 4-13-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim IPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.1.1b(1)
 CL TITLE: Controls
 BOARD TITLE: Turbine, R₂ Controls, etc
 HED#: 43060
 HED#: 6.4.017
 DATE: 2-8-84
 HED CATEGORY: B
 CP600
 BOARD#: C2, 903, 904, 905

HED DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (Economy):
 Controls not used or not connected are:
 Panel 903: #838, 663, 677, 645, 690, 689
 Panel 904: #927, 1023, 997, 1001, 1013, 1017
 Panel 905: #1267
 Panel C2: #221
 Rem. CP600: # 512

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Unnecessary use of valuable panel space.

RECOMMENDED REVISION

Remove controls no longer in use.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

C-3 Design Change - MAY BE IN PROCESS

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

MANAGEMENT REVIEW

CHAIRMAN WJZabank DATE 5/22/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

Add the following to 904: item nos.
997, 1001, 1013, 1017.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.1.1b(1)
 CL TITLE: Controls
 BOARD TITLE: A00

R. Sabah
EVALUATOR

HEO#: _____
 HEO#: 6.4.018
 DATE: 2-3-84 REV:
 HEO CATEGORY:
 BOARD#: CP000

HEO DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (Economy):
 The key switch on control #612 violates tech specs and should be removed and circuit frozen in position 2.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of error in selecting a circuit that violates tech specs.
 Adds clutter and possible confusion to the operator.

RECOMMENDED REVISION

Remove control #612 and freeze in #2 position.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/13/84

- Concur.
- Concur With Comment/Note.
- ^{DO NOT CONCUR} Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Delete - Combine with 6.4.017
(48060)

MANAGEMENT REVIEW

CHAIRMAN _____ DATE _____

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

[x] NO ACTION

SHOULD BE DELETED

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*A. Arnold 4/19/84
W. Zabone 4/17/84
C. Brennan 4/19/84
R. Sabeh 4-19-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.4
 CL TITLE: Controls
 BOARD TITLE: RX CLG

R. Sabeh
 EVALUATOR

HED#: 4B 115
 HED#: 6.4.020
 DATE: 4/18/84
 HED CATEGORY: B
 BOARD#: 903

HEO DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (ADEQUACY):
 The pushbuttons #868 and 845 on panel 903 have a "cheater capability" to keep the pushbutton activated

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the probability of error in accurate injection of nitrogen into the HPCE line

RECOMMENDED REVISION

Replace the pushbuttons #868 and 845 with controls that will perform the function with the required level of precision

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study to determine the circuit requirements.

MANAGEMENT REVIEW

CHAIRMAN W. Zabone DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

W Baluk 7/19/84
of Brenner 9/19/84
R Sabeh 4-19-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.4 CL ITEM: 6.4.2.2b
CL TITLE: Controls
BOARD TITLE: Rx Control, FW & Cond

R. Sabeh
EVALUATOR

HED#: 4B126
HEC#: 6.4.021
DATE: 4-19-84 REV:
HED CATEGORY: B
BOARD#: 905, C1

HED DESCRIPTION

GUIDELINE- CODING OF CONTROLS (Location Coding):
Control 1301 is located on panel 905 with its associated system located on panel C1.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in activating the RFP trip system.

RECOMMENDED REVISION

Relocate control 1301 to panel C1.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[X] DES. IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

[] Concur.
[X] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: Include in the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN W Baluk DATE 5/02/84

[X] Concur.
[] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

std. 6/18/84
C. Dunning 4/8/80
W. Babuk 4/9/84

OBSERVATION

PLANT: Pilgrim NPS | E. Gagnon/R. Sabeh | HED#: 4B 132
 TASK: Verif./Valid. | EVALUATOR | HED#: 6.4.022
 CL: 6.4 | CL ITEM: 6.4.1.1c(2) | DATE: 6/4/84 | REV:
 CL TITLE: Controls | HED CATEGORY: B
 BOARD TITLE: Rx CLG | BOARD#: 903

HED DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (Human Suitability):
 In executing the task "Inhibit Auto ADS" (IT: 31.00), the operator must remember to reset ADS timer A, 853, and B, 698 (panel 903) within every 120 seconds. Failure to reset the timers could alter the plant response such as to erroneously indicate to the operator that additional failures have occurred and unnecessarily aggravate operator tasks.

g

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time and probability of error in maintaining those critical safety functions effected by inadvertent depressurization of the RPV.

RECOMMENDED REVISION

1. Provide a operator controlled ADS timer "Inhibit" or
2. Provide a distinct audible warning in advance of the 120 second point.

RECOMMENDED IMPLEMENTATION

- [] PRIOR TO OR AT NEXT REFUELING
- [x] AT CONVENIENT OUTAGE
- [] AT EARLIEST OPPORTUNITY
- [] NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN S. Luna DATE 6/8/84

- [] Concur.
- [x] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Study to determine modifications to best suit operator needs. Study should include the option of a digital time count down display.

MANAGEMENT REVIEW

CHAIRMAN W. Babuk DATE 6/11/84

- [x] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

[x] Panel Improvement Study.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WB Babuk 6/8/84

OBSERVATION
 PLANT: Pilgrim NPS | E. Gagnon/R. Sabeh | HED#: 4B 131
 TASK: Verif./Valid. | EVALUATOR | HED#: 6.4.023
 CL: 6.4 CL ITEM: 6.4.2.1 DATE: 6/5/84 REV:
 CL TITLE: Controls HED CATEGORY: B
 BOARD TITLE: CNTMT Vent & ISOL BOARD#: C7

HED DESCRIPTION
 GUIDELINE- DIRECTION OF MOVEMENT:
 Switches 1434, 1435, 1436, 1443, and 1445 have "open" at the left position and "auto" at the right position. Switches 1400, 1401, 1402, 1403, 1404, 1405, 1406 and 1407 have "close" at the left position and "auto" at the right position. Other switches 1410 and 1411 have three labels and two function positions, i.e., "close-auto" and "open". The functional positions of the controls do not conform with convention.

[] SUPPORT MATERIAL ATTACHED
 POTENTIAL OPERATOR ERROR(S)
 Increase the time and probability of error in placing control at the proper functional position.

RECOMMENDED REVISION
 Replace switches with ones that conform with convention, i.e., "auto" always at the center position with "close" always at the left position and "open" always at the right position.

RECOMMENDED IMPLEMENTATION
 [] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] DESIGN IMPROVEMENT STUDY (C7)

TECHNICAL REVIEW
 CHAIRMAN SLuna DATE 6/8/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____
System requirements via Elementary
Sketches and functional control
drawing must be reviewed to
determine required switch
function. This item will be
covered in the C7 design
improvement implementation

MANAGEMENT REVIEW
 CHAIRMAN WB Babuk DATE 6/11/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/13/84
 WZBabert 4/13/84
 R Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.6 CL ITEM: 6.5.1.2b
 CL TITLE: Visual Displays
 BOARD TITLE: Rx CLG, Turbine, A00

EVALUATOR: R. Sabeh
 HED#: 5B061
 HED#: 6.5.002
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: 983, C2, CP008

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion):
 Instruments on panels requiring conversion are:
 Panel 983: #803, 808 require multiplying by 5. #613
 Panel C2: #148 subtract value from 30. #147 multiply by 50
 Panel CP008: #479 multiply value by 5
 This observation is supported by OER-30 and OER-033.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and the probability of error in making conversions.

RECOMMENDED REVISION

Revise scales for direct reading or for conversion by factors of 10.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~03 only change Enhancement~~
 WNA

[x] Panel Improvement Study (meter scales)

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Other problems WNA

MANAGEMENT REVIEW

CHAIRMAN WZBabert DATE 5/22/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

Please Include in Panel Improvement Study (meter scales)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4/13/84
 R. Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.1.3c(1)
 CL TITLE: Visual Displays
 BOARD TITLE: Electrical, Count Vent

R. Sabeh
 EVALUATOR

HED#: 5B062
 HED#: 6.5.003
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: C3, C7

HED DESCRIPTION

GUIDELINE- CONTRAST:
 Indicators with white letters on black background are:
 Panel C3: #332, 342, 329, 318.
 Panel C7: 1459.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading instruments.

RECOMMENDED REVISION

Replace instrument dials with black letters on white background.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~EJ Enhancement~~

[x] Panel Improvement Study (meter scales)

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/14/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Mgt. Team requested further research on this issue - they felt a BEO standard must exist. W.S. was unable, despite talking to many engineers, to locate any standard. Mgt. team then asked to place this item in the panel improvement study (meter scales).*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.1.4a
 CL TITLE: Visual Displays
 BOARD TITLE: All

R. Sabah
 EVALUATOR

HED#: _____
 HED#: 6.5.004
 DATE: 1-24-84 REV:
 HED CATEGORY:
 BOARD#: All

HED DESCRIPTION

GUIDELINE- PRINTING ON THE DISPLAY FACE
 (Provision of Needed Message):
 Parameter scale missing from:
 Panel 903: #804,808 Panel 904: #838,881,814,912
 Panel 906: #1172,1302,1303,1306; Panel C2: #145,146
 Panel C1: #24,25,42,47,28,27,48,47 Panel CP600: #468
 Panel C4: Foxboro Indicators Panel C170: 442,443

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading parameter values.

RECOMMENDED REVISION

Label scale with parameter value.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 1/13/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Duplicate of 6.5.005 - Delete as typographical error.

MANAGEMENT REVIEW

CHAIRMAN _____ DATE _____

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

NO ACTION

SHOULD BE DELETED.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WTSabeh 4/13/84
RSabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.4a
 CL TITLE: Visual Displays
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 51306 3
 HEO#: 8.5.005
 DATE: 1-24-84 REV:
 HEO CATEGORY: B
 BOARD#: All

HEO DESCRIPTION

GUIDELINE- PRINTING ON THE DISPLAY FACE (Provision of Needed Message):
 Parameter scales missing:
 Panel 903: #804, 808, 601, 610
 Panel 904: #838, 882, 814, 912.
 Panel 906: #1302, 1303, 1305.
 Panel C2: #145, 148.
 Panel C1: #24, 25, 42, 47, 28, 27, 48, ~~46~~, 45
 Panel C4: Foxboro Indicators.
 Panel C170: #442, 443.
 Panel C100: #466

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading parameter values.

RECOMMENDED REVISION

Label scale with parameter value.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/13/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Delete all controllers. The indicator shows internal condition of signals within the device, and is not related to a process. Delete items # 604, 608, 836, 1302, 1303, 1305, 26, 27, 45, 46, 48 (all controllers).

MANAGEMENT REVIEW

CHAIRMAN WTSabeh DATE 5/22/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Place in panel improvement study for meter scales

~~[] Implementation~~

[x] Panel Improvement Study (meter scales)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1000 - vol 1 - 1/16/84
WT Baluk 4/16/84
Rhabe 4-16-84 *of Brown 4/16/84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.6c
 CL TITLE: Visual Displays
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 5B064
 HEO#: 8.5.006
 DATE: 2-18-84 REV:
 HEO CATEGORY: B
 BOARD#: All

HED DESCRIPTION

GUIDELINE- SCALE MARKINGS: (Values Indicated by Unit Graduations):
 Scale graduation values that do not agree with guideline criteria for progressing on
~~Panel C171: #2333:~~
 Panel 900: #802, 801, 832, 833, ~~804~~, 835, 883, 884, 886, 818, 819, 821.
 Panel 904: #829, 830, 831, 876, 878, 877, 878, 889, 890, 907, 908, 1025, 813.
 Panel 806: #1099, 1100, ~~1101~~, 1102, 1175, 1176, 1177, 1178, 1188, 1192,
 1193, 1171, 1107, 1108, 1162.
 Panel C2: #130, 133, 138. Panel C1: #14, 15, 18, 19, 20, 25.
 Panel C3: #283, 287, 297, 301, 345. Panel CP800: #488, 489.
 Panel C7: #1367, 1368, 1369, 1374, 1375, 1368, 1378, 1388, 1393, 1384, ~~1427~~, ~~1428~~,
 1450, 1361, 1371, 1389, 1396, 1393
 SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error for reading scale values.

RECOMMENDED REVISION

Revise scale values to conform with recommended graduation values identified in the guideline criteria.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study (meter scales)

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study with 4B048.

MANAGEMENT REVIEW

CHAIRMAN WT Baluk DATE 5/24/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Check that scales also display proper units.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R Sabeh 4-16-84 *W Babcock 5/16/84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.2.1b
 CL TITLE: Visual Displays
 BOARD TITLE: Rx CLG, Rx Clnup

R. Sabeh
EVALUATOR

HED#: 5B065
 HED#: 6.5.007
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: 903, 904

HED DESCRIPTION

GUIDELINE- DIRECTIONALITY OF MOVEMENT AND NUMBERING WITH MOVING-POINTER METERS
 (Vertical Straight Scales):
 Values increase in downward movement.
 Panel 903: #829.
 Panel 904: #833.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in reading values.

RECOMMENDED REVISION

Revise scale to increase in an upward movement.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

59 ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Appears that the meter is installed upside down compared to other meters of this type. Inverting the meter and installing a new scale should fix the problem.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

2 to vol 1161
 WJ Balow 4/18/84
 R Sabeh 4-16-84 C. Brennan 4/15/84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.4.1h
 CL TITLE: Visual Displays
 BOARD TITLE: See Below

R. Sabeh
 EVALUATOR
 HED#: 5B066
 HED#: 8.5.010
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: See Below

HED DESCRIPTION

GUIDELINE- GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Placement of Recorders):
 Recorders that must be verified and attended should be located in the primary
 operating area.
 Panels C7, 902 and 910 all contain recorders.
 Recorder on panel C2 #185 should be on Panel 903.

Board Title: Cntmt Vent, Turbine Process Rad, Area Rad, Rx CLG

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to obtain recorder data.

RECOMMENDED REVISION

Determine the need for operator verification and attention of the recorders
 on Panels C7, 902 and 910.
 Relocate the needed recorders, if any, to the primary operating area.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Ex 3 Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study. Consider HPCI exhaust press on C2 for justification of need. Should be removed from C2, but investigate need for parameter to be recorded, and placed on 903. The recorder is not on the P&ID M-243, M-244.

MANAGEMENT REVIEW

CHAIRMAN WJ Balow DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.1b
 CL TITLE: Visual Displays
 BOARD TITLE: Cntmt Vent

R. Sabeh
 EVALUATOR

HED#: ~~SB 134~~ 135
 HEO#: 8.5.015
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: C7

HED DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Completeness of Information):
 During the OER operators reported that they do not have feedback as to whether the torus ~~temperature~~ or the drywell concentration sample points are being monitored.
 This observation is supported by OER-027. ^{ed by} O₂

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in obtaining necessary information.

RECOMMENDED REVISION

Provide a status light indication of the parameter being monitored.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

~~[] No action at this time~~

[x] Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 1/16/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include with 13001, study of C7 devices. HEO description does not supply enough data to define the problem. Request Design review team to clarify.

Meter #1461 on C7 (O₂ concentration) is a multiple input meter with a selector switch mounted locally. Operators do not know the position of the switch so do not know the sample point.

MANAGEMENT REVIEW

CHAIRMAN WR Babuk DATE 5/20/84

Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Add to C7 panel improvement study to add sample selector switch to C7 or an indicator for which point is being sampled.
Should be category "B"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

2nd P old 1/16/89
 WTBabcock 4/16/89
 C. Brennan 9/16/89
 R. Sabeh 4-16-89

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.1b
 CL TITLE: Visual Displays
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 58067
 HED#: 8.5.019
 DATE: 1-24-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HED DESCRIPTION

(10) GUIDELINE- INFORMATION TO BE DISPLAYED (Completeness of Information): FWHtr block
 Black valve position is needed on front panel C1 as well as back panel C4. (dup)
 This observation is supported by OER-034.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time required to obtain operational information.

RECOMMENDED REVISION

Install block valve position indicators on Panel C1.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

D-3 Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/86

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study to determine the best solution to the operations requirement.

MANAGEMENT REVIEW

CHAIRMAN WTBabcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Add consideration of turbine block and stop valve position indication (analog meters) on C2.

Other improvements may exist in this area - as part of panel improvement study suggest that operations personnel be interviewed again (not so extensive as OER interview)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Approved 4/16/84
 C. Brannin
 R. Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 5B068
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.021
 CL: 8.5 | CL ITEM: 8.5.3.1c(2) | DATE: 2-7-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: B
 BOARD TITLE: Electrical, Turbine | BOARD#: C3, C2

HED DESCRIPTION

GUIDELINE- CHARACTERISTICS AND PROBLEMS OF LIGHT INDICATORS (Precautions to Avoid Misinterpretation):
 The indicator lights above controls #208, 404, 408 have red lens on left and green lens on right (reversal from convention).

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of operator error in detecting control status.

RECOMMENDED REVISION

Reverse the lights to conform with convention.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Bar Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Similar switches have red-green lites mounted in the proper convention (Red right - green left). Include in the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN W Babuk DATE 5/22/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Note also switch #207 apparently has the G & R lites reversed ~~to~~ when compared to its positions.

Study to consider this as a generic issue.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/11/84
 W. Sabeh 4/16/84
 C. Breuninger 4/16/84
 R. Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.6d & 8.5.3.2a(2) DATE: 2-8-84 REV:
 CL TITLE: Visual Displays HEO CATEGORY: B
 BOARD TITLE: Electrical BOARD#: C3

R. Sabeh
 EVALUATOR

HEO#: 58069

HEO#: 8.5.028

HEO DESCRIPTION

GUIDELINE- COLOR CODING (Consistency of Meaning):
 BUS trouble lights on Panel C3 use amber and white covers with the same meaning.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Loss of the color coding value.

RECOMMENDED REVISION

Replace white covers with amber covers.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Des. impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include all C3 vertical section lights in the panel improvement study to determine a color standard. Include ^{the} other control boards in the study.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W/ Babcock 4/16/84
 of Babcock 4/16/84
 Babcock 4-16-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh EVALUATOR | HED#: SB070
 TASK: Control Room Survey | | HEO#: 8.5.028
 CL: 8.5 | CL ITEM: 8.5.4.2b(4) | DATE: 2-8-84 | REV:
 CL TITLE: Visual Displays | | HED CATEGORY: B
 BOARD TITLE: ADG | | BOARD#: CP860

HEO DESCRIPTION

GUIDELINE- DISCRETE RECORDERS (Channel Selection Capability):
 Recorder #480 does not have the capability of selecting a single channel display.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to determine specific parameter trend/value.

RECOMMENDED REVISION

Provide recorders with a single channel select capability.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study. Investigate to see if the capability exists within the recorder (Speedomax) Investigate all recorders of this type for need/desirability of this function.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Add capability for slow/fast chart speed to study.

C. Ar 12 4/1/84
 W Babcock 4/18/84
 J Bennis 4/18/84
 R Sabeh 4-18-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5
 CL ITEM: 8.5.1.2d(2)
 CL TITLE: Visual Displays
 BOARD TITLE: Turbine

R. Sabeh
 EVALUATOR

HED#: 5B110
 HED#: 8.5.838
 DATE: 2-8-84
 REV:
 HEO CATEGORY: B
 BOARD#: C2

HEO DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Scale Range):
 Recorder #146 uses a single pen and a dual scale for coarse and fine readings.
 The pointers are not identified or associated with either colored pen and reading accuracy is made difficult by the scale markings.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error for reading and associating scale values with their parameters.

RECOMMENDED REVISION

Each colored pen should be labeled with the parameter being measured and the scales redesigned to furnish the range and precision required for control room operation.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in panel improvement study to determine usage of and parameters displayed on this recorder prior to recommending ^{new} scales.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

my... 4/16/89
 of... 4/16/89
 R. Sabeh 4-16-89

OBSERVATION

PLANT: Pilgram NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.1c
 CL TITLE: Visual Displays
 BOARD TITLE: Rx Clinup

R. Sabeh
 EVALUATOR

HED#: 5B071
 HED#: 8.5.831
 DATE: 2-8-84 REV:
 HED CATEGORY: B
 BOARD#: 004

HED DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Unnecessary Information):
 Indicator Lights #870 and 871 not needed or used.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Occupies valuable panel space.

RECOMMENDED REVISION

Remove light indicators.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/89

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study with 4B048, to determine if lites are in use.

MANAGEMENT REVIEW

CHAIRMAN W. Zabala DATE 5/22/89

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Pat Utne 9/18/84
 WJ Baluk 4/18/84
 C. Brennan 4/18/84
 R. Sabeh 4-18-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.2.3
 CL TITLE: Visual Displays
 BOARD TITLE: All

R. Sabeh
 EVALIATOR

HED#: SB111
 HED#: 6.5.038
 DATE: REV:
 HED CATEGORY: B
 BOARD#: All

DESCRIPTION

Majority of instrument faces

GUIDELINE- ZONE MARKINGS:
 There are ~~no~~ zone markings on the instrument faces to identify operating ranges, upper or lower limits and danger zones used throughout the control room. Markings were applied w/o use of a standard criteria.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error to identify operating ranges, limits or danger zones

RECOMMENDED REVISION

Study the use of zone markings for meter faces to enhance operator identification of operating ranges, limits and danger zones

RECOMMENDED IMPLEMENTATION

- [] PRIOR TO OR AT NEXT REFUELING
- [] AT CONVENIENT OUTAGE
- [] AT EARLIEST OPPORTUNITY
- [] NON-MANDATORY

[X] Des. Impr. Study.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/18/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study to determine the standards for zone markings to be used, and which displays require this type of enhancement.

MANAGEMENT REVIEW

CHAIRMAN WJ Baluk DATE 5/22/84

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

*W. Balank report
of Benin 9/19/84
R. Sabeh 4-19-84*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pllgrim NPS
TASK: Control Room Survey
CL: 6.5
CL ITEM: 9.5.1.3a
CL TITLE: Visual Displays
BOARD TITLE: RX CLG
HEO#: 5B119
HEO#: 6.5.040
DATE: 4/19/84
REV:
HEO CATEGORY: B
BOARD#: 983

HEO DESCRIPTION

GUIDELINE - READABILITY (CHARACTER HEIGHT):
The character heights on meter #601 and 610 do not subtend
a visual angle of 15 minutes of arc

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in reading
the meter values

RECOMMENDED REVISION

Increase the size of the character heights on meters
601 and 610

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
NON-MANDATORY

[X] Des. Impr Study

TECHNICAL REVIEW

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Include in panel improvement
study. Recommend that meters be procured that
match the remainder of the control boards.*

CHAIRMAN: Bob Arnold DATE: 4/19/84

MANAGEMENT REVIEW

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

CHAIRMAN: W. Balank DATE: 5/22/84

Comment/Note/Reason:

Bob Arnold 4/19/84
WJ Sabeh 4/19/84
Cl Breunig 4/15/84
R Sabeh 4-19-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION:

PLANT: Pilgrim NPS | R. Sabeh | HED#: 5B124
TASK: Control Room Survey | EVALUATOR | HED#: 6.5.041
CL: 6.5 | CL ITEM: 6.5.1.1c | DATE: 4-19-84 | REV:
CL TITLE: Visual Displays | HED CATEGORY: B
BOARD TITLE: Rx CLG | BOARD#: 903

HED DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Unnecessary Information):
The amber lights on instruments 720, 721, 760, 761 are disconnected and their function removed.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Unnecessary information interferes with and degrades operator performance.

RECOMMENDED REVISION

Remove the disconnected amber lights.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONVENIENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

- [] Concur.
- [x] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study

MANAGEMENT REVIEW

CHAIRMAN W Sabeh DATE 5/22/84

- [x] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

6/5/84
Wally Balent
6/5/84

OBSERVATION

EVALUATOR	TOPIC _____	HED#: <i>5B127</i>
	_____	HED#: <i>6.5.043</i>
TASK:	_____	DATE: <i>6/1/84</i> REV: _____
CL:	CL ITEM: _____	HED CATEGORY: <i>B</i>
CL TITLE:	_____	
CONTROL BOARD LOCATION	_____	

HED DESCRIPTION

GUIDELINE-

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

SUGGESTED CORRECTIVE ACTION

AIT REVIEW

- CHAIRMAN *S. Luna* DATE *6/5/84*
- Concur.
- Concur With Comment/Note.
- Do Not Concur for Following Reason:

The AIT recommends inclusion of the DRT recommendation with the overall meter scale improvement effort

RECOMMENDED IMPLEMENTATION

- PRIOR TO OR AT NEXT REFUELING
- AT CONVENIENT OUTAGE
- AT EARLIEST OPPORTUNITY
- NON-MANDATORY

MANAGEMENT REVIEW

- CHAIRMAN *W. Balent* DATE *6/7/84*
- Concur.
- Concur With Comment/Note.
- Do Not Concur for Following Reason:

[x] panel improvement study (meter scales)

Figure 6-1. Human Engineering Observation Assessment.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Baluk 6/10/84

OBSERVATION

PLANT: Pilgrim NPS | E. Gagnon/R. Seteh | HED#: *SB L3X 6 unit 6-21-84*
 TASK: Verif./Valid. | EVALUATOR | HED#: 6.5.045
 CL: 6.5 | CL ITEM: 6.5.1.2d(1) | DATE: 6/6/84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: *B*
 BOARD TITLE: Rx Control | BOARD#: 906

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Scale Range):
 The cooling water flow in the CRD hydraulic system is 765 gpm but the flow indicator range, 1191, is 0-50 gpm.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time and probability of error in determining CRD cooling water flow.

RECOMMENDED REVISION

Replace the scale on 1191 w/ one that has a range to suitably accommodate 65 gpm.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Panel Improvement Study

TECHNICAL REVIEW

CHAIRMAN *S. Lucas* DATE *6/8/84*

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Determine proper cooling flow range and provide meter with a scale to cover the proper operational range. This item should be included in the panel improvement design implementation effort.

MANAGEMENT REVIEW

CHAIRMAN *W. Baluk* DATE *6/11/84*

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

*2nd Mgt. Team meeting 9/10/84:
 Off-scale meter caused by defective CRD's (too much flow). These have now been repaired. Flow is down to less than 50 gpm. No changes needed;
 W.B.*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

22/01107
 of Bureau 6/8/84
 W. Balwick 6/8/84

OBSERVATION

PLANT: Pilgrim NPS | E. Gagnon/R. Sabeh | HED#: 58133
 TASK: Verif./Valid. | EVALUATOR | HED#: 6.5.047
 CL: 6.5 CL ITEM: 6.5.1.1.b DATE: 6/5/84 REV:
 CL TITLE: Visual Displays HED CATEGORY: B
 BOARD TITLE: Rx CLNUP, PAM BOARD#: 904, C171

HED DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Completeness of Information):
 Monitoring SP pressure for EOP entry and decision points therein
 requires a range of 0-60 psig. SP pressure is available on 882
 (panel 904), having a range of -1.0 to +2.0 PSID, or by combining
 DW/SP Delta-P, 883 (panel 904), with DW pressure, 1329 or 1330
 (panel C171).

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time and probability of error in monitoring SP pressure
 during emergency events leading to critical safety functions not
 being maintained.

RECOMMENDED REVISION

Provide SP pressure indicators in the primary operating area
 covering the range of 0-60 psig.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [x] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Panel Improvement Study

TECHNICAL REVIEW

CHAIRMAN S. Luna DATE 6/8/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

include in panel layout design
implementation study to determine
best location for added meter (Probat
on C904)

MANAGEMENT REVIEW

CHAIRMAN W. Balwick DATE 6/11/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS | E. Gagnon/R. Sabeh | HED#: 58134
 TASK: Verif./Valid. | EVALUATOR | HED#: 8.5.048
 CL: 8.5 | CL ITEM: 8.5.1.2b | DATE: 6/5/04 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: B
 BOARD TITLE: Rx Control | BOARD#: 906

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion):
 The plaque, 2004, defining reactor power level vs. IRM channel range position
 specifies reactor power in KWT or MWT whereas operator decision points in
 the EDPs require % power. Thus the operator must work with 2 different sets
 of power units during emergency events.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time and probability of error in reading and responding
 to reactor power.

RECOMMENDED REVISION

Change reactor power units on 2004 to %.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN W. Baluk DATE 6/11/04

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Add to nameplate study.

Note: neither nameplate nor meter
 scales may have the correct
 units. EOP's may have
 to be changed also. May
 require G.E. input.

MANAGEMENT REVIEW

CHAIRMAN W. Baluk DATE 6/11/04

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Design Improvement Study (labels, etc.)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 W Zaburk 4/17/84
 Ch Brennan 4/17/84
 R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.1.1
 CL TITLE: Labels and Location Aids
 BOARD TITLE: ADG, Contmt Vent, R Cooling, Rx Clean-up
 R. Sabeh EVALUATOR
 IED#: 6B072
 HED#: 8.8.001
 DATE: 1-26-84 REV:
 IEO CATEGORY: B
 BOARD#: CP800, C7, 903, 904

HED DESCRIPTION

GUIDELINE- NEED FOR LABELING:
 Labels on Panel CP800: #488, 485 missing.
 Panel C7: #1454, 1455, 1448 have operator notation to indicate the label is in error.
 Panel 903: #581 should be relabeled torus air temperature, ⁶¹⁰ f601 have no label
 Panel 903 and 904: #826 and 842 no direction for increase.
 This observation is supported by DER-037 and DER-042.
~~All labels on C170/171 Unit C-21-u~~

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time needed for control identification and activation.

RECOMMENDED REVISION

Install appropriate labels on instruments and controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/Mimic/demarcation study. Add all labeling on C170/171. These should be checked for accuracy.

MANAGEMENT REVIEW

CHAIRMAN W Zaburk DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W. Babcock 4/17/84
R. Sabeh 4/17/84
R. Sabeh 4-17-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.1.2a,b
 CL TITLE: Labels and Location Aids
 BOARD TITLE: All

R. Sabeh
EVALUATOR

HED#: 68073
 HEO#: 8.8.002
 DATE: 1-25-84 REV:
 HEO CATEGORY: B
 BOARD#: All

HEO DESCRIPTION

GUIDELINE- HIERARCHICAL SCHEME:
 The limited hierarchical labeling does not adequately satisfy these guideline criteria.
 This observation is supported by OER-041.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases confusion, search time, redundant label content and probability of error in reading functionally related controls and instruments.

RECOMMENDED REVISION

A hierarchical labeling study should be conducted to result in an improved overall labeling arrangement.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des Impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arn. 4/11/84
 W. Babuk. 4/17/84
 Ch. Bremner 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.2.1a
 CL TITLE: Labels and Location Aids
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 6 B074
 HED#: 8.8.2.1a
 DATE: 1-26-84 REV:
 HED CATEGORY: B
 BOARD#: All

HED DESCRIPTION

GUIDELINE- PLACEMENT (Normal Placement):
 Labels not placed above their associated controls are:
 Panel CP800: #472, 473, 500, 501, 527, 528, 518, 519, 529.
 Panel 903: #604, 608, 587, 502, 594, 599, 591.
 Panel 904: #1005, 1022, 836, 866, 868, 880.
 Panel 905: #1285, 1266, 1299, 1300, 1302, 1305, many pushbuttons.
 Panel C1: #26, 27, 46, 48, 56, 57.
 Panel C4: #1520 thru 1528

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Label may be obscured during control actuation and increase probability of error.

RECOMMENDED REVISION

Relocate labels above controls and displays.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Babuk DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W Babink 4/17/84
 C. Krenn 4/17/84
 R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B075
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.004
 CL: 8.8 | CL ITEM: 8.8.2.1L | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HEO CATEGORY: B
 BOARD TITLE: A11 | BOARD#: A11

HEO DESCRIPTION

GUIDELINE- PLACEMENT (Panel Labeling):
 All display labels are placed below the instrument and does not conform to guideline criteria.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Difficult to associate label with instrument, resulting in increased response time and the probability of error.

RECOMMENDED REVISION

Relocate labels above each instrument.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

CRJ Des. Impr. study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W Babink DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:
Mgt. Team not sure if this should be done - what advantage after 10 yrs. of operation? If study can show legitimate HFE reasons why it is better to have labels above then change will be considered.

Note by P.I.: This seems to be a power industry standard (labels below).

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 of Wrennion 9/17/89
 W Balank 4/17/84
 R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B076
 TASK: Control Room Survey | EVALUATOR | HED#: 6.6.006
 CL: 6.6 | CL ITEM: 6.6.3.3a,b | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: All | BOARD#: All

HED DESCRIPTION

GUIDELINE- CONSISTENCY (Internal Consistency and Consistency with Procedures):
 No standard list of abbreviations or acronyms is used on the labels, e.g.,
 PREHEATER/PREHTR, BLOCK/BLK, HYDROGEN/H2
 This observation is supported by DER-839.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in label reading.

RECOMMENDED REVISION

Conduct a labeling study to standardize the use of label terminology. This study can be incorporated with the study recommended under HED-6.6.002.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/Mimic/demarc. study. The acronym list must be integrated with the annunciator and panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN W Balank DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

J. Brown 9/17/89
R. Sabeh
W. Babcock 9/17/89

OBSERVATION

PLANT: Pilgrim MPS | R. Sabeh | HED#: 6B077
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.007
 CL: 8.8 | CL ITEM: 8.8.3.6 | DATE: 1-26-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: All | BOARD#: All

HED DESCRIPTION

GUIDELINE- BREVITY:
 There is an inconsistency in labeling, Some labels use complete words for abbreviations that are in common usage by operators, e.g., RCS/Reactor Cooling System. This observation is supported by DER-039.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to read labels.

RECOMMENDED REVISION

Reword labels using standard and common abbreviations and acronyms.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/22/89

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 W. Babuk 5/22/84
 J. Brennan 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B078
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.008
 CL: 8.8 | CL ITEM: 8.8.3.7 | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: Rx, CLG | BOARD#: 983

HED DESCRIPTION

GUIDELINE- FUNCTIONAL GROUPS (Functional Relationship and Location):
 Controls for fast start-up test and fast injection procedures require a set of control actuations in sequential series. The controls associated with these sequential actions are scattered across the subpanel requiring the operator to search for proper controls in sequence. This observation is supported by OER-036. ↑

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in activating proper control sequence.

RECOMMENDED REVISION

Code the controls to provide the operator an aid for identifying the control sequence actions for fast startup.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ENHANCEMENT

[x] Design Improvement Study (labels, etc.)

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Refers to HPCI fast start-up only. Include with ^{who}

MANAGEMENT REVIEW

CHAIRMAN W. Babuk DATE 5/22/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Put in label, mimic, nameplate study.
Add other systems to study review, such as RCIC and/or RHR.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W Babcock 7/17/84
of Beeman 4/17/84
R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B079
 TASK: Control Room Survey | EVALUATOR | HED#: 6.8.009
 CL: 6.8 | CL ITEM: 6.8.3.8b | DATE: 2-10-84 | REV:
 CL TITLE: Labels and Locations Aids | HED CATEGORY: B
 BOARD TITLE: | BOARD#: CP000, 903, 904, C1

HED DESCRIPTION

GUIDELINE- CONTROL POSITION LABELING (Direction):
 The direction of movement does not conform to convention on:
~~Panel CP000, #472, 473~~
 Panel 903: #628, 599
 Panel 904: #842, 945, 951, 952, 958
 Panel C1: #45, 46, 48 (turn left to increase temperature)
 Panel C7: #1448, 1454, 1455, 1413; operator pencil markings indicate
 directions differ from labels
 Panel C3: #366, 372, 377, 380
 This observation is supported by OER-024.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in making control movements.

RECOMMENDED REVISION

Change switch direction of movement to conform with convention and label appropriately.
 This observation is included under HED 6.4.005.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BUB ARNOLD DATE 4/17/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in the Panel Improvement Study with 4B048

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Coordinate with label study.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Post Unroll 4/17/84
 W. Brown 4/17/84
 al Bremner 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.6 CL ITEM: 8.6.4.1a
 CL TITLE: Labels and Location Aids
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HEO#: 6B080
 HEO#: 8.6.010
 DATE: 1-25-84 REV:
 HEO CATEGORY: B
 BOARD#: All

HEO DESCRIPTION

GUIDELINE- READABILITY (Character Height):
 Character heights are not consistent, e.g., Panel C3 - #411, 415, 421, 423.
 Also Panel C2: #148, 155. The smaller character size does not meet guideline
 criteria.
 This observation is supported by OER-038.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary to identify the instruments and controls.

RECOMMENDED REVISION

Conduct a labeling study to standardize on label sizes this effort should be
 included with the hierarchical study recommended under HEO 8.6.002.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/
 demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Balenk DATE 5/22/84

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. J. ... 4/17/84
 Cl. Brennan 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 63081
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.011
 CL: 8.8 | CL ITEM: 8.8.4.1b(1) | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: AII | BOARD#: AII

HED DESCRIPTION

GUIDELINE- READABILITY (Contrast):
 All labels are white characters on black or dark background. This does not conform with the guideline criteria and contributes to the observation reported under HED 8.8.005.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time required for reading labels.

RECOMMENDED REVISION

Revise labels to use dark (black) characters on a light (white) background. This observation should be included with the study recommended in HED 8.8.002 and 8.8.009.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in label/mimic/demarcation study. Also includes labels on switch escutcheons.

MANAGEMENT REVIEW

CHAIRMAN W. J. Baluk DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 W Balwick 4/17/84
 A Brenner 4/17/84
 Labels 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 68082
 TASK: Control Room Survey | EVALUATOR | HED#: 8.6.012
 CL: 8.6 | CL ITEM: 8.6.6.1a,b | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- USE (Necessity and Human Factors Practices):
 Temporary labels have been on the panels for an extended period of time, e.g., many dynotape labels as on Panel C3: #246, 247, 248 annunciators or C170: #450, 451, 452, 453, 454, 455, 456, 457, 1340, 1341, 1342, 1343, 1344, 1345, 1347, 1338. On Panel C7 operators have penciled in label identification which conflicts with permanent label, e.g., #1454.
 This observation is supported by OER-040.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time required for reading labels.

RECOMMENDED REVISION

Provide permanent labels on indicators and controls.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Dev. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in label/mimic/demarcation study. The study should result in the removal of all temporary labels, except for maintenance labels.

MANAGEMENT REVIEW

CHAIRMAN W Balwick DATE 5/22/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Add all switches on panel C1 which have Dymotape position labels.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

of Brennan 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.6.1h
 CL TITLE: Labels and Location Aids
 BOARD TITLE: Cntnt Vent

R. Sabeh
 EVALUATOR:

HED#: 6 B083
 HED#: 6.8.016
 DATE: 1-25-84 REV:
 HED CATEGORY: B
 BOARD#: C7

HED DESCRIPTION

GUIDELINE- UE (Adjacent Devices):
 Panel C7 - #1433 covers labels on #1440.
 Assessment of this criteria is limited because the tags were removed during panel photography.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary for identifying controls.

RECOMMENDED REVISION

Initiate a procedure that instructs proper method of installing tag-outs so that adjacent devices or labels are not obscured.

RECOMMENDED IMPLEMENTATION

WAK PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Enhancement

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 9/17/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Request operations to change the two tags on C7 to the new type tag.

MANAGEMENT REVIEW

CHAIRMAN WR Sabeh DATE 5/22/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

ILMAN ENGINEERING OBSERVATION ASSESSMENT

100000000 4/11/84
 e. et 4/11/84
 of Bureau 4/17/84
 R. Sabah 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabah | HED#: 6B084
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.010
 CL: 8.8 | CL ITEM: 8.8.8.2c | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: See Below | BOARD#: See Below

HED DESCRIPTION

GUIDELINE- DEMARCATION (Permanence):
 Stick-on tape is used for most of the demarcation lines on
 Panels #903, 904, C1, CP000

Board Title: Rx CLG, Rx Cinup, FW & Cond, AOG

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Tape could fall off resulting in loss of demarcation value.

RECOMMENDED REVISION

Replace with a more permanent demarcation line. The favorable comments received during the OER suggests that the panels should include more demarcation.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/
demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

11/11/87
 J. Brennan 4/17/89
 R. Sabeh 4-14-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 68085
 TASK: Control Room Survey | EVALUATOR | HEO#: 6.8.017
 CL: 6.8 | CL ITEM: 6.8.0.3 | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HEO CATEGORY: B
 BOARD TITLE: See below | BOARD#: See below

HEO DESCRIPTION

GUIDELINE- COLOR:
 Colors are not associated with specific functions.
 Board Title: Rx CLG, Rx CInup, FW & Cond, Electrical, PAM, Cntmt Vent
 Board No.: #903, 904, C1, C3, CP800, C7

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Minimizes the value of color coding.

RECOMMENDED REVISION

Investigate the use of color to aid in function identification.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study to make a color standard, and coordinate with the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/22/89

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 WBabcock 4/17/84
 Brennan 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B086
 TASK: Control Room Survey | EVALUATOR | HED#: 6.8.018
 CL: 6.8 | CL ITEM: 6.8.0.4a(2) | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: Electrical | BOARD#: C3

HED DESCRIPTION

GUIDELINE- USE OF MIMICS (Color):
 The mimic lines on Panel C3 are not color discriminative.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary for following the mimic.

RECOMMENDED REVISION

Provide color discriminable mimic.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN WBabcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Baluk 4/17/84
Ch. Bremier 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.6 CL ITEM: 8.6.6.4a(3)
 CL TITLE: Labels and Location Aids
 BOARD TITLE: Electrical

R. Sabeh
 EVALUATOR

HED#: 6 B08 7
 HEO#: 8.6.010
 DATE: 1-25-84 REV:
 HEO CATEGORY: B
 BOARD#: C3

HEO DESCRIPTION

GUIDELINE- USE OF MIMICS (Color):
 Mimic lines on Panel C3 do not have adequate color contrast with the panel surface.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the response time and probability of error in following the mimic lines.

RECOMMENDED REVISION

Provide color contrasting mimic lines.
 This HEO should be considered with HEO 8.6.010.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN W. Baluk DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 W. Baluck 4/17/84
 R. Sabeh 4/17/84
 U-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B088
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.020
 CL: 8.8 | CL ITEM: 8.8.8.4b(4) | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: Rx, CLG | BOARD#: 903

HED DESCRIPTION

GUIDELINE- USE OF MIMICS (Color):
 The origin of all lines for the containment isolation mimic are not clear.
 This observation is supported by OER-044.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Introduces confusion and reduces the value of the mimic.

RECOMMENDED REVISION

Correct mimic indicator lines and incorporate a set of lights to identify the type of isolation signal.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

LES Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demarcation string, to consider replacing the mimic with one that provides more useful data, arranged in an easy to use manner.

MANAGEMENT REVIEW

CHAIRMAN W Baluck DATE 5/22/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*w/submit 11/17/84
of Brenni 2/17/89
R labels 4-17-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.6 CL ITEM: 8.6.3.35
 CL TITLE: Label and Location Aids
 BOARD TITLE: Electrical

R. Sabeh
EVALUATOR

HED#: 6B089
 HED#: 8.6.021
 DATE: 2-3-84 REV:
 HED CATEGORY: B
 BOARD#: C3

HED DESCRIPTION

GUIDELINE- INTERNAL CONSISTENCY:
 The bus indicator numbers do not increase progressively (#240 out of sequence).
 In addition, two different colored light caps are used.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the response time and probability of error in identifying the proper bus.

RECOMMENDED REVISION

Renumber the bus indicators to increase progressively.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONCURRENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN w Sabeh DATE 5/22/89

Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
 WJ Sabeh 4/17/84
 J. Bernier 4/17/84
 R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B090
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.022
 CL: 8.8 | CL ITEM: 8.8.3.3c | DATE: 2-8-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: Rx CLG, Rx Clnup | BOARD#: 903, 904

HED DESCRIPTION

GUIDELINE- CONSISTENCY (With Procedures):
 Panel 903: Containment spray Signal label #755 and 770 should be changed to
 Containment Spray Permissive. *885, 886 and*
 Panel 904: Display #887 reads pounds/hr times 10 to the 8th and Procedure
 2294 (pg 18) indicates gal/min.
 Panel C2: *168* reads in mills; the instructions (2.2.99) reads
in inches

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error to determine water flow through
 the jet pumps.

RECOMMENDED REVISION

Panel 903: Change labels.
 Panel 904: Change the procedure labels.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/stem mimic/
 demarcation study

MANAGEMENT REVIEW

CHAIRMAN WJ Sabeh DATE 5/21/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

of Brennan 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B091
 TASK: Control Room Survey | EVALUATOR | HED#: 6.6.026
 CL: 6.6 | CL ITEM: 6.6.3.3b | DATE: 2-3-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: Rx Cleanup, Elec. | BOARD#: 984, C3

HED DESCRIPTION

GUIDELINE- CONSISTENCY (Internal Consistency):
 Labels for #992 and 1008 are different but the controls perform the same function. Label working on controls #429 and 430 is confusing to relate to control function on panel C3.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Confuse the operator and increase the probability of error.

RECOMMENDED REVISION

Relabel controls to be consistent.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr Study

TECHNICAL REVIEW

CHAIRMAN: BOD ARNOLD DATE 4/17/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Concur with switches on 904 panel. These two (#992 and 1008 need to be revised) Include in labeling/mimic/demarcation study to determine need for small label on switch escutcheions on panels C3 and C1, C2 as well

MANAGEMENT REVIEW

CHAIRMAN W Babuk DATE 5/22/89

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/17/84
in progress 4/17/84
at Mission 4/17/84
R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 6B092
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.028
 CL: 8.8 | CL ITEM: 8.8.1.1 | DATE: 2-3-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: FW & Cont, Turbine, AWCU, Recirc | BOARD#: C1, C2, 904

HED DESCRIPTION

GUIDELINE- NEED FOR LABELING:
 Panel C1: Labels for lights above #38 and 37 are missing.
 Panel C2: 4 lights associated with control #231 do not have labels.
 Panel 904: Labels on # 888 & 913 are missing

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Confusion and increases probability of error in relating switch position to indicators.

RECOMMENDED REVISION

Label the lights above controls #38, 37 and #231.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des impr. study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in labeling/mimic/demarcation study.

MANAGEMENT REVIEW

CHAIRMAN Bob Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Brennan 4/19/84
R. Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 68120
 TASK: Control Room Survey | EVALUATOR | HED#: 6.6.028
 CL: 6.6 | CL ITEM: 6.6.3.8a | DATE: 4/18/84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: B
 BOARD TITLE: All | BOARD#: All

HEO DESCRIPTION

GUIDELINE- CONTROL POSITION LABELING (POSITION):
 The functional control positions are worn off or have never been etched on the control plate (escutcheon) for a large number of switches

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in identifying control position

RECOMMENDED REVISION

Replace or etch control plates with functional control position (escutcheon)

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/14/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic/demercation study.

MANAGEMENT REVIEW

CHAIRMAN W. Brennan DATE 5/22/84

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

WOLFEVILLE 7/1/84
 Gal. N. 3, 1, 1, 89
 of Program 9/19/89
 B. Sabeh 4-19-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.6
 CL ITEM: 6.6.1.1
 CL TITLE: Labels and Location Aids
 BOARD TITLE: PAM
 EVALUATOR: R. Sabeh
 HED#: 6.6.029
 DATE: 4/18/84
 HED CATEGORY: B
 BOARD#: C170 and C171
 REV:

CHAIRMAN BOB ARNOLD DATE 4/19/84

- TECHNICAL REVIEW
- Concur.
 - Concur With Comment/Note.
 - Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label/mimic demarcation study. Temporary labels have been affixed to these switches because the labels on the escutcheons are too small to read.

- SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time and the probability of error in selecting the proper valve

RECOMMENDED REVISION

Install labeled name plates to identify valve functions

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

EA Des. Impr. Study

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN W. Sabeh DATE 5/22/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4/19/84
 Ch. Brennan 4/19/84
 R. Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.6 CL ITEM: 6.6.1.1
 CL TITLE: Labels
 BOARD TITLE: Rx CLG,PAM

R. Sabeh
 EVALUATOR

HED#: 6B125
 HED#: 6.6.030
 DATE: 4-19-84
 HED CATEGORY: B
 BOARD#: 903,C:71

HED DESCRIPTION

GUIDELINE- NEED FOR LABELING:
 The red and green lights associated with valve controls 720,721,750,751 indicate valve position command as opposed to valve position for all other valve controls in the control room. Valve position is indicated on panel C171, instrument 1330.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in responding to relief valve operation.

RECOMMENDED REVISION

Provide labels indicating that the green and red lights are ~~valve~~ solenoid positions only (valve position command).
open
Lights if power available

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/19/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Coordinate with label study.

Bob Arnold 4/12/84
 WTBalunk 4/14/84
 R. Sabeh 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.3.2b
 CL TITLE: Panel Layout
 BOARD TITLE: Rx Clnup, Rx Cont

EVALUATOR: R. Sabeh
 HED#: 83094
 HED#: 6.8.002
 DATE: 1-26-84
 REV:
 HED CATEGORY: B
 BOARD#: 904, 905

HED DESCRIPTION

GUIDELINE- STRINGS OR CLUSTERS OF SIMILAR COMPONENTS (String Length):
 Panel 904: 48 pairs of red/green indicator lights produce a display grouping which exceeds length criteria of 20 inches.
 Panel 905: Control rod matrix lights exceed maximum string length criteria of 20 inches.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in identifying specific indicator.

RECOMMENDED REVISION

Provide demarcation lines to reduce operator search time.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] ENHANCEMENT DESIGN IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN DOB ARNOLD DATE 4/12/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the labeling / Demarcation / Mimic design study. There is, at present, no systematic basis to implement these enhancements.

MANAGEMENT REVIEW

CHAIRMAN WTBalunk DATE 5/23/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabink, 4/11/84
 R. Sabink 4-12-84

OBSERVATION

PLANT: Pilgrim MPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.3.2c(1,2) DATE: 1-25-84 REV:
 CL TITLE: Panel Layout HED CATEGORY: B
 BOARD TITLE: Rx Clnup, Rx Cont, Electrical, Contmt Vent BOARD#: 904, 905, C3, C7

HED DESCRIPTION

GUIDELINE- STRINGS OR CLUSTERS OR SIMILAR COMPONENTS (Number of Components):
 Components that exceed 5 in a row or column are:
 Panel 904: Secondary containment lights.
 Panel 905: Control rod drive indicators. 1187 thru 1193
 Panel C3: Diesel generator indicators for A and b. Canal and Bridgewater line indicators.
 Panel C7: Controls #1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1485, 1486, 1467, 1468, 1469, 1470, 1471.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in component identification.

RECOMMENDED REVISION

Provide demarcation lines to reduce operator search time.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Design Impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the labeling, mimic, demarcation study. No systematic methodology exists at the present time.

MANAGEMENT REVIEW

CHAIRMAN W. Sabink DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/12/84
 W. Babuk 4/12/84
 R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.3.3
 CL TITLE: Panel Layout
 BOARD TITLE: FW & Cond, Electrical, Rx Ctl

R. Sabeh
 EVALUATOR

HED#: 8B097
 HEO#: 6.8.005
 DATE: 1-25-84 REV:
 HED CATEGORY: B
 BOARD#: C1, C3, 905

HEO DESCRIPTION

GUIDELINE- MIRROR IMAGING:
 Panel C1: Loop A and B for RBCCW and TBCCW are mirror imaged.
 Panel C3: Diesel generator A and B controls are mirror imaged. # 359 and 369
 Panel C3: UAT and startup transfer controls ~~are~~ mirror imaged.
 Panel 905: #1107/1108 mirror imaged with 1102/1103 and their associated controls.
 This observation is supported by OER-045.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the response time and the probability of error in control display manipulation.

RECOMMENDED REVISION

Relocate controls and displays to reduce probability of error.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [x] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] Des: Impr. study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend a design improvement study to consider the significance of mirror imaging problems and recommend ^{alternative} solutions to significant problems.

MANAGEMENT REVIEW

CHAIRMAN W. Babuk DATE 5/22/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Add to panel improvements study.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8
 CL TITLE: Panel Layout
 BOARD TITLE: Rx Cleanup

R. Sabeh
 EVALUATOR

HED#: 85098
 HEO#: 6.8.008
 DATE: 1-25-84
 HEO CATEGORY: B
 BOARD#: 904

HEO DESCRIPTION

GUIDELINE- SEQUENCE FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS
 (Functional Considerations):
 Cleanup controls #966, 967, 968, 969, 970, 971 separate controls #976, 977, 978, 979, 980, 981, 983, 984, 985, 986, 987, 988, 989, 990, 991.
 This observation is supported by OER-022.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error for control selection and activation.

RECOMMENDED REVISION

Reposition cleanup controls 966 thru 971 to eliminate separation of systems. This HEO is the same as HEO 6.8.009.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

Add to panel improvement study to determine a new location for H₂/O₂ controls. They do not belong on 904. Also switch type is the wrong type for these controls (should be CR2990). Also consider control #'s 944, 962, 963 & 964 for relocation

~~Ex-Design Change~~
 Panel Improvement Study

Note: H₂/O₂ controls are item #'s 972 thru 991

BH Apr 10 4/10
 W Zablocki 4/12/84
 R Sabeh 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.1.3a
 CL TITLE: Panel Layout
 BOARD TITLE: Rx Cont
 HED#: 8P.059
 HED#: 6.8.007
 DATE: 1-25-84 REV:
 HED CATEGORY: B
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- ENHANCING RECOGNITION AND IDENTIFICATION (Spacing):
 Set of controls for recorders #1107/1108 and #1162/1163 are not separated to
 indicate boundaries.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in control selection.

RECOMMENDED REVISION

Separate or provide demarcation between sets of controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Design Impr. Study

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the label, etc,
study

CHAIRMAN Bob Arnold DATE 4/12/84

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN W Zablocki DATE 5/02/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WBaluck 4/12/84
 R Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.1.3d
 CL TITLE: Panel Layout
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 6B100
 HEO#: 6.8.010
 DATE: 2-8-84 REV:
 HED CATEGORY: B
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- ENHANCEMENT RECOGNITION AND IDENTIFICATION (Emergency Controls):
 No distinctive enhancements are used for emergency controls.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in selecting proper control.

RECOMMENDED REVISION

Provide enhancement recognition for emergency controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[E] Design Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in label, etc design improvement study.

Note: The committee is unsure as to interpretation of NRC guidelines.

MANAGEMENT REVIEW

CHAIRMAN WBaluck DATE 5/28/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Agree to study, but looks like only a few controls could benefit. Study may clarify uncertainty.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W Babcock 5/14/84
R Sabeh 5-12-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.2.1a(3)
 CL TITLE: Panel Layout
 BOARD TITLE: Rx Control CNTMT CL6, FW-COND

EVALUATOR: R. Sabeh
 HED#: 813101
 HED#: 8.8.011
 DATE: 2-8-84 REV:
 HED CATEGORY: B
 BOARD#: 903, C1

HED DESCRIPTION

GUIDELINE- SEQUENCE, FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS
 (Sequence of Use):
 Operator must activate controls #768 and 753 on Panel 903 then go to Panel C1
 to activate controls #101, 108, or 121, 124.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary to perform tasks resulting from operator movement
 within the control room.

RECOMMENDED REVISION

Relocate controls on panel C1 to Panel 903.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Design study improvement study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend no action until
SFTA report identifies effects of this
observation, at which time a design improvement
study will be initiated.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

of Brannia 4/17/84
R Sabeh 4-17-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS

EVALUATOR
K. Sabeh

HED#: 88102

TASK: Control Room Survey

HED#: 6.8.012

CL: 6.8

DATE: 2-8-84

REV:

CL TITLE: Panel Layout

HED CATEGORY: B

BOARD TITLE: Rx Cinup, Rx Cont.

BOARD#: 904, 905, 921

HED DESCRIPTION

GUIDELINE- SEQUENCE, FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS

(Functional Considerations):

Recorder 1171 on Panel 905 and recorders 814 and 898 on Panel 904 values must be taken along with #1R263-104 on Panel 921 every 15 minutes, during heating of Core-Coin Instrument #014 on Panel 903 used with instruments #861, 862, 863 on Panel 904.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases response time due to excessive operator movement to and from the back panels.

RECOMMENDED REVISION

Relocate the recorder on Panel 921 to Panel 904 and relocate display #614 on panel 904 with # 861, 862 and 863.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[] Des Impr study

TECHNICAL REVIEW

[] Concur.

[X] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study.

CHAIRMAN DOB ARNOLD DATE 4/17/84

MANAGEMENT REVIEW

[] Concur.

[X] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Plant computer project to be consulted to see if computer can process these signals more efficiently.

CHAIRMAN W Babak DATE 5/22/84

*P. Arnold 4/17/84
W. Sabeh 4/17/84
Chairman 4/17/84
Sabeh 4-17-84*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel Improvement Study to come up with criteria to control panel layout.

MANAGEMENT REVIEW

CHAIRMAN W Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

OBSERVATION

PLANT: Pilgrim NFS HED#: 8B103

TASK: Control Room Survey EVALUATOR: R. Sabeh HED#: 6.8.015

CL: 6.8 CL ITEM: 6.8.2.2a DATE: 2-3-84 REV:

CL TITLE: Panel Layout HED CATEGORY: B

BOARD TITLE: Turbines, Rx CLG BOARD#: C2, 903

HED DESCRIPTION
 GUIDELINE- LOGICAL ARRANGEMENT AND LAYOUT (Order and Labeling):
 Panel C2: #218, 219, 227, 228 are not arranged in a logical sequence. also 231, 233
 Panel 903: Controls #750 and 751 do not follow sequentially.
On Panel 603, controls #750 and 751 do not follow sequentially.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to select proper pump controls and increase the probability of error.

RECOMMENDED REVISION

Reposition the controls into a logical sequence of left to right and top to bottom and reverse control locations on Panel 903.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Des. Impr. Study.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Balow 4/18/84
C. Blum 4/18/84
R. Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.2.1a(1)
 CL TITLE: Panel Layout
 BOARD TITLE: Rx Cleanup

R. Sabeh
 EVALUATOR

HED#: 8B105
 HED#: 6.8.017
 DATE: 3-19-84 REV:
 HED CATEGORY: B
 BOARD#: 904

HED DESCRIPTION

GUIDELINE- SEQUENCE, FREQUENCY OF USE, AND FUNCTIONAL CONSIDERATIONS (Sequence):
 The Primary & Secondary containment Isolation status lights are positioned right-to-left and labels numbered from bottom-to-top.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time & the probability of error in identifying containment isolation status.

RECOMMENDED REVISION

Reposition status lights & re-number labels to be used in a left-to-right and top-to-bottom sequence.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study

MANAGEMENT REVIEW

CHAIRMAN W. Balow DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Paul Arnold 4/19/84
 W. Sabeh 4/19/84
 J. Brennan 4/19/84
 R. Sabeh 4-19-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 8B122
 TASK: Control Room Survey | EVALUATOR | HED#: 6.8.018
 CL: 6.8 | CL ITEM: 6.8.2.3a | DATE: 4/18/84 | REV:
 CL TITLE: Panel Layout | HED CATEGORY: B
 BOARD TITLE: RX CLG, Turbine, FW & Cond | BOARD#: 903, C2 & C1

HED DESCRIPTION

GUIDELINE- LAYOUT CONSISTENCY (REPEATED FUNCTIONS):
 The meters on HPCI and RCIC are not in the same sequence.
 Meter #585 and 586 on HPSI and 831 and 832 are reversed.
 The indicator lights for 138, 139, 140, 141, 150, 151, 152, 153, 154, 155, 156,
 157, 158, 159, 160, 161, 162, 163 and 164 on panel C2 are not in the same layout
 as #2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 on panel C1.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error reading the proper meter

RECOMMENDED REVISION

Relocate the meters so that the meter line up for RCIC is #829, 832, 831 and 830 with the line up for HPCI to be #584, 585, 586 and 583.
 Orient the indicator lights on panels C2 and C1 to be consistent

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/19/84

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel Improvement study.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

PLANT EVALUATOR HED#:
Pilgrim NPS E.Gagnon/R.Sabeh

TASK: HEO
Verif./Valid. 6.8.019

CL: CL-ITEMS DATE: REV:
6.8 6.8.2.1c(1) 5/31/84

CL TITLE: HEO CATEGORY:
Panel Layout

BOARD TITLE: BOARD#:
Reactor Cooling 903

HEO DESCRIPTION

- GUIDELINE- (MA) SEQUENCE, FREQUENCY OF USE, AND FUNCTIONAL CONSIDERATIONS
- (MB) (FUNCTIONAL CONSIDERATIONS):
- (MC) On the suction line from the recirc loop for shutdown cooling using RHR, the
- (NA) inboard isolation valve control (703) is grouped with RHR loop A and the outboard
- (NB) valve (713) with Loop B. These valves are not loop-dependent and are ~ 6 ft
- (NC) apart.
- (OA)
- (OB)
- (OC)
- (PA)
- (PB)

(715)

POTENTIAL OPERATOR ERROR(S)

- (QA) Delay in placing line in service for RHR shutdown cooling operation.
- (QB)
- (QC)
- (RA)
- (RB)

(715)

RECOMMENDED REVISION

- (SA) Relocate 703 and 713 to space available next to 699 (Loop A) or
- (SB) 711 (Loop B) depending on loop preference for RHR shutdown cooling.
- (SC)
- (TA)
- (TB)
- (TC)
- (UA)
- (UB)

6/5/84
 W. J. Armstrong
 6/5/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

CHAIRMAN S.F. Luna DATE 6/5/84

AIT REVIEW

- Concur.
- Concur With Comment/Note.
- Do Not Concur for Following Reasons:

The AIT concurs with HEO description but does not necessarily agree with suggested corrective action. The AIT recommends inclusion of this item in the panel design improvement assessment report & make the panelist be forced review of other key/lock switches with the current

RECOMMENDED IMPLEMENTATION

- PRIOR TO OR AT NEXT REFUELING
- AT CONVENIENT OUTAGE
- AT EARLIEST OPPORTUNITY
- NON-MANDATORY

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Do Not Concur for Following Reason:

Mgt Team's W.J. Armstrong stated that there controls are separated purpose. Panel improvement study should investigate clearer markings or demarcation of these switches.

OBSERVATION

EVALUATOR: _____ TOPIC: _____ HED#: BB 129

TASK: _____ HED#: 68-019

CL: _____ CL ITEM: _____ DATE: 5/31/84 REV: _____

CL TITLE: Panel Layout HED CATEGORY: B

CONTROL BOARD LOCATION: _____

HEO DESCRIPTION

GUIDELINE- _____

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

SUGGESTED CORRECTIVE ACTION

[x] Panel improvement study (903)

operation. The AIT also recommends consideration of other potential errors with the Observation Assessment.

Figure 6-1. Human Engineering

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Cl Bremier 4/18/84
R Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 9B106
 TASK: Control Room Survey | EVALUATOR | HED#: 6.9.003
 CL: 6.9 | CL ITEM: 6.9.3.1a(1) | DATE: 1-26-84 | REV:
 CL TITLE: Control Display Integration | HED CATEGORY: B
 BOARD TITLE: Rx CLG, Rx Clnup | BOARD#: 903, 904

HED DESCRIPTION

GUIDELINE- GENERAL MOVEMENT RELATIONSHIPS (Rotary Controls):
 Panel 903: Control #826 increases clockwise, indicator #829 increases downward.
 Panel 904: Control #842 increases clockwise, indicator #833 increases downward.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in control movement.

RECOMMENDED REVISION

Replace indicators #829 and 833 with ones that increase upward.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: SEE 5B065 FOR SOLUTION.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*Bob Arnold 4/18/84
 WJ Balonik 4/18/84
 Ch Brennan 4/18/84
 R Sabeh 4-18-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.9 CL ITEM: 6.9.1.1c(1)
 CL TITLE: Control Display Relationship
 BOARD TITLE: Rx Cont

R. Sabeh
 EVALUATOR

HED#: 98107
 HED#: 6.9.004
 DATE: 2-8-84 REV:
 HED CATEGORY: B
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- SINGLE CONTROL AND DISPLAY PAIRS (Association):
 Control #1185 for recorders 1171 and 1172 and control 1198 for controllers
 #1299 and 1300 are not located so that association is apparent.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases response time and probability of error in selecting the necessary display.

RECOMMENDED REVISION

Relocate controls below the devices they are associated with.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study to determine the problem parameter and to recommend a solution. P&ID M-253 does not show recorder 640-28 being associated with reactor water level.

MANAGEMENT REVIEW

CHAIRMAN W Balonik DATE 5/22/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Note: recorder 640-28 has a selector switch to enable it to receive reactor water

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W. Sabeh 4/18/84
 & Bunnion 4/18/84
 R. Sabeh 4-18-84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 9B108
 TASK: Control Room Survey | EVALUATOR | HED#: 8.9.806
 CL: 8.9 | CL ITEM: 8.9.1.1c(2) | DATE: 2-3-84 | REV:
 CL TITLE: Control Display Relationship | HED CATEGORY: B
 BOARD TITLE: Turbine, Electrical | BOARD#: C2, C3

HED DESCRIPTION

GUIDELINE- SINGLE CONTROL AND DISPLAY PAIRS (Association):
 The direction of movement of controls and light colors are not consistent with convention. Controls (e.g., #206, 207, 208, 215, 216) move counterclockwise to raise.
 Red/Green lights above controls #206, 404, 406 are reversed.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in control display use.

RECOMMENDED REVISION

Reposition lights and change control movement to conform with convention.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/18/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

a. Arnold 4/18/84
 W. Baluck 4/18/84
 R. Sabeh 4/18/84
 R. Sabeh 4-18-84

OBSERVATION

PLAN: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.9 CL ITEM: 8.9.1.1a
 CL TITLE: Control Display Relationship
 BOARD TITLE: Turbine

R. Sabeh
 EVALUATOR

HED#: 98109
 HEO#: 8.9.008
 DATE: 2-3-84 REV:
 HEO CATEGORY: B
 BOARD#: C2

HEO DESCRIPTION

GUIDELINE- SINGLE CONTROL AND DISPLAY PAIRS (Proximity):
 Indicator #168 and control #191 are not in close proximity to each other.
 Indicators #168 and 167 are distant from controls #229, 230, 231.
 Indicators #169, 170 are distant from controls #204, 205.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased probability of error in reading indicator while activating control.

RECOMMENDED REVISION

Relocate indicator #168 closer to control #191. Relocate indicators 168, 167 closer to 229, 230, 231. Move controls 204, 205 lower on the panel and relocate indicators 169, 170 to the vacated space.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Des. Impr. Study.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study. Panel C2 is being revised due to equipment update project program. Future changes must consider past changes. Recommended revision is not necessarily the best solution.

MANAGEMENT REVIEW

CHAIRMAN W. Baluck DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Sabeh 4/18/84
R. Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS

R. Sabeh
EVALUATOR

HED#: 0B113

TASK: OER

HED#: OER-004

CL: Questionnaire CL ITEM: STA-9

DATE: REV:

CL TITLE: Training

HED CATEGORY: B

BOARD TITLE: NA

BOARD#: NA

HED DESCRIPTION

GUIDELINE- HOW DO YOU MAINTAIN YOUR TECHNICAL PROFICIENCY?

Lack of STA simulator training for retaining and updating technical proficiency.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in providing technical support to the operational team during abnormal or emergency operations.

RECOMMENDED REVISION

Training department develop and implement an STA simulator team training program.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Admin. Proc. Change

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Reviewed 4/19/84
 W. Zemanek 4/19/84
 J. Brennan 4/19/84
 R. Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: DER
 CL: Observation CL ITEM: 6.1.5.1a
 CL TITLE: N/A
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 08123
 HED#: DER-006
 DATE: 4/18/84 REV:
 HED CATEGORY: B
 BOARD#: All

HED DESCRIPTION

GUIDELINE- STATIC ELECTRICITY & TEMPERATURE & HUMIDITY (Comfort Zone):
 Touching the instrument face cover can influence the instrument reading due to a static charge due to friction of the operators feet on the floor from

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in reading meter levels

RECOMMENDED REVISION

Raise humidity in the control room during the winter months or install static carpeting
 anti

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the Habitability study.

MANAGEMENT REVIEW

CHAIRMAN W. Balush DATE 5/03/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

APPENDIX C

CATEGORY C HEDs

HUMAN ENGINEERING OBSERVATION ASSESSMENT

4/10/84 Stabel Y-10-84

CHAIRMAN BOB ARNOLD DATE 4/10/84

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Provide a location code on book case matching document number, and color code emergency procedures folder & binder color on the location code on the bookcase?
Procedures have hard bindings; PFDs are laminated in plastic. Operations should make a semi-annual inspection to replace documents that are worn. Operations should develop a system to identify control room docs. incl. for storage location. Supervision should enforce system message.

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Establish a Nuclear Operations Procedure to define & control control room documents, procedures etc. Required documents should be inventoried periodically.

CHAIRMAN W. Belenke DATE 5/17/84

OBSERVATION

PLANT: Pligrim NPS HED#: 1C001
 TASK: Control Room Survey EVALUATOR: R. Sabeh
 CL: 6.1 CL ITEM: 6.1.1.4b and d DATE: 1-20-84 REV:
 CL TITLE: Control Room Workspace HED CATEGORY: C
 BOARD TITLE: NA BOARD#: NA

HED DESCRIPTION

GUIDELINE- DOCUMENT ORGANIZATION AND STORAGE:
 Location aids to access appropriate procedures do not conform to guideline criteria to identify, distinguish and access documents. In addition, the documents are not protected against wear.

POTENTIAL OPERATOR ERROR(S)

SUPPORT MATERIAL ATTACHED
 Delay in executing procedures. This involves searching for the appropriate document and particular procedure required.

RECOMMENDED REVISION

Provide improved procedure document identification, storage and protection against wear.

RECOMMENDED IMPLEMENTATION

- PRIOR TO OR AT NEXT REFUELING
- AT CONVENIENT OUTAGE
- AT EARLIEST OPPORTUNITY
- NON-MANDATORY

~~DE-EMPHASIS~~

[x] Admin. Procedure Change.

13-01-84
 WTBalun 7/10/84
 R Sabeh

HUMAN ENGINEERING OBSERVATION ASSESSMENT

CHAIRMAN Bob Arnold DATE 5/17/84

OBSERVATION

PLANT: Pilgrim NPS HED#: 1C002
 TASK: Control Room Survey EVALUATOR: R. Sabeh
 CL: 6.1 CL ITEM: 6.1.15 b, d, & f DATE: 1/28/84 REV:
 CL TITLE: Control Room Workspace HED CATEGORY: C
 BOARD TITLE: NA BOARD#: NA

HED DESCRIPTION

GUIDELINE- SPARE PARTS, OPERATING EXPENDABLES AND TOOLS:
 Spare parts are not readily accessible. The storage space is limited and there is no inventory accounting to ensure that an adequate supply of spares and expendables is readily available.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in taking corrective equipment action and performance of control room functions.

RECOMMENDED REVISION

Provide additional storage space for spare parts and institute an inventory accounting system.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~ENHANCEMENT~~

[x] Admin. Procedure Change

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend that control room administrators be responsible for maintaining an adequate supply of spares and expendables.

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:
Recommend that Chief Operations Engineer implement inventory process for replacement parts in control room.

CHAIRMAN WTBalun DATE 5/17/84

OBSERVATION

PLANT: Pilgrim NFS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.2b(1)
 CL TITLE: Control Room Workspace
 BOARD TITLE: Rx CL0

EVALUATOR
 R. Sabeh

IED#: 1C003
 IEO#: 6.1.008
 DATE: 1-28-84
 HED CATEGORY: C
 BOARD#: 903

HED DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS (Control Height):
 Controls that exceed 83 in. on the benchmark panels are:
 Panel 903: vibration meter subpanel #687, 691, 692, 694, 699.
 Controls that are located below 34 in. in height are:
 Panel 903: HPCI inverter (toggle switch)
 Panel 904: RCIC inverter (toggle switch)

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in operating controls or inability to operate controls by 5th percentile female personnel.

RECOMMENDED REVISION

Lower the vibration meter panel or reposition at another location.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] DESIGN CHANGE

TECHNICAL REVIEW

[] Concur.
 [X] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Remoney Vibration meter subpanel #s 587, 591, 592, 594, 599 because it is not used nor needed for control room operation.

CHAIRMAN BOB ARNOLD DATE 4/10/84

HPCI and RCIC Toggle switches are fan inverters, and are normally on, and not operated during an accident. No action required

MANAGEMENT REVIEW

[X] Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

CHAIRMAN W. Babcock DATE 5/17/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

10 u - al 9/1
R Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.4.1a
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. Sabeh
EVALUATOR

HED#: 1C004
 HEO#: 6.1.017
 DATE: 1-23-84 REV:
 HED CATEGORY: C
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- OPERATOR PROTECTIVE EQUIPMENT (Types of Equipment):
 No protective equipment other than the Scott Air Paks are available in the control room.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in protecting personnel from hazards which could impact on operator performance.

RECOMMENDED REVISION

Provide protective clothing and adequate storage within the control room area.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Request Operations Dept. to determine protective clothing and air pack needs

MANAGEMENT REVIEW

CHAIRMAN W Sabeh DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

~~PPE exists~~
Design change in progress on new breathing air source (piped into control room). No known requirements for protective clothing.
Change to "in-process" design change.

~~[x] Admin Proc. change~~

[x] Design change (in process)

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.4.1f
 CL TITLE: Control Room workspace
 BOARD TITLE: NA

R. Sabeh
EVALUATOR

HED#: ~~B010~~
1C026 WPA
6-21-84
HEO#: 6.1.018
DATE: 1-23-84 REV:
HEO CATEGORY: ~~B~~ C
BOARD#: NA

HED DESCRIPTION

GUIDELINE- OPERATOR PROTECTIVE EQUIPMENT (Expendables):
 There are no replacement air tanks that are readily available.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Without spare air tanks the operators are limited to 46 minutes of operation or less.

RECOMMENDED REVISION

Provide spare air tanks and adequate storage space for extended operations to satisfy requirement for extended operation.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Design change

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Refer to HEO # 6.1.017.
Reduce to category "C"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. C. ...
R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.5.3a(2)
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 1C005
 HED#: 6.1.021
 DATE: 1-23-84 REV:
 HED CATEGORY: C
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- ILLUMINATION (Shadowing):
 Labels below instrumentation on vertical panels are shadowed. This is especially true for recorders which project beyond the panel surface.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Inability to quickly and accurately identify instruments.

RECOMMENDED REVISION

Relocate labels above their associated instruments.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] DES IMPR. STUDY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/11/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommended a design improvement study of labeling be conducted.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/12/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.1
CL ITEM: 6.1.5.6a
CL TITLE: Control Room Workspace
BOARD TITLE: NA

EVALUATOR: R. Sabeh
HED#: 10006
HED#: # 1.024
DATE: 1-23-84
HED CATEGORY: C
BOARD#: NA

HED DESCRIPTION

GUIDELINE- PERSONAL STORAGE:
No space is provided for personal storage.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Degrades operator performance and contributes to clutter.

RECOMMENDED REVISION

Provide operators with personal storage facilities.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE.
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[X] Des. Impe. Study

TECHNICAL REVIEW

- [] Concur.
- [X] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Recommend a design improvement study for habitability (control room) be conducted. Plant Computer also project may impact this study.*

CHAIRMAN BOB ARNOID DATE 4/11/84

MANAGEMENT REVIEW

- [X] Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN W. B. Sabeh DATE 5/17/89

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1302 LEV... 4/17/84
Ba 4/17/84
Babal 4-11-84

OBSERVATION

PLANT: Pilgrim MPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.1.2a
 CL TITLE: Control Room Workspace
 BOARD TITLE: Reactor Control

R. Sabeh
EVALUATOR

HED#: 1C025
 HED#: 6.1.030
 DATE: 4/10/84 REV:
 HED CATEGORY: D.C
 BOARD#: 905

HED DESCRIPTION

GUIDELINE- GUIDELINE: CONSISTENCY OF
 MANNING WITH EQUIPMENT LAYOUT.
 (COVERAGE): The overhead TV
 monitor used to display
 computer generated data at the 905
 panel is not located in a
 convenient position for operator
 viewing.

This observation is supported by OER-002.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Excessive operator movement
 results in a delay to respond
 to data displayed on the
 monitor.

RECOMMENDED REVISION

Adjust the overhead TV
 monitor for convenient
 operator viewing.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[X] No action Required~~
 [X] At earliest opportunity

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Plant computer project will
replace this device,

MANAGEMENT REVIEW

CHAIRMAN W. Salank DATE 5/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: This HED will be resolved by new plant
computer project. CRDIR Project will
interface with computer project.
Increase to category "C", consistent
with plant computer schedule.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.2 CL ITEM: 6.2.1.6
 CL TITLE: Communications
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 2C009
 HED#: 6.2.004
 DATE: 1-26-84 REV:
 HED CATEGORY: C
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- ANNOUNCING SYSTEM (General):
 The 5 voice channels are continuously in use. During plant shutdown, when contractors are at the plant, they generate nuisance sounds that interferes with control room communications.
 This observation is in support of DER-007.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Loss of important incoming voice traffic.

RECOMMENDED REVISION

Provide a selective gain control for channel 1, 2, 4 and 5 at supervisors workstation. This is another criteria that could be included in the design of a shift supervisor's workstation under HED 6.2.002.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[x] Admin Procedure Change~~
 [x] DESIGN IMPROVEMENT STUDY.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: The recommended suggested revision is not technically feasible with the present system. This problem is Request Operations Dept. to initiate procedure to limit access to page system. I suggest page buttons be converted to keylock switches.

MANAGEMENT REVIEW

CHAIRMAN W. Belank DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Mgt. Team agrees with 1st sentence above, but not second ("Request Operations"). It is not desirable to limit access to page system. Procedural controls will not be effective. Mgt. Team recommends that Communications Study look at whether it is feasible to add an independent channel for control room use to the existing system. Retain as category "C".

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1011-1111
3a 4 189
R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 8.2 CL ITEM: 8.2.2.6b
CL TITLE: Communications
BOARD TITLE: NA

R. Sabeh
EVALUATOR

HED#: 2C010
HEO#: 8.2.009
DATE: 1-28-84 REV:
HEO CATEGORY: C
BOARD#: NA

HEO DESCRIPTION

GUIDELINE- SIGNAL INTENSITY (Comfort): C1709C171
The Post Accident Monitoring Panel (CP800) alarm and fire alarm produce sounds that are a discomfort to the operator.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The discomfort produced from exceeding the alarm noise level necessary to get an operator's attention will result in reduced operator performance.

RECOMMENDED REVISION

Modify the alarm intensity level and frequency to get the operator's attention and still not be a discomfort.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN WJ Sabeh DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

Mgt. Team recommends that Nuclear Operations Dept. issue an Engineering Support Request or a Maintenance Request on this issue.

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.2 CL ITEM: 8.2.2.7b
 CL TITLE: Communications
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#: 2011
 HEO#: 8.2.010
 DATE: 2-8-84 REV:
 HED CATEGORY: C
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- READABILITY (False Alarms):
 Fire alarm is activated by cigarette smoke in areas of the Administration Building, Control Room Annex and Security Alarm Station (SAS).

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Personnel investigating the alarm degrades operator control room performance.

RECOMMENDED REVISION

Adjust sensitivity of alarms to activate above cigarette smoke level.

RECOMMENDED IMPLEMENTATION

[X] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN: Bob Arnold DATE: 4/1/84

[X] Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

MANAGEMENT REVIEW

CHAIRMAN: W. Balank DATE: 5/17/84

[] Concur.
 [X] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

Mgt. Team recommends that Nuclear Operations Dept. issue a Maintenance Request to re-adjust calibration of these units. If re-adjustment is not effective, NOD to request that the installing company investigate the problem.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

12000 version 8/11/74
 C. Sabeh 4/11/84
 BSabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.1.2c(3)
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

EVALUATOR: R. Sabeh
 HED#: 3012
 HED#: 6.3.003
 DATE: 1-23-84
 HED CATEGORY: C
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- ALARM PARAMETER SELECTION (Multi-channel or Shared Alarms):
 The annunciator system does not have a refresh capability.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of operator error in interpreting alarm status and the probability of missing a subsequent alarm.

RECOMMENDED REVISION

Provide an annunciator refresh capability.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/11/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Recommend an annunciator study in conjunction with 3B02A. Investigate BEO annunciator system at New Boston.

MANAGEMENT REVIEW

CHAIRMAN WSabeh DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

Sabeh 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NFS
 TASK: Control Room Survey
 CL: 6.4 CL ITEM: 6.4.1.1d
 CL TITLE: Controls
 BOARD TITLE: NA
 HED#: 4 C O 13
 HED#: 6.4.002
 DATE: 1-24-84
 HED CATEGORY: C
 BOARD#: NA
 REV: _____

HED DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (Competibility with Emergency Gear):
 Operators have no experience using controls while dressed in protective clothing.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Difficulty in operating controls due to lack of experience.

RECOMMENDED REVISION

Provide operator training using protective equipment.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 NON-MANDATORY
 Consistent with TRAINING, SCHEDULES

Admin process change

[X] Enhancement.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN WT Belant DATE 5/17/84
 Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

NOD and/or Training to initiate search of available breathing apparatus to find an acceptable type with communications capabilities.
Change to "Enhancement"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/16/84
 WTBalank 4/16/84
 R. Sabeh 4/16/84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 50019
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.008
 CL: 8.5 | CL ITEM: 8.5.4.1b | DATE: 1-24-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: C
 BOARD TITLE: All | BOARD#: All

HED DESCRIPTION

GUIDELINE- GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Scale Compatibility):
 Recorder scales and recorder paper that are not compatible are:
 Panel C170: #434, 439, 449.
 Panel C171: #1327, 1332, 1339.
 Panel 903: #815.
 Panel C1: #24, 25, 23.
 Panel C7: #1430.
 Panel CP902: Area Rad FR 705-4, AR 5075-A.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in reading recorder values.

RECOMMENDED REVISION

Install recorder paper compatible with recorder scale.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [x] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

~~[x] Admin. Proc. change~~
 [x] DESIGN IMPROVEMENT STUDY.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Integrate with the panel
Improvement study on any possible
new recorder scales.

MANAGEMENT REVIEW

CHAIRMAN WTBalank DATE 5/17/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Study on recorders should investigate
which is correct - the recorder scale
or the recorder paper - on recorders
having differing scales and paper.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

of Benjamin 4/16/84
R. Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 5C015
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.011
 CL: 8.5 | CL ITEM: 8.5.4.2a(1) | DATE: 1-24-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: C
 BOARD TITLE: A00 | BOARD#: CP600

HED DESCRIPTION

GUIDELINE- SPECIFIC RECORDER TYPES (Continuous Recorders-Labeling):
 There is no recorder labeling on Panel CP600 - #488.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading recorder data.

RECOMMENDED REVISION

Label recorder #488 on panel CP600.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] Design Improvement Study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Investigate why recorder is out
of service, and if the recorder is needed,
then label correctly.

MANAGEMENT REVIEW

CHAIRMAN W. Babink DATE 5/17/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold 4/16/84
 W Babcock 4/16/84
 C Brennan 4/16/84
 R Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 0.5
 CL TITLE: Visual Displays
 BOARD TITLE: Rx Cont

R. Sabeh
 EVALUATOR

HEO#: 50016
 HEO#: 0.5.017
 DATE: 1-24-84
 REV:
 HEO CATEGORY: C
 BOARD#: 905

HEO DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Scale Selection):
 The scales on APRM meters #1102 and 1103 on Panel 905 and #108 on Panel C2 do not provide the required precision.
 This observation is supported by OER-031. ^{1107 and 1108}

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading meter recorded values.

RECOMMENDED REVISION

Change scale and recorder sensitivity to provide needed accuracy.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Panel improvement study (meter scales)

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in the panel improvement study to determine precision requirements.

MANAGEMENT REVIEW

CHAIRMAN W Babcock DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WT Babcock 4/16/84
Blabek 4-16-84

OBSERVATION

PLANT: Pilgrim
 TASK: Control Room Survey
 CL: 6.5 CL ITEM: 6.5.3.1a(3) DATE: 2-8-84 REV:
 CL TITLE: Visual Displays HED CATEGORY: C
 BOARD TITLE: NA BOARD#: NA

HED DESCRIPTION

GUIDELINE- PRECAUTIONS TO ASSURE AVAILABILITY (Bulb Changing Hazard):
 Changing a light bulb on panel C3 caused a short and resulted in a "scram."

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability for equipment damage and/or plant shutdown.

RECOMMENDED REVISION

Provide an operator aid for replacing bulbs without shorting circuit or replace with circuit design to permit bulb changing without possibility of shorting.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ENHANCEMENT

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/17/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Son 02/11/14
 WZBeluk 9/16/84
 J. Brennan 4/16/84
 R. Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.6 CL ITEM: 8.6.4.1g
 CL TITLE: Visual Displays
 BOARD TITLE: Turbine

R. Sabeh
 EVALUATOR

HED#: 50018
 HED#: 8.6.029
 DATE: 2-8-84 REV:
 HED CATEGORY: C
 BOARD#: C2

HED DESCRIPTION

QUIP LINE - GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (Use):
 Recorder #146 provides confusing values.
 This HED is supported by OER 030.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error to determine vacuum level.

RECOMMENDED REVISION

Replace recorder #146 with a vacuum pressure gauge.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Des. change

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 9/16/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Vacuum gage should be added in addition to the recorder. Recorder should have operator aid and/or a new scale with compatible parameters - easily understood

MANAGEMENT REVIEW

CHAIRMAN WZBeluk DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*W. Sabeh 4/16/84
of Blonain 4/16/84
R. Sabeh 4-16-84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 5019
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.032
 CL: 8.5 | CL ITEM: 8.5.4.1k | DATE: | REV:
 CL TITLE: Visual Displays | HED CATEGORY: C
 BOARD TITLE: Rx Clnup, FW and Cond | BOARD#: 904, C1

HED DESCRIPTION

GUIDELINE- GENERAL CHARACTERISTICS OF GRAPHIC RECORDERS (visibility):
 The channel being recorded cannot be determined without opening the door and
 advancing the paper on:
 Panel 904: #1025
 Panel C1: #14 and 15

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time to read recorder and the probability of error in reading
 channel value.

RECOMMENDED REVISION

Replace recorders with those that provide easy identification of channel being
 monitored.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[x] Des. change~~
 [x] Panel Improvement Study.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Add to Panel Improvement Study so
that new recorders may be integrated
into overall improvements.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*Bob Arnold 4/11/84
 W. Babcock 4/16/84
 Ch. Brennan 4/16/84
 R. Sabeh 4-16-84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 5020
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.033
 CL: 8.5 | CL ITEM: 8.5.1.2a | DATE: 2-8-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: C
 BOARD TITLE: Rx Clnup | BOARD#: 904

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Scale Selection):
 The units on instruments #912 and 894 are worn away and one is replaced with tape.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to read the display and the probability of error in reading accuracy.

RECOMMENDED REVISION

Replace with readable scales.

RECOMMENDED IMPLEMENTATION

M PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Enhancement

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Scales are "homemade & have faded out."

MANAGEMENT REVIEW

CHAIRMAN WT Babcock DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W/Balch 4/16/84
Ch Brenner 4/16/84
R Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.2
 CL TITLE: Visual Displays
 BOARD TITLE: Rx Cont

EVALUATOR: R. Sabeh
 HED#: 5021
 HED#: 8.5.034
 DATE: 2-3-84 REV:
 HED CATEGORY: C
 BOARD#: 906

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Scale Selection):
 The power value is shown in percent power to a level of 125 percent for
 #1120, 1122, 1124, 1126, 1128, 1130, 1132, 1134, 1146, 1147, 1149,
 1161, 1163, 1166, 1167, and 1169.
 What does 125 percent refer to?

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time and the probability of error to determine power levels.

RECOMMENDED REVISION

Identify the power unit parameter and range of scale.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [X] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] Des Impr study

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- [] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study to determine the parameter by consulting with GE, if necessary.

MANAGEMENT REVIEW

CHAIRMAN W/Balch DATE 5/17/84

- Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

put this where?
Bottom of next review

NOTE: Refer to G.E./BWROG "generic" CRDR report for reference to this HED.

W/B 6/18/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*Additional 1/16...
w/ Babcock 9/16/84
of Brennon 8/16/84
R. Sabeh*

OBSERVATION

PLANT: Pilgrim NPS R. Sabeh
TASK: Control Room Survey EVALUATOR

CL: 8.5 CL ITEM: 8.5.1.5a HED#: 5C022
DATE: 2-18-84 REV: HED#: 8.F.036

CL TITLE: Visual Displays HED CATEGORY: C

BOARD TITLE: All BOARD#: All

HED DESCRIPTION

GUIDELINE- SCALE MARKINGS (Use of Graduations):
Scales with more than 9 graduations between numbers:
Panel C170: #438, 449.
Panel C171: #1339, 1331.
Panel 903: #818, 819, 821, 883, 884, 832, 833, 835, 836, 882, 882.
Panel 904: #829, 830, 861, 882, 883, 877, 889, 890, 907, 908.
Panel 905: #1078, 1079, 1171, 1192, 1193.
Panel C2: #133, 145.
Panel CP600: #466, 468, 469, 477, 478.
Panel C7: #1480.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading indicators and recorders.

RECOMMENDED REVISION

Revise scale markings to conform with the guideline criteria of 9 graduations or less between numbers.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 1/16/84

[] Concur.

Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN S. Brennon DATE 5/17/84

[] Concur.

Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:
Comment/Note/Reason: _____

Integrate this HED into the Panel Improvement Study.

~~Enhancement~~

[x] Panel Improvement Study (meter scales)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

WT Balwick 6/8/84

OBSERVATION

PLANT: Pilgrim NPS | E. Gagnon/R. Sabeh | HED#: 50026 ^{unit} 6-21-4
 TASK: Verif./Valid. | EVALUATOR | HED#: 8.5.048
 CL: 8.5 CL ITEM: 8.5.1.2b DATE: 6/5/84 REV:
 CL TITLE: Visual Displays HEO CATEGORY: C
 BOARD TITLE: Rx Control BOARD#: 905

HEO DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (Elimination of Operator Conversion):
 The plaque identifying reference RPV water levels for use with 1173 & 1174 (panel 905) contains arrows pointing to various positions on the scale of 1173 which differ from the stated level by 7/8 inches. The scale pointer is between the arrows and scale easily allowing the incorrect association of the pointer with the arrows on the plaque.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time and probability of error in reading and responding to RPV water level.

RECOMMENDED REVISION

Remove the arrows from the plaque to reduce and generalize the plaque/instrument scale relationship.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Label, mimic, etc. study.

TECHNICAL REVIEW

CHAIRMAN S. Lura DATE 6/8/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Investigate modification to plaque to line up plaque level indications to meter scale. Add to label study

MANAGEMENT REVIEW

CHAIRMAN WT Balwick DATE 6/11/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Bob Arnold - 4/17/84
W. Sabeh 4/17/84
C. S. Brennon 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.2.4d
 CL TITLE: Labels and Location Aids
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#: 6023
 HEO#: 8.8.006
 DATE: 1-25-84 REV:
 HEO CATEGORY: C
 BOARD#: All

HEO DESCRIPTION

GUIDELINE- VISIBILITY (Cleaning):
 The number of labels obscured by dirt or foreign matter would indicate that no procedure for cleaning exists.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error in reading labels.

RECOMMENDED REVISION

Establish a label cleaning procedure.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Admin. Proc. change

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN C.S. Brennon DATE 5/17/84

Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*Chairman
of Commission 9/18/89
Resubmit 4-18-84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: 0C024
 TASK: DER | EVALUATOR | HED#: DER-002
 CL: Questionnaire CL ITEM: B2 | DATE: 1-28-84 | REV:
 CL TITLE: Communications | HEO CATEGORY: C
 BOARD TITLE: NA | BOARD#: NA

HEO DESCRIPTION

GUIDELINE- DO ANY COMMUNICATIONS SYSTEMS INTERFERE WITH CONTROL ROOM OPERATIONS?
 General Requirements (Plug-in Jacks):
 There is an insufficient number of plug-in phone jack positions at the console
 panels (one at either end of the control room panels).

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The long cords interfere with operator free movement and delays voice communication.

RECOMMENDED REVISION

Install at least two (2) additional plug-in jack positions at the control panels.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Des. Impr. Study

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/18/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in Communication Study and shorten the cords used in the main operating area after the additional plugs have been installed.

MANAGEMENT REVIEW

CHAIRMAN C.S. Brennan DATE 5/17/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

APPENDIX D

CATEGORY D HEDs

OBSERVATION

PLANT: Pllgr in FPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.1.3f(3)
 CL TITLE: Control Room Workspace
 BOARD TITLE: FW HTRS Control

HEID: 6.1.004
 DATE: 1-28-84
 HED CATEGORY: D
 BOARD#: C4

HED DESCRIPTION

GUIDELINE- EQUIPMENT-TO-OPPOSING-SURFACE DISTANCE:
 The separation between the front of panels C4 and C5 facing each other is 60 inches. This is 36 inches less than the guideline criteria.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in performing operator functions due to interference with IBC personnel.

RECOMMENDED REVISION

Arrange surveillance schedules to avoid conflict in this area. It should be noted that the operators did not indicate the separation distance as being a problem.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] NO ACTION

TECHNICAL REVIEW

[] Concur.
 [x] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Administrative controls are already in place since the Watch Engineer is in control to schedule Surveillance/maintenance. No further action required.

MANAGEMENT REVIEW

[x] Concur.
 [] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____
 CHAIRMAN WT Babcock DATE 5/16/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

4/11/84 Sabeh 4-10-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1
 CL TITLE: Control Room Workspace
 BOARD TITLE: All benchboards

R. Sabeh
 EVALUATOR

HED#: ~~13004~~ 1A004
 HED#: 6.1.009

DATE: 2-3-84
 REV:
 HED CATEGORY: ~~D~~ D
 BOARD#: 903, 04, 06, C1, 2, 3

HED DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS (Distance from the Front Edge)
 Controls on all panels less than 3 in. from the benchboard edge are:
 Panel 903: #760, 751, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766,
 767, 768 Panel 904: #941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008 Panel 905: #1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430.
 Panel 905: #1301

905 panel

WR 6-21-4

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Potential accidental activation of controls.

RECOMMENDED REVISION

Install protective railing or move the controls back to at least 3 in. from edge.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

DESIGN CHANGE

NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Protective guard rail has already been installed on all panels except 905. Rail not necessary at 905 because only one control switch (1301) is involved and is ok as the oval handle is not likely to be for an accidental operation.

Correct HED Description as marked.

MANAGEMENT REVIEW

CHAIRMAN W. Babcock DATE 5/22/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason: DO NOT CONCUR

Comment/Note/Reason: Do not concur with HED category. Reduce to category "D". No further changes will be made. Mgt. team agrees with technical review team's assessment.

IMAGE EVALUATION
TEST TARGET (MT-3)

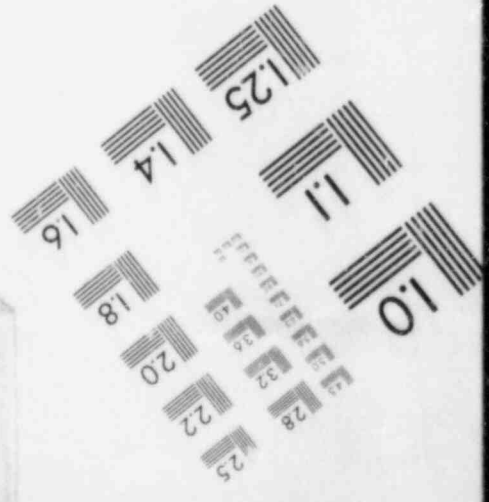
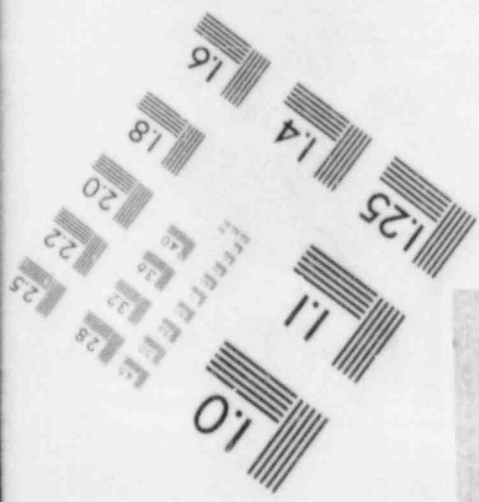
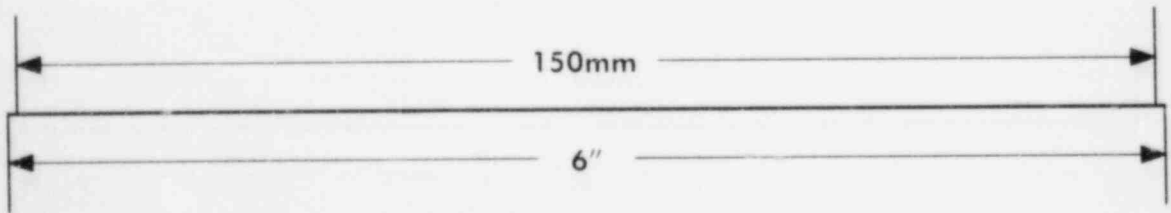
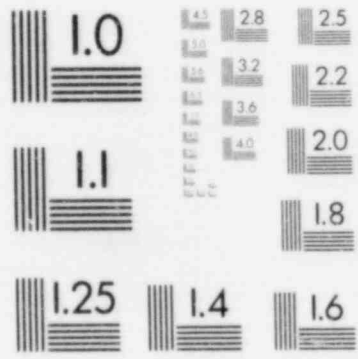
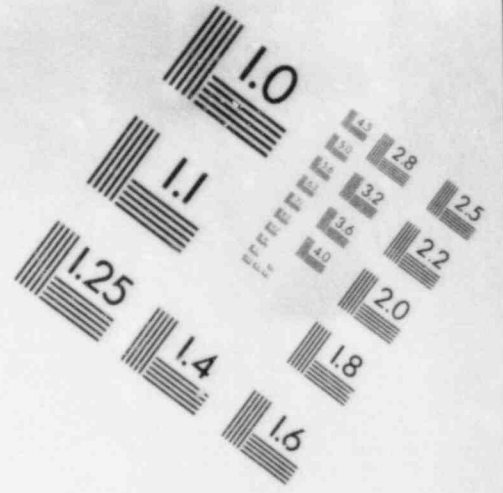
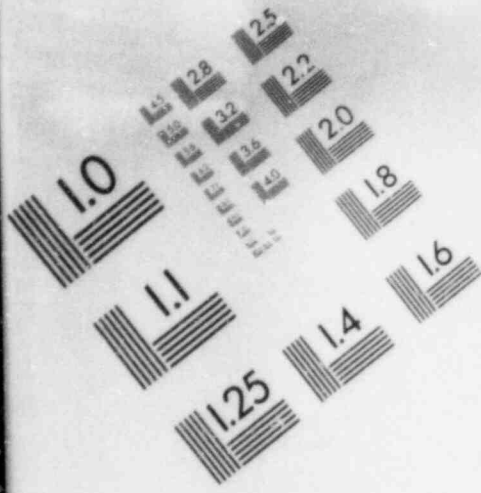


IMAGE EVALUATION
TEST TARGET (MT-3)

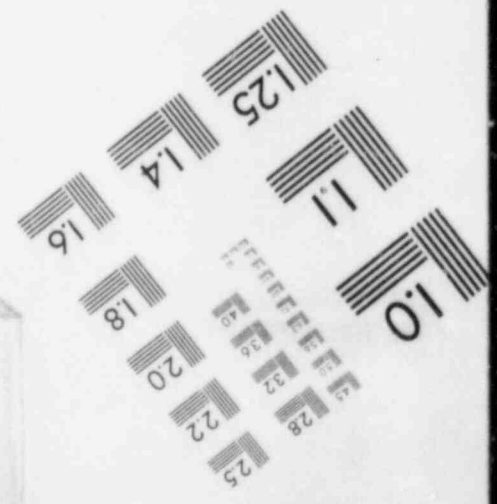
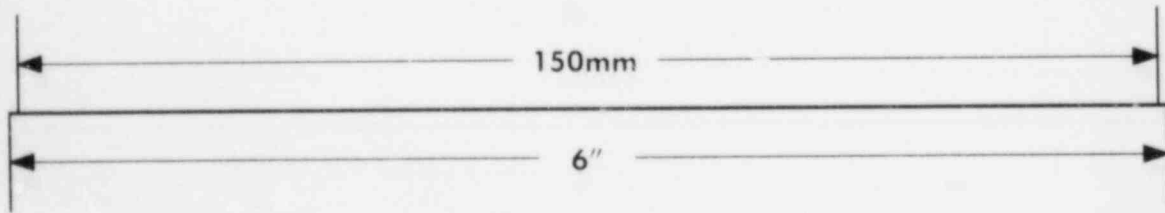
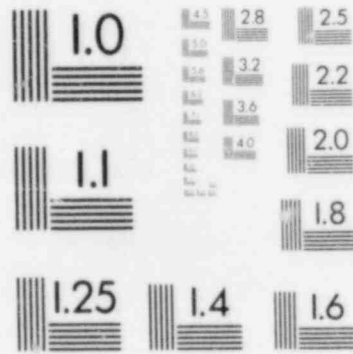
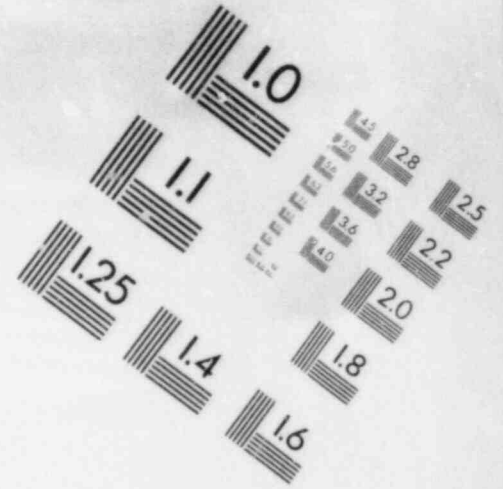
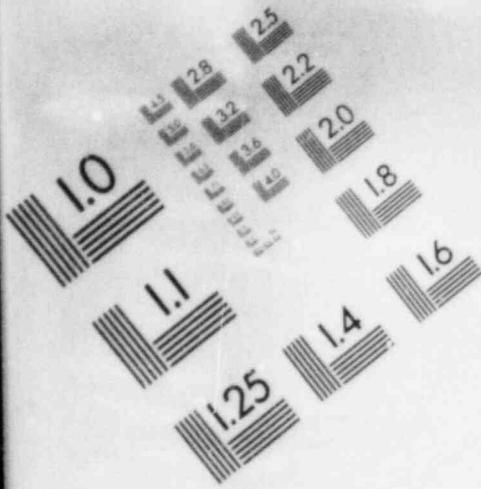
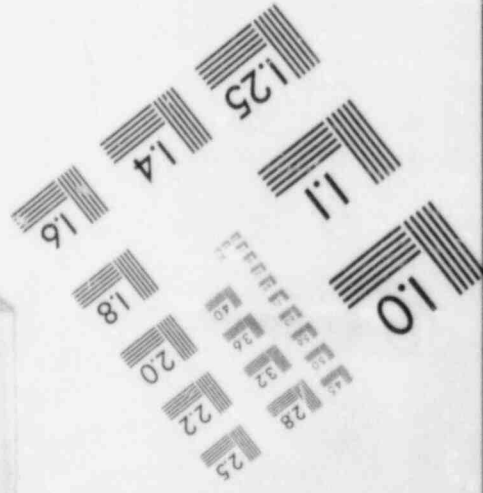
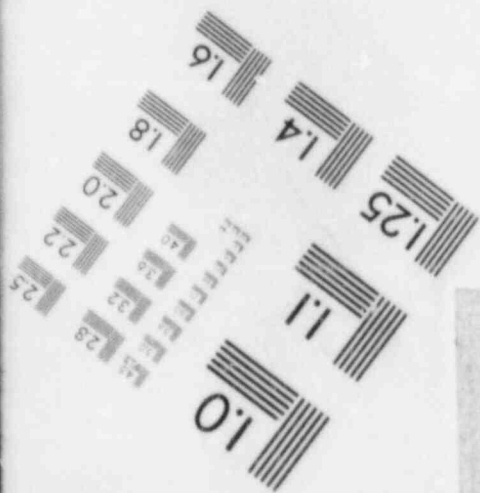
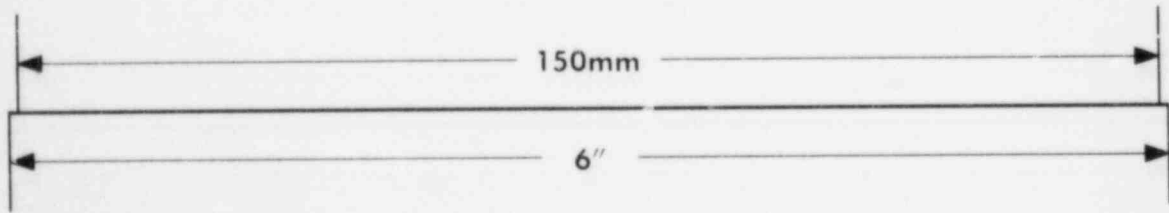
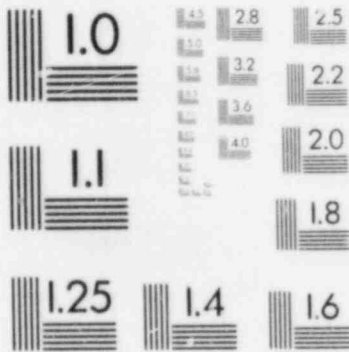
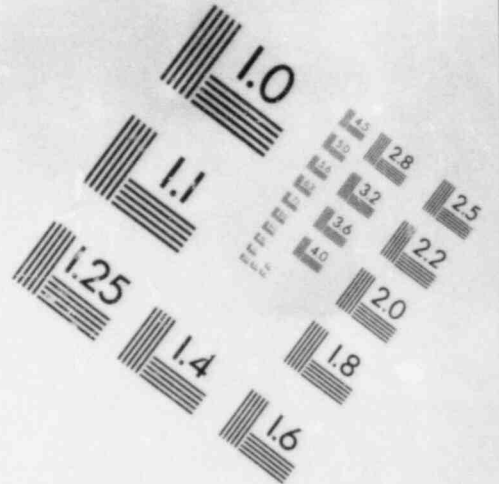
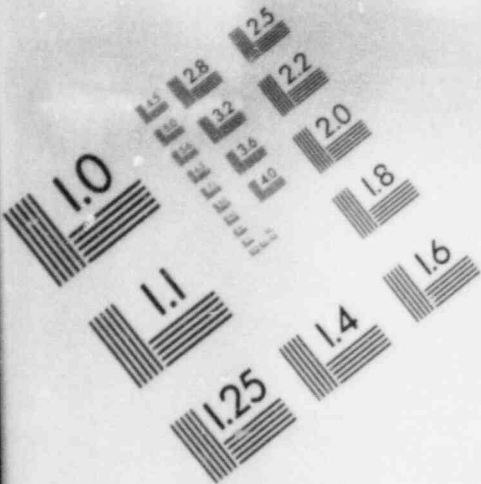


IMAGE EVALUATION
TEST TARGET (MT-3)



OBSERVATION

PLANT: Pilgrim NPS

R. Sabeh
EVALUATORHED#: ~~130031001~~

TASK: Control Room Survey

HEC#: 6.1.010/A

CL: 6.1

CL ITEM: 6.1.2.2d(2)

DATE: 2-3-84

REV:

CL TITLE: Control Room Workspace

HED CATEGORY: BD

BOARD TITLE: All bench boards

BOARD#: 903, 84, 06, C1, 2, 3

HED DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS:

Distance from the Front Edge: Controls that are beyond

28 in. from the front edge of the console are -

Panel 903: #804, 838, 808, 824, 826, 828, 587, 592, 596, 598, 597,
598, 599, 600, 594, 591, 845.Panel 904: #839, 836, 841, 842, 866, 868, 873, 880, 895, 822,
823, 824, 825, 826, 827, 828, 915. SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in activating controls that exceed the reach envelope for the 5th percentile female operator.

RECOMMENDED REVISION

Relocate controls to within the 28-in. reach envelope or provide an operator aid to assist the 5th percentile female operator to reach the controls. It should be noted that no operators expressed the distance as being a problem.

RECOMMENDED IMPLEMENTATION

 PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY
~~[] ADMIN PROC CHANGE~~ NO ACTION

TECHNICAL REVIEW

CHAIRMAN DOB ARNOLD DATE 4/10/84 Concur. Concur With Comment/Note. Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Instruct operations dept. to issue statement that no operator will be assigned who is not capable of operating all controls on all panels. It is suggested that operations retain an auditable record of compliance.

MANAGEMENT REVIEW

CHAIRMAN W/Sabeh DATE 5/10/84 Concur. Concur With Comment/Note. DO NOT CONCUR Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Mgt. Team does not believe the above comment is possible to comply with given present "anti-discrimination" rules. Operators are now provided with apparatus such as footstools to enable them to reach all controls. No further action. Reduce to category "D".

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.d(2)
 CL TITLE: Control Room Workspace
 BOARD TITLE: All benchboards

R. Sabeh
 EVALUATOR

HED#: ~~TT58097/114~~
 HED#: 6.1.010/B
 DATE: 2-3-84 REV:
 HED CATEGORY: **BD**
 BOARD#: 903, 84, 86, C1, 2, 3

HED DESCRIPTION

GUIDELINE- STAND UP CONSOLE DIMENSIONS (cont.)
 Panel 905: #1088, 1089, 1090, 1092, 1094, 1096, 1098, 1099, 1098, 1109, 1110, 1111, 1112, 1113, 1114, 1116, 1118, 1117, 1118, 1119, 1121, 1123, 1125, 1127, 1129, 1131, 1133, 1083, 1084, 1144, 1148, 1149, 1150, 1152, 1154, 1155, 1160, 1160, 1161, 1164, 1165, 1166, 1167, 1168, 1169, 1184, 1185, 1196, 1197, 1198.
 Panel C1: #36, 37, 43, 44, 28, 27, 45, 46, 48, 58, 57
 Panel C2: #178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191
 Panel C3: #337, 431

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

See 6.1.010/A

RECOMMENDED REVISION

See 6.1.010/A

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

NO ACTION

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/10/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: See # 6.1.010A

MANAGEMENT REVIEW

CHAIRMAN W. Balenk DATE 6/18/84

- Concur.
 Concur With Comment/Note.
 DO NOT CONCUR
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

SEE 6.1.010A

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.2e(2)
 CL TITLE: Control Room Workspace
 BOARD TITLE: Cleanup, FW

R. Sabeh
 EVALUATOR

HED#: ~~HA001~~
 HED#: 6.1.012
 DATE: 1-28-84
 HEO CATEGORY: ~~BA~~ ^{REV: WR4} D
 BOARD#: 904, C1

HEO DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS (Horizontal Displacement of Displays):
 Horizontal displacement of displays (annunciators) from the control working
 position that are not within the 45 degree criteria are:
 Panel 904: #780
 Panel C1: #1,38

(Annunciator)

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of reading errors.

RECOMMENDED REVISION

Install additional annunciator controls on panels 904 and C1.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY ~~CONSISTENT WITH ANNUNCIATOR STUDY~~
 NON-MANDATORY

~~[X] Des. IMP. STUDY~~
 [x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: The annunciator study will consider the optimal location for annunciator controls on all panels.

MANAGEMENT REVIEW

CHAIRMAN W. Schenk DATE 5/20/84

- [] Concur.
- [] Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason: DO NOT CONCUR

Comment/Note/Reason: Mgt. team operations representatives believe present annunciator control arrangement is satisfactory. No changes to be made. Reduce to category "D"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

4/10/84 R Sabeh 4-10-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.5a(1)
 CL TITLE: Control Room Workspace
 BOARD TITLE: AOG, Cntmt, Vent, PAM

R. Sabeh
 EVALUATOR

HED#: 1B006
 HED#: 6.1.013

DATE: REV:
 HED CATEGORY: **D**
 BOARD#: CP600, C7, C170

HED DESCRIPTION

GUIDELINE- VERTICAL PANELS (Control Height):
 Controls that exceed 70 in. in height are:
 Panel CP600: #461
 Panel C7: #1357, 1359, 1360, 1362, 1361, 1362, 1354, 1366, 1368
 Panel C170: #433
 Controls below 34 in. in height are:
 CP600: #520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the response time and difficulty for operating controls by 5th percentile female operators for controls over 70 in. in height.
 Increase the response time and difficulty for operating controls by 96th percentile male operators for controls below 34 in. in height.

RECOMMENDED REVISION

Relocate controls heights to conform with guideline criteria identified as 34 and 70 in., or provide an aid to raise the 5th percentile female operator and provide control safeguards to prevent accidental activation of controls below 34 in.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~ES ADJUST. PROC. CHANGE~~

NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Instruct operators direct to issue statement that no operator will be assigned who is not capable of operating all controls on all panels. It is suggested that operators retain an auditable record of compliance.*

MANAGEMENT REVIEW

CHAIRMAN W Baluch DATE 5/18/84

- Concur.
 Concur With Comment/Note.
 DO NOT CONCUR
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Refer to HEO # 6.1.010/A.
 Reduce to category "D".*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.2.5b(1)
 CL TITLE: Control Room Workspace
 BOARD TITLE: CP600, 170, 171, C7

R. Sabeh
 EVALUATOR

HED#: ~~1B007~~
 HED#: 6.1.014

DATE: 2-10-84 REV:
 HED CATEGORY: **D**
 BOARD#: AOG, PAM, Cntmt, Ven

HED DESCRIPTION

GUIDELINE- VERTICAL PANELS (Display Height):
 Display that exceed 70 in. in height are:
 Panel CP600: Meters #462, 463, 464 and annunciator panels 458, 459
 Panel C170: Annunciator panels 432, 433
 Panel C171: Annunciator panels 1326, 1328
 Panel C7: Annunciator panels #1360, 1363; Meters #1360, 1361, 1363, 1364, 1365, 1367, 1368, 1369, 1370, 1371, 1372, 1374, 1375

C1: #14, 42
 C2: #129, 130, 131, 132, 133, 134, 135, 136, 137, 142
 C3: #266, 268, 267, 268, 272, 273, 274, 275, 279, 280

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the probability of display reading errors by the 5th percentile female operator.

RECOMMENDED REVISION

Lower displays or provide aid to raise the 5th percentile female operator to a height for reading the displays.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] ENHANCEMENT ADMIN. PROCEDURE CHANGE

[x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/10/84

- [] Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: C1, C2, C3 are not vertical panels.

Instruct operations Dept. to issue statement that no operator will be assigned who is not capable of operating or reading displays on all panels. Operations should retain records

MANAGEMENT REVIEW

CHAIRMAN W. Balunk DATE 5/18/84

- [] Concur.
 Concur With Comment/Note.
 DO NOT CONCUR
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Refer to HED # 6.1.010/A. Reduce to category "D".

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh EVALUATOR | HED#: *1C007*
 TASK: Control Room Survey | | HED#: 8.1.025
 CL: 8.1 | CL ITEM: 8.1.6.7b (1,2) | DATE: 1-23-84 | REV:
 CL TITLE: Control Room Workspace | | HED CATEGORY: *X D*
 BOARD TITLE: NA | | BOARD#: NA

HED DESCRIPTION

GUIDELINE- AMBIENCE AND COMFORT (Restroom and Eating Facilities):
 There is poor accessibility and inadequate space for the number of
 personnel to be accommodated.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Degrades operator performance and operator alertness.

RECOMMENDED REVISION

Increase restroom and eating facilities.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[] DES. IMPR. STUDY~~

[x] NO ACTION.

TECHNICAL REVIEW

CHAIRMAN *Bob Arnold* DATE *4/11/84*

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Recommend combination with 1C006.*

MANAGEMENT REVIEW

CHAIRMAN *W. Bedrup* DATE *5/17/84*

- [] Concur.
- [] Concur With Comment/Note.
- DO NOT CONCUR*
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:
Reduce to category "D".

Management Team believes present facilities are adequate.

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1 CL ITEM: 6.1.5.7c
 CL TITLE: Control Room Workspace
 BOARD TITLE: NA
 HED#: 6008
 HED#: 6.1.028
 DATE: 1-26-84
 HED CATEGORY: S D
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- AMBIENCE AND COMFORT (Rest Area/Lounge):
 There is limited rest area provided.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Degrades operator performance and alertness during extended watch periods.

RECOMMENDED REVISION

Increase and improve rest area facilities.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONCURRENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] Des. IMPR. Study

[x] No Action

TECHNICAL REVIEW

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Combine with 10006

MANAGEMENT REVIEW

[] Concur.
 [] Concur With Comment/Note.
 DO NOT CONCUR
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Reduce to category "D"

Mgt. Team believes present facilities are adequate

CHAIRMAN WT Babcock DATE 5/7/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS

R. Sabeh
EVALUATOR

HED#:

TASK: 8.1

HED#: 6.1.027B

CL: 8.1

CL ITEM: 8.1.2.2f

DATE: 2-8-84

REV:

CL TITLE: Control Room Workspace

HED CATEGORY: D

BOARD TITLE: Electrical

BOARD#: C3

HED DESCRIPTION

GUIDELINE- STAND-UP CONSOLE DIMENSIONS (Lateral Spread) (cont.)

Panel 905: 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235.

Panel C3: 280, 289, 290, 291, 292, 296, 302, 303, 304, 305, 306, 316, 317, 318, 319, 320, 327, 328, 329, 330, 331, 332, 344, 345, 346, 347, 351, 352, 353, 354, 355, 372, 373, 374, 375, 376, 380, 381, 382, 383, 384, 385, 386, 387, 403, 404, 405, 406, 407, 408, 409, 426, 427, 428, 429, 430, 248

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

See 6.1.027/A

RECOMMENDED REVISION

See 6.1.027/A

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN _____

DATE _____

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

CHAIRMAN W Babink

DATE 5/16/84

Concur.

Concur With Comment/Note.

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: SAME AS HED # 6.1.027A

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim NPS R. Sabeh EVALUATOR HED#:
TASK: Control Room Survey HED#: 6.1.028
CL: 6.1 CL ITEM: 6.1.2.5 K(1) DATE: 2-10-84 REV:
CL TITLE: Control Room Workspace HED CATEGORY: D
BOARD TITLE: Rx Cont BOARD#: 906

HED DESCRIPTION

GUIDELINE- VERTICAL PANELS (Display Height):
Displays that must be read frequently which are located outside the 50 - 65
in. height are: Recorders: #1070, 1079, 1080, 1170, 1171, 1172, 1107, 1108, 1102, 1103.
Vertical Meters: #1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1103, 1106, 1107, 1108,
1109, 1190, 1191, 1192, 1193, 1194, 1196.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time necessary to read displays and increases the probability of
reading error for 5th percentile female operators.

RECOMMENDED REVISION

There is no good human engineering fix other than to relocate displays to conform
with guideline criteria.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[X] NO ACTION

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/11/84

- [] Concur.
[X] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Relocation of displays is
not practical due to density of displays
on control board. Operators have not
complained of problems in this area

MANAGEMENT REVIEW

CHAIRMAN W Belcut DATE 5/16/89

- [X] Concur.
[] Concur With Comment/Note.
[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

W. B. Behrman 4/2/84
W. B. Behrman 4/2/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Verif./Valid.
CL: 6.1 CL ITEM: 6.1.1.1, 6.1.1.2
CL TITLE: Control Room Workspace
BOARD TITLE: N/A
E. Gagnon/R. Sabeh
EVALUATOR
HED#: HED#: 6.1.034
DATE: 6/8/84 REV:
HED CATEGORY: D
BOARD#: N/A

HED DESCRIPTION:

GUIDELINE- ACCESSIBILITY OF INSTRUMENT/EQUIPMENT AND CONSISTENCY OF MANNING WITH EQUIPMENT LAYOUT:
The number of operators (2) and operator area of responsibilities (OP1: panels 904, 905, C2; OP2: all other panels) designated for use in this analysis were based on simple CR geometrical considerations. As a result, many of the tasks, necessary to monitor and maintain critical safety functions during emergency events, reflect unnecessary participation by both operators resulting in poorly coordinated or unnecessary operator travel. This is further complicated by the location of essential or desirable devices on panels outside the primary operating area.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased time and probability of error in monitoring and maintaining critical safety functions during emergency operations.

RECOMMENDED REVISION

Determine optimum operator manning, areas of responsibilities and device locations from operator task requirements.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY
[x]

TECHNICAL REVIEW

CHAIRMAN S LUNA DATE 6/8/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ ^{Do Not concur} for Following Reason:

Comment/Note/Reason: Plant does not want specific
assignments for operators during emergency situations
the shift supervisor directs operator actions as
he sees fit based on the number of operators
recalled to the MCR. This allows flexibility
of movement of all control room personnel by not
restricting an operator to one location unless he
is so assigned by the supervisor

MANAGEMENT REVIEW

CHAIRMAN W. B. Behrman DATE 6/11/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

[x] NO ACTION.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

B. Sabeh 4-11-84

OBSERVATION

PLANT: Pilgrim FPS

EVALUATOR: R. Sabeh

TASK: Control Room Survey

HEID#:
HEID#: 6.2.002

CL: 6.2 CL ITEM: 6.2.1.2c(2)

REV: D

CL TITLE: Communications

HEO CATEGORY: D

BOARD TITLE: NA

BOARD#: NA

HEO DESCRIPTION

GUIDELINE- CONVENTIONAL POWERED TELEPHONE SYSTEM (Switching Mechanism):
The control room does not have a priority access capability.

[] SUPPORT MATERIAL ATTACHE

POTENTIAL OPERATOR ERROR(S)

Delay in sending and receiving voice traffic.

RECOMMENDED REVISION

Provide an automatic priority access for incoming and outgoing voice traffic.
The recommendations under this HEO should include this as a criteria item requirement for the communication equipment package suggested under HEO 6.2.001.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONVENIENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

[X] No Action Required

TECHNICAL REVIEW

[] Concur.

[] Concur With Comment/Note.

[X] Do NOT concur Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: BOZZON EDISON ESTABLISHED

PROCEDURES IN 12 YRS OPERATING EXPERIENCE,

HAS NOT IDENTIFIED A NEED FOR THIS TYPE OF

SYSTEM.

MANAGEMENT REVIEW

[X] Concur.

[] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN

WT Bolkopf DATE 5/16/84

15 Sabeh 4.13.84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim iPS
 TASK: Control Room Survey
 CL: 6.3
 CL ITEM: 6.3.4.1a
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

EVALUATOR: R. Sabeh
 HED#: 375047
 HED#: 6.3.028
 DATE: 1-23-84
 REV: 1
 HED CATEGORY: B D
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- CONTROLS (Silence):
 A separate silence pushbutton is not provided with each set of annunciator controls.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time to silence annunciator alarm.

RECOMMENDED REVISION

Provide silence pushbuttons with each set of annunciator controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

See Emergency Study

[X] NO ACTION

TECHNICAL REVIEW

[] Concur.
 [X] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include with Annunciator Study with 3 BOLA

MANAGEMENT REVIEW

[] Concur.
 [] Concur With Comment/Note.
 [X] ~~Reevaluate & Resubmit for Following Reason:~~
 Comment/Note/Reason: Mgt. Team believes the present system (3-button) is acceptable. Reduce to category "D"

CHAIRMAN W Babcock DATE 5/18/84

Order 4-12-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3 CL ITEM: 6.3.4.1b,c
 CL TITLE: Annunciator Warning System
 BOARD TITLE: Rx CLO, FW & Cond.

HED#: ~~3-0-0-1~~
 HED#: 6.3.021
 DATE: 1-23-84
 REV:
 HED CATEGORY: ~~D~~
 BOARD#: 983, C1

HED DESCRIPTION

GUIDELINE- CONTROLS (Acknowledge and Reset):
 There are no annunciator controls on Panels 984 and C1.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay acknowledging and resetting annunciator alarms.

RECOMMENDED REVISION

Provide annunciator controls for Panels 984 and C1.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

EJ Don Imp... Study

[X] NO ACTION

TECHNICAL REVIEW

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include with Annunciator Study with 3B034

CHAIRMAN BOB ARNOLD DATE 1/12/84

MANAGEMENT REVIEW

[] Concur.
 Concur With Comment/Note
 DO NOT CONCUR
 REEVALUATE & RESUBMIT FOR FOLLOWING REASON:
 Comment/Note/Reason:

CHAIRMAN WT Babcock DATE 5/19/84

Mgt. Team believes present system is acceptable.

Reduce to category "D"

March 4-11-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.3
 CL ITEM: 6.3.3.2c
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

EVALUATOR: R. Sabeh
 HED#: 5.3.026
 DATE: 2-8-84
 HED CATEGORY: D
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- VISUAL ALARM RECOGNITION AND IDENTIFICATION (Flasher Failure):
 Flashers are checked at the start of each watch. Failure of a flasher between watches will not be detected until the start of the next watch. This observation is supported by the annunciator DER summary.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases probability of error in not responding to an alarm status.

RECOMMENDED REVISION

Install a capability to detect flasher failure when it occurs.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [X] AT CONVENIENT OUTAGE
 [] NON-MANDATORY

[X] No action required

TECHNICAL REVIEW

[] Concur.
 [] Concur With Comment/Note.
 [X] DO NOT CONCUR - Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: The test frequency of 3 times in a 24 hour period plus additional times when alarms come in is deemed sufficient.

MANAGEMENT REVIEW

CHAIRMAN W Babink DATE 5/16/84
 [X] Concur.
 [] Concur With Comment/Note.
 [] Re-evaluate & Resubmit for Following Reason:
 Comment/Note/Reason:

HUMAN ENGINEERING OBSERVATION ASSESSMENT

save 4-11-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.3 CL ITEM: 8.3.4.1c(3)
 CL TITLE: Annunciator Warning System
 BOARD TITLE: NA

R. Sabah
 EVALUATOR
 HED#: ~~3B02A~~
 HED#: 8.3.026
 DATE: 2-8-84 REV:
 HED CATEGORY: **D**
 BOARD#: NA

HEO DESCRIPTION

GUIDELINE- CONTROLS (Reset):
 Reset controls at panels 903 and 905 ^a affect annunciators on panels 903, 904 and 906, controls on panel C2 affect annunciators on panels C1 and C2, controls on panels C3 affect annunciators on panel C3.
 This observation is supported by DER-849.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Possible loss of annunciator signal when more than one tile is alarming on different panels.

RECOMMENDED REVISION

Provide additional annunciator controls at each workstation panel.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 [x] AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[x] Does Impr Study~~
 [x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/12/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in Annunciator Study with 3B02A

MANAGEMENT REVIEW

CHAIRMAN W Balank DATE 5/18/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit for Following Reason:~~
DO NOT CONCUR

Comment/Note/Reason: Mgt. Team believes present system is acceptable.

Reduce to category "D".

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.4 CL ITEM: 8.4.3.1
 CL TITLE: Controls
 BOARD TITLE: PAM CHAN A, ~~PAM CHAN B~~, Area Rad

R. Sabeh
 EVALUATOR

HED#:
 HED#: 8.4.010
 DATE: 1-24-84 REV:
 HED CATEGORY: D
 BOARD#: C170, ~~044~~, C11

HED DESCRIPTION

GUIDELINE- PUSHBUTTON DESIGN PRINCIPLES (Pushbutton Surface):
 Pushbuttons which do not satisfy this guideline criteria as being concave or slip resistant:
 Panel C170: Pushbuttons ~~435, 440~~⁴³⁵
 Panel C171: Pushbuttons ~~1325, 1336~~
 Panel 911: WWV receiver and line filter selector.
 Do not satisfy this guideline criteria as being concave or slip resistant.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases time and the probability of error for positive actuation of pushbutton.

RECOMMENDED REVISION

Install slip resistant surface on pushbuttons.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] No action

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ ^{DO NOT CONCUR} for Following Reason:

Comment/Note/Reason: Panel C170 #433 are annunciator controls. On panel 911, the WWV receiver is not operated by the operators, but is set and left.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/16/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Ann. controls & WWV receiver controls not used sufficiently to justify changes. No operators have complained about these.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

ISSUANCE 4-13-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabsh EVALUATOR | HED#:
 TASK: Control Room Survey | | HED#: 6.4.012
 CL: 6.4 | CL ITEM: 6.4.3.3c(1,4) | DATE: 1-24-84 | REV:
 CL TITLE: Controls | | HED CATEGORY: D
 BOARD TITLE: Rx Cont | | BOARD#: 905

U HED DESCRIPTION

GUIDELINE- LEGEND PUSHBUTTONS (Provision for Lamp Failure):
 No lamp test capability and no legend keying is provided.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in detecting a failed lamp.
 Increases the possibility of error when replacing removed covers.

RECOMMENDED REVISION

Provide a lamp test capability and a positive means to prevent
 interchanging lamp or pushbutton covers.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [X] NON-MANDATORY

[X] No action req'd

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- Concur.
- Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ ^{DO NOT CONCUR} for Following Reason:

Comment/Note/Reason: Legend pushbuttons have dual bulbs. Drawings showing correct legend locations are available to control room operators.

MANAGEMENT REVIEW

CHAIRMAN W Baluck DATE 5/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

At Khanna 9/17/84
R Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NFS

EVALUATOR: R. Sabeh

TASK: Control Room Survey

CL: 6.4 CL ITEM: 6.4.1.1

CL TITLE: Controls

BOARD TITLE: Turbine

4

HED#: 613114

HED#: 6.4.019

DATE: 4/18/84

REV: B D

BOARD#: Q2

HED DESCRIPTION

GUIDELINE- GENERAL PRINCIPLES (ADEQ):

Instructions on control plate #231 require the operator to hold the handle in position for 2 seconds to stop the auxiliary oil pumps

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in holding the pump control handle

RECOMMENDED REVISION

Provide a delay circuit in the control to hold the handle for proper pump operation
Provide a delay circuit

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONCURRENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

ESD Des. Impro. Study

[X] NO ACTION

TECHNICAL REVIEW

[] Concur.

[X] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason: improvement.

Comment/Note/Reason: Include in the panel study to determine the best way to eliminate the time required on the switch.

CHAIRMAN Bob ARNOLD

DATE 4/19/84

MANAGEMENT REVIEW

[] Concur.

[] Concur With Comment/Note.

[X] Do NOT CONCUR
Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

Manual control of this function is desired. No change to be made

CHAIRMAN W. Babuk

DATE 5/22/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

R. Sabeh 4-13-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.1f
 CL TITLE: Visual Displays
 BOARD TITLE: All

R. Sabeh
 EVALUATOR

HED#:
 HED#: 8.5.001
 DATE: 1-24-84 REV:
 HED CATEGORY: D
 BOARD#: All

HED DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Display Failure)
 Indication of display failure is not ^{read readily} apparent to the operator except on the following indicators:
 Panel C7: #1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1402, 1403, 1401.
 Panel C2: #168.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of detecting a display failure.

RECOMMENDED REVISION

Provide means to detect instrument failure.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

EX3 No Action Required

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/13/84

- [] Concur.
- [] Concur With Comment/Note.
- DO NOT CONCUR
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: There are multiple protection channels, ^{annunciator} alarms on sensitive processes, and almost all loop failures are detectable by the difference between electrical zero and mechanical zero. Loops are 10-50 ma, and are being converted to 4-20 ma.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: No one instrument is required for an operator to respond to an accident, so no unsafe condition exists should a failure occur. Operators are trained to "scan" all instruments, and not to focus on one instrument only. Therefore a single instrument failure should be readily apparent.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Ch. Beggs 4/16/84
B. Sabeh 4.16.84

CHAIRMAN BOB ARNOLD DATE 4/16/84

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

CHAIRMAN W. T. Sabeh DATE 5/17/84

OBSERVATION

PLANT: Pilgrim NFS HED#:
 TASK: Control Room Survey EVALUATOR
 CL: 6.5 CL ITEM: 6.5.3.3c DATE: 1-24-84 REV:
 CL TITLE: Visual Displays HED CATEGORY: D
 BOARD TITLE: Rx Cont BOARD#: 906

HED DESCRIPTION

GUIDELINE- DESIGN AND USE OF LEGEND LIGHT INDICATORS (Distinguishability from Legend Pushbuttons):
 This criteria deviation is reported under HED 6.4.011.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

See HED 6.4.011.

RECOMMENDED REVISION

See HED 6.4.011.

RECOMMENDED IMPLEMENTATION

- [] PRIOR TO OR AT NEXT REFUELING
- [] AT CONVENIENT OUTAGE
- [] AT EARLIEST OPPORTUNITY
- [] NON-MANDATORY

[X] No Action - REFER TO 6.4.011 (48056)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

of Mannin 9/16/84
Rebel 9-16-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 8.5 CL ITEM: 8.5.5.1a(3)
CL TITLE: Visual Displays
BOARD TITLE: Cont Vent

R. Sabeh
EVALUATOR

HED#:
HED#: 8.5.012
DATE: 1-24-84 REV:
HED CATEGORY: D
BOARD#: C7

HED DESCRIPTION

GUIDELINE- DRUM-TYPE COUNTERS (Numerical Presentation Factors - Grouping of Numerals):
Counter on Panel C7 - #1459 uses 8 ungrouped numbers.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading the counter.

RECOMMENDED REVISION

Provide demarcation for appropriate number grouping.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

[3] No action required.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/16/84

- Concur.
- Concur With Comment/Note.
Do Not Concur
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: No operator expressed a problem in this area. Believe this device is adequate as-is. Device is infrequently used.

MANAGEMENT REVIEW

CHAIRMAN WT Sabeh DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

at P... 9/16/84
R. Sabeh 4-16-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#:
 TASK: Control Room Survey | EVALUATOR | HED#: 8.5.013
 CL: 8.5 | CL ITEM: 8.5.5.1a(4) | DATE: 1-24-84 | REV:
 CL TITLE: Visual Displays | HED CATEGORY: D
 BOARD TITLE: Cntmt Vent | BOARD#: C7

HED DESCRIPTION

GUIDELINE- DRUM-TYPE COUNTERS (Numerical Presentation Factors - Contrast):
 Counter #1459 on Panel C7 uses white numbers on a black background.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in reading the counter.

RECOMMENDED REVISION

Replace white numbers on black background with black numerals on white background dark letters on a light background.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[x] No action required

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ *Do not concur* for Following Reason:

Comment/Note/Reason: *No operator expressed a problem in this area. Device is infrequently used.*

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/17/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

ILMAN ENGINEERING OBSERVATION ASSESSMENT

*upover in 11/10/07
 of Brennan 4/16/84
 R. Sabeh 4-16-84*

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.6 CL ITEM: 8.5.5.1c(1)
 CL TITLE: Visual Displays
 BOARD TITLE: Cntmt Vent

EVALUATOR: R. Sabeh
 HED#: HED#: 8.5.814
 DATE: 1-24-84 REV:
 HED CATEGORY: D
 BOARD#: C7

HED DESCRIPTION

GUIDELINE- DRUM TYPE COUNTERS (Drum Movement)
 The counter on panel C7 #1459 is a continuous movement and does not conform with the guideline criteria

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the time and the probability of error in reading drum counter valve.

RECOMMENDED REVISION

Replace continuous movement with a snap action discrete number change.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] No action required

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/16/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ ^{Do not concur} for Following Reason:

Comment/Note/Reason: Plant operators have not expressed a problem in this area. Device is adequate as-is.

MANAGEMENT REVIEW

CHAIRMAN W. Balink DATE 5/17/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

of August 9/16/84
R. Sabeh 0-16-84

CHAIRMAN BOB ARNOLD DATE 4/16/84

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- DO NOT CONCUR
Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Many Annunciations require remote actions/monitoring. All Annunciations described here require monitoring in the control room.

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

CHAIRMAN W. Schubert DATE 5/16/84

Comment/Note/Reason:

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 0.5 CL ITEM: 0.5.1.1b
 CL TITLE: Visual Displays
 BOARD TITLE: Rx CLG

HEID#: _____
 HED#: 0.5.018
 DATE: 1-24-84 REV: _____
 HED CATEGORY: D
 BOARD#: 903

HED DESCRIPTION

OUTLINE- INFORMATION TO BE DISPLAYED (Completeness of Information):
 Actuation of HI/HI RADIATION annunciator tile requires operator to read meters on back panels.
 This observation is supported by OER-032.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time required for reading meters and removes operator from primary control area.

RECOMMENDED REVISION

Relocate meters to the primary control area.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[] no action required

of the person 4/16/84
R. Sabath 4-16-84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.5
CL TITLE: Visual Displays
BOARD TITLE: NA
EVALUATOR: R. Sabath
HED#: 6.5.822
HEO CATEGORY: D
BOARD#: NA
DATE: 2-8-84
REV: 1

HEO DESCRIPTION

GUIDELINE- INFORMATION TO BE DISPLAYED (Demand vs. Status):
System/equipment status is not displayed for all important parameters.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary for identifying a possible system/equipment outage.

RECOMMENDED REVISION

Provide system/equipment status for all important parameters.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

03 No action req'd.

TECHNICAL REVIEW

[] Concur.

Concur With Comment/Note.
Do not concur

Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Equipment design does provide feedback of status instead of demand information.

CHAIRMAN BOB ARSLAND DATE 4/16/84

MANAGEMENT REVIEW

Concur.

[] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

CHAIRMAN LOIS BALK DATE 5/17/84

9/16/84
R. Sabbeh

OBSERVATION

PLANT: Pilgrim NFS
TASK: Control Room Survey
CL: 8.5 CL ITEM: 8.5.3.1a
CL TITLE: Visual Displays
BOARD TITLE: NA

HEO#: 6.5.024
DATE: 2-8-84
HEO CATEGORY: D
BOARD#: NA

HEO DESCRIPTION

GUIDELINE- PRECAUTIONS TO ASSURE AVAILABILITY:
There is no dual bulb/filament or bulb test capability.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Inability to detect bulb or circuit failure.

RECOMMENDED REVISION

Provide a dual bulb/filament or bulb test capability.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONVENIENT OUTAGE
[] AT EARLIEST OPPORTUNITY
NON-MANDATORY

63 No action Required

TECHNICAL REVIEW

- Concur.
- Concur With Comment/Note.
- Do NOT CONCUR. Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Do not believe that lamp test is desirable because of the magnitude of the wiring required to implement this feature. Do not believe that dual filament bulbs provide enough contrast to distinguish. No operator complaints have been in this area. Operators do not normally leave controls until light change action.

CHAIRMAN BOB ARNOLD DATE 4/6/84

MANAGEMENT REVIEW

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

CHAIRMAN W. S. BARBER DATE 5/17/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Officer 4/16/84
R. Sabich 4-16-84

OBSERVATION

PLANT: Pilgrim NPS

EVALUATOR: R. Sabich

HEM#:

TASK: Control Room Survey

HEM#: 6.5.027

CL: 6.5 CL ITEM: 6.5.3.1c(2)

DATE: 2-8-84 REV:

CL TITLE: Visual Displays

HE3 CATEGORY: D

BOARD TITLE: All

BOARD#: All

HE3 DESCRIPTION

GUIDELINE- CHARACTERISTICS AND PROBLEMS OF LIGHT INDICATORS (Precautions to Avoid Misinterpretation):
There is no provision to prevent interchanging covers on light indicators.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the probability of misinterpreting the display status and interchanging indicator covers.

RECOMMENDED REVISION

Provide a keying scheme to prevent lamp cover interchangeability.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
[] AT CONCURRENT OUTAGE
[] AT EARLIEST OPPORTUNITY
[] NON-MANDATORY

[] No action req'd.

TECHNICAL REVIEW

[] Concur.

[] Concur With Comment/Note.

[X] DO NOT CONCUR
Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: DRAWINGS SHOWING CORRECT LIGHT COVER LOCATIONS ARE AVAILABLE TO CONTROL ROOM OPERATORS.

MANAGEMENT REVIEW

[] Concur.

[X] Concur With Comment/Note.

[] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: The relative position of red and green lamps is on left and R on right, with the exception of a few turbine controls. These will be investigated as part of HED# SB068.

CHAIRMAN W. Belink DATE 5/17/84

CHAIRMAN BOB ARNOLD DATE 4/16/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

cl Brennan 9/17/84
R. Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh EVALUATOR | HED#: EDTE
 TASK: Control Room Survey | | HED#: 8.5.037
 CL: 8.5 | CL ITEM: 8.5.2.2a(2) | DATE: 4/18/84 | REV:
 CL TITLE: Visual Displays | | HED CATEGORY: BD
 BOARD TITLE: PX CLG | | BOARD#: 903

HED DESCRIPTION

GUIDELINE- POINTER (POINTER TIP FORM):
 The pointer tip conceals the scale graduation markings on #820 and 834 (YARLIAYS).

See HED 8.5.038 and 8.5.039

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase the probability of error in reading scale accuracy

RECOMMENDED REVISION

Provide a scale pointer that minimizes concealment of scale graduation on meters 820 and 834.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ED Des. Impr. Study

[x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/19/84

Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN WR Zubrick DATE 5/22/84

[] Concur.
 Concur With Comment/Note.
 DO NOT CONCUR
 ~~Reevaluate & Resubmit for Following Reason:~~
 Comment/Note/Reason: _____

These devices are being replaced - no action needed.

Change to category "D"

NOTE:

Entire meter being replaced

WRB 6/13/84

ILMAN ENGINEERING OBSERVATION ASSESSMENT

Cl Brennan 9/19/84
R Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh
TASK: Control Room Survey | EVALUATOR
CL: 6.6 | CL ITEM: 6.6.1.2(a) | HED#: ~~5817~~
DATE: 4/18/84 | REV: | HED#: 6.6.038
CL TITLE: Visual Displays | HED CATEGORY: **B D**
BOARD TITLE: RX CLG, *Rx Control* | BOARD#: 903, 905

HED DESCRIPTION

GUIDELINE- USABILITY OF DISPLAYED VALUES (SCALE SELECTION):
The scale units are not consistent with the degree of precision and accuracy needed by the operator on instruments #828 and 834 (YARWAYS), 1173 and 1174 on panel 905
See HED 6.6.037 and 6.6.039

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and probability of error in reading water level

RECOMMENDED REVISION

Revise scale units to be consistent with the precision and accuracy needed by the operator to perform the yarway functions

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Let Des. Impor Study

NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 9/19/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include in panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN W Baluck DATE 5/22/89

- Concur.
- Concur With Comment/Note.
- DO NOT CONCUR
Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason:

These devices are being replaced - no action needed

Change to category "D"

Note: these scales are in process of being replaced with new units

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Ch. Harrison 4/19/84
R. Sabeh 4-19-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.5 CL ITEM: 8.5.1.3c
 CL TITLE: Visual Displays
 BOARD TITLE: RX CLG

R. Sabeh
EVALUATOR

HED#: ~~5B48~~
 HEO#: 8.5.039
 DATE: 4/18/84 REV:
 HEO CATEGORY: ~~B~~-D
 BOARD#: 903

HEO DESCRIPTION

GUIDELINE- READABILITY (CONTRAST):
 Displays should contain black markings on a white background.
 The meter face on #820 and 834 contain black markings on a
 dark green background (YARWAYS)

See HEO 8.5.037 and HEO 8.5.038

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Difficult for the operator to read scale accurately

RECOMMENDED REVISION

Revise scale to contain black markings on a white background

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 [x] AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] Do Impro Study
 [x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/19/84

[] Concur.
 Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Include in the panel improvement study.

MANAGEMENT REVIEW

CHAIRMAN WJ Sabeh DATE 5/22/84

[] Concur.
 [] Concur With Comment/Note.
~~DO NOT CONCUR~~
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: Devices being replaced - no action
Change to category "D"

Note Entire meter being replaced
 WJ 6/13/84

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. Brennan 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#:
 TASK: Control Room Survey | EVALUATOR | HED#: 6.6.013
 CL: 6.6 | CL ITEM: 6.6.5.1e | DATE: 1-25-84 | REV:
 CL TITLE: Labels and Location Aids | HED CATEGORY: D
 BOARD TITLE: NA | BOARD#: NA

HED DESCRIPTION

GUIDELINE- USE (Mounting):
 Numerous tagouts are just slipped over the control and could be knocked off.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error for operating controls.

RECOMMENDED REVISION

Revise tag-outs to conform with guideline criteria, i.e., securely fixed to the control.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] No action req'd.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Do not Concur*
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Tags in use are made of a
stiff material and are not likely to be
knocked off the controls.

MANAGEMENT REVIEW

CHAIRMAN W. Balwick DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

at Bremner 4/17/84
R. Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.6 CL ITEM: 6.6.5.1g
 CL TITLE: Labels and Location Aids
 BOARD TITLE: NA

R. Sabeh
 EVALUATOR

HED#:
 HED#: 6.6.014
 DATE: 1-26-84 REV:
 HED CATEGORY: D
 BOARD#: NA

HED DESCRIPTION

GUIDELINE- USE (Activation):
 Tag-outs do not physically prevent actuation of controls.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Accidentally activating tagged out controls.

RECOMMENDED REVISION

Provide tag-outs to prevent actuation of controls.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] No action req'd.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- ^{Do not concur} Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Operators are formally trained in tag-out procedures, and tag-outs are logged and reviewed at shift change.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Tags are specifically not designed to prevent operation, but to warn operators of potential unsafe conditions.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

24/1/84
of Bremen 4/17/84
Re-label 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh EVALUATOR | HED#: |
 TASK: Control Room Survey | | HED#: 8.8.023 |
 CL: 8.8 | CL ITEM: 8.8.5.2b(7) | DATE: 2-8-84 | REV: |
 CL TITLE: Labels and Location Aids | HEO CATEGORY: D |
 BOARD TITLE: NA | BOARD#: NA |

HEO DESCRIPTION

GUIDELINE- CONTROL (Review Procedures):
 There are no retraining requirements for the use of temporary *labels* tags.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the probability of error in determining equipment status.

RECOMMENDED REVISION

Institute a training instruction on the proper use of tagged equipment.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

EX: No action required

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- Concur.
- Concur With Comment/Note.
- Do not concur
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: When temporary labels are installed, the operators are retrained in the new method of using the equipment, if necessary.

MANAGEMENT REVIEW

CHAIRMAN WJ Balenk DATE 5/17/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W/Balank 4/17/84
 R Sabeh 4-17-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: |
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.024
 CL: 8.8 | CL ITEM: 8.8.1.1 | DATE: 2-8-84 | REV: |
 CL TITLE: Labels and Location Aids | HED CATEGORY: D |
 BOARD TITLE: Cntmt Vent | BOARD#: C7 |

HED DESCRIPTION

GUIDELINE- NEED FOR LABELING:
 Labels on switches #1391 and 1398 are mismatched, i.e., each switch is labeled A and B.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

The operator is unable to identify the proper control.

RECOMMENDED REVISION

Relabel the switches for proper identification.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

No action req'd

TECHNICAL REVIEW

Concur. CHAIRMAN BOB ARNOLD DATE 4/17/84
 Concur With Comment/Note.
 ~~Reevaluate & Resubmit~~ ^{DO NOT CONCUR} for Following Reason:
 Comment/Note/Reason: Labels match the P&ID and the field installation.

MANAGEMENT REVIEW

Concur. CHAIRMAN W/Balank DATE 5/17/84
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:
 Comment/Note/Reason: _____

HUMAN ENGINEERING OBSERVATION ASSESSMENT

*at Bremmion 9/12/84
R Label 4.17.84*

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#:
 TASK: Control Room Survey | EVALUATOR | HED#: 8.8.027
 CL: 8.8 | CL ITEM: 8.8.8.2a(2) | DATE: 2-3-84 | REV:
 CL TITLE: Labels and Location Aids | HEO CATEGORY: D
 BOARD TITLE: Rx CLG | BOARD#: 983

HEO DESCRIPTION

GUIDELINE- DEMARCATION (Use):
 Controls #852/897 and #853/898 are functionally related but relationship is not apparent.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase probability of error for activating both controls simultaneously.

RECOMMENDED REVISION

Provide demarcation and hierarchical labeling for the two pairs of controls.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [x] NON-MANDATORY

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/17/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ ^{Do NOT CONCUR} for Following Reason:

Comment/Note/Reason: Items are two redundant channels and not functionally related.

MANAGEMENT REVIEW

CHAIRMAN WT Balwick DATE 5/12/84

- Concur.
- [] Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

[x] NO ACTION

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 8.8 CL ITEM: 8.8.2.1a(2) DATE: 1-25-84 REV:
 CL TITLE: Panel Layout HED CATEGORY: **B D**
 BOARD TITLE: Rx CLG **NPCI** BOARD#: 903

HED DESCRIPTION

GUIDELINE- SEQUENCE, FREQUENCY OF USE, AND FUNCTIONAL CONSIDERATIONS (Sequence):
 Controls for Fast Startup Test and Injection procedures are not grouped in a usable sequential manner.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in activating sequential controls.

RECOMMENDED REVISION

Relocate controls to conform with guideline criteria or provide operator aids to direct the operator to the next necessary sequential action.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT WUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~[] ENHANCEMENT~~

[x] No action (refer to 6B078)

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: No control relocation, but enhancement with color coding or numerical sequential numbering scheme. Refer to 6B078.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Refer to HED # 6B078 for action on this issue.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

W. B. B. 4-12-84
 Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.3.2d(1,2)
 CL TITLE: Panel Layout
 BOARD TITLE: Rx cont

R. Sabeh
 EVALUATOR

HED#: ~~88076~~
 HED#: 6.8.004
 DATE: 1-25-84 REV:
 HEO CATEGORY: **BD**
 BOARD#: 906

HEO DESCRIPTION

GUIDELINE- STRINGS OR CLUSTERS OF SIMILAR COMPONENTS (Large Matrices):
 Rod display matrix "p" coordinates are labeled at the bottom.
 2

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the search time and the probability of error for rod identification.

RECOMMENDED REVISION

Include labels for "p" coordinates at top of rod display matrix. It should be noted that the bottom coordinates should not be removed to enable an operator in the seated position to read the coordinates.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

~~6.7 Design improvement study~~
 NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Include with the labeling, etc study. No systematic basis exists, at present, for making this enhancement

MANAGEMENT REVIEW

CHAIRMAN W Babuck DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- ~~Reevaluate & Resubmit for Following Reason:~~
DO NOT CONCUR

Comment/Note/Reason: Axes are labelled at side and bottom. Believe this is satisfactory.
Reduce to category "D"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

1201
R. Sabeh 4-12-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.8 CL ITEM: 6.8.1.1a,b
 CL TITLE: Panel Layout
 BOARD TITLE: Turbine, Electrical

R. Sabeh
EVALUATOR

HED#: HED#: 6.8.009
 DATE: 2-8-84 REV:
 HED CATEGORY: D
 BOARD#: C2, C3

HED DESCRIPTION

GUIDELINE- ASSIGNING PANEL CONTENTS (Grouping by Sequence and Function):
 Turbine controls are located on panels C2 and C3.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time necessary to perform turbine tasks resulting from excessive movement within the control room.

RECOMMENDED REVISION

Relocate all turbine controls from Panel C3 to C2.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

ES No action required

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/12/84

- [] Concur.
- [] Concur With Comment/Note.
- ~~Reevaluate & Resubmit~~ *Do Not Concur* for Following Reason:

Comment/Note/Reason: *The control on C3 that is necessary for synchronizing - the speed/load changer - is duplicated. In both. No change is required.*

MANAGEMENT REVIEW

CHAIRMAN W. Balmer DATE 5/17/84

- [] Concur.
- Concur With Comment/Note.
- [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: *Duplicated controls required for ease of plant operation.*

HUMAN ENGINEERING OBSERVATION ASSESSMENT

of Brennan 4/18/84
R. Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS
TASK: Control Room Survey
CL: 6.8 CL ITEM: 6.8.2.1c(1)
CL TITLE: Panel Layout
BOARD TITLE: Rx Cinup
R. Sabeh EVALUATOR
HEO#: 815104
HEO#: 6.8.016
DATE: 2-3-84 REV:
HEO CATEGORY: B D
BOARD#: 904

HEO DESCRIPTION

GUIDELINE- SEQUENCE, FREQUENCY OF USE AND FUNCTIONAL CONSIDERATIONS (Functional Considerations):
Controls #1008 and 1013 are associated with controls #992 and 997. The separation between these controls does ^{not} satisfy the guideline criteria. ^{and} ^{are associated with} ^{and} ^{are respectively}

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error to activate controls in sequence.

RECOMMENDED REVISION

Relocate controls #992 and 1008 above #997 and 1013, respectively

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

Ed D. chg
[x] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: These controls may be in process of being removed per recirc piping mod.

MANAGEMENT REVIEW

CHAIRMAN W Baluch DATE 5/20/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

No action required - these devices are being removed

Change to no action - category "D"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Channon 4/18/84
R Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS | R. Sabeh | HED#: |
 TASK: Control Room Survey | EVALUATOR | HED#: 6.9.001 |
 CL: 6.9 | CL ITEM: 6.9.1.1b | DATE: 1-26-84 | REV: |
 CL TITLE: Control Display Integration | HED CATEGORY: D |
 BOARD TITLE: Rx CLG | BOARD#: 903 |

HED DESCRIPTION

GUIDELINE- SINGLE CONTROL AND DISPLAY PAIRS (Obscuration):
 Panel 903: Control #628 mounted to the left of display #629.

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Control adjustment may interfere with display readability unless left hand is used on control.

RECOMMENDED REVISION

Relocate control to a position below the display.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[x] No action req'd.

TECHNICAL REVIEW

CHAIRMAN BOB ARNOLD DATE 4/18/84

- Concur.
 Concur With Comment/Note.
 ~~Reevaluate & Resubmit~~ ^{Do not concur} for Following Reason:

Comment/Note/Reason: This equipment is not used in normal or emergency operation, but is a test function only.

MANAGEMENT REVIEW

CHAIRMAN WBaluck DATE 5/17/84

- Concur.
 Concur With Comment/Note.
 Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: No change req'd for this HED.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

Ch. Blumner 4/18/84
R. Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.9 CL ITEM: 6.9.2.2d
 CL TITLE: Control Display Integration
 BOARD TITLE: Rx CLG, Clnup

R. Sabeh
EVALUATOR

HED#: _____
 HED#: 6.9.002
 DATE: 1-26-84 REV: _____
 HED CATEGORY: D
 BOARD#: 903, 904

HED DESCRIPTION

GUIDELINE- SINGLE PANEL ARRANGEMENTS (Consistent Practice):
 Panel 903: control #828 is to the left of Display #829, but on
 Panel 904: #842 is below Display #833.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increases the time and the probability of error in making fine adjustments.

RECOMMENDED REVISION

Reposition Control #828 on Panel 903 below Display #829.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 AT CONVENIENT OUTAGE
 AT EARLIEST OPPORTUNITY
 NON-MANDATORY

[X] No action req'd.

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- [] Concur.
 [] Concur With Comment/Note.
 [X] ^{Do not concur} Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: These controls are not used during normal or emergency operations, but as a test function only.

MANAGEMENT REVIEW

CHAIRMAN W. Balenk DATE 5/17/84

- [] Concur.
 [X] Concur With Comment/Note.
 [] Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: No changes to be done for this HEO.

HUMAN ENGINEERING OBSERVATION ASSESSMENT

J. Brennan 4/18/84
R. Sabeh 4-18-84

OBSERVATION

PLANT: Pilgrim NPS

R. Sabeh
EVALUATOR

HED#: ~~0812~~

TASK: OER

HED#: OER-083

CL: Questionnaire CL ITEM: E6

DATE: 1-31-84 REV:

CL TITLE: Visual Displays

HED CATEGORY: ~~B~~ "D"

BOARD TITLE: NA

BOARD#: NA

HED DESCRIPTION

GUIDELINE- ARE THE DISPLAYS EASY TO READ AND INTERPRET?

The location of a west position indicator light is on the right and east indicator on the left of the scram discharge header panel. These locations do not conform with convention.

alarm above 905.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increase operator response time and potential source of error.

RECOMMENDED REVISION

Reposition lights to conform with convention.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING
AT CONVENIENT OUTAGE
AT EARLIEST OPPORTUNITY
NON-MANDATORY

~~[X] Design Change~~
[X] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob Arnold DATE 4/18/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Design change to align the position of the indicators.

MANAGEMENT REVIEW

CHAIRMAN W. Sabeh DATE 5/22/84

- Concur.
- Concur With Comment/Note.
- ~~Reevaluate & Resubmit for Following Reason:~~
DO NOT CONCUR

Comment/Note/Reason: _____

No action required - this device is being removed.

Reduce to category "D"

HUMAN ENGINEERING OBSERVATION ASSESSMENT

4/10/84 *W Babink 9/10/84*
R Sabeh 4-10-84

OBSERVATION

PLANT: Pilgrim NPS
 TASK: Control Room Survey
 CL: 6.1
 CL TITLE: Control Room Workspace
 BOARD TITLE: Cntmt Vent, Rx Cinup

R. Sabeh
 EVALUATOR

HED#: _____
 HEO#: 6.1.003
 DATE: 1-20-84
 REV: _____
 HED CATEGORY: D
 BOARD#: C7,904

HEO DESCRIPTION

GUIDELINE- EQUIPMENT-TO-OPPOSING SURFACE DISTANCE:
 The separation between the front of panel C7 and the back of Panel 904 is 40 in.
 This is 10 in. less than the guideline criteria.

[] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Delay in performing operator functions and increases the probability of errors.

RECOMMENDED REVISION

Relocate critical instrumentation to the primary operating area as recommended in HEO 6.1.001. This recommendation will greatly reduce the impact of the limited separation. It should be noted that the operators did not indicate the separation distance as being a problem.

RECOMMENDED IMPLEMENTATION

[] PRIOR TO OR AT NEXT REFUELING
 [] AT CONVENIENT OUTAGE
 [] AT EARLIEST OPPORTUNITY
 [] NON-MANDATORY

[X] NO ACTION

TECHNICAL REVIEW

CHAIRMAN Bob ARNOLD DATE 4/10/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: Critical instrumentation is covered under another HEO. Review with plant operators reveals no problem with the 10 inch discrepancy. No corrective action required.

MANAGEMENT REVIEW

CHAIRMAN WT Babink DATE 5/16/84

- Concur.
- Concur With Comment/Note.
- Reevaluate & Resubmit for Following Reason:

Comment/Note/Reason: _____

-----OBSERVATION----- (DRAFT FORMAT) -----

PLANT EVALUATOR HED#:
Lgrim NPS E.Gagnon/R.Saben

TASK: HEO
Verif./Valid. 6.1.033

CL: CL-ITEMS DATE: REV:
6.1 6.1.1.1a 6/1/84

CL TITLE: HEO CATEGORY:
Control Room Workspace

BOARD TITLE: BOARD#:
N/A ~~N/A~~ NCR

HEO DESCRIPTION

- GUIDELINE- (MA) ACCESSIBILITY OF INSTRUMENTATION/EQUIPMENT
- (MB) (PRESENT IN THE CONTROL ROOM):
- (MC) In executing the task "monitor DW sump isolation valves & flow" ^L
- (NA) (4T:15.00) the flow can only be observed outside the _A
- (NB) control room.
- (NC)
- (OA)
- (OB)
- (OC)
- (PA)
- (PB)

POTENTIAL OPERATOR ERROR(S)

- (QA) Delay in determining DW sump flow leading to
- (QB) uncertainty in critical safety function status.
- (QC)
- (RA)
- (RB)

RECOMMENDED REVISION

- (SA) Provide DW sump flow indication ⁱ on the
- (SB) control room.
- (SC)
- (TA)
- (TB)
- (TC)
- (UA)
- (UB)

HUMAN ENGINEERING OBSERVATION ASSESSMENT

6/5/84
 Cf. Bureau 6/5/84
 W. Balbank 6/5/84

OBSERVATION

EVALUATOR	TOPIC	HEO#1	HA 211
		HEO#2	4.1.033
TASK#		DATE:	6/1/84 REV:
CL#	CL ITEM#	HEO CATEGORY:	A-D
CL TITLE:			
CONTROL BOARD LOCATION			

HEO DESCRIPTION

GUIDELINE-

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATION ERROR(S)

SUGGESTED CORRECTIVE ACTION

OTHER (SPDS integration)

AIT REVIEW

- Concur. CHAIRMAN S. Luna DATE 6/5/84
- Concur With Comment/Note.
- Do Not Concur for Following Reasons:

RECOMMENDER IMPLEMENTATION

- PRIOR TO OR AT NEXT REFUELING
- AT CONVENIENT OUTAGE
- AT EARLIEST OPPORTUNITY
- NON-MANDATORY

MANAGEMENT REVIEW

- Concur. CHAIRMAN W. Balbank DATE 6/7/84
- Concur With Comment/Note.
- Do Not Concur for Following Reason:

The MR Team recommends investigation of addition of these signals to SPDS display

2nd Mgt. Team meeting 9/10/84: Not practical to put on SPDS. Therefore, no action to be taken. Info available in radwaste CR which is continuously manned & in communication with main CR. Reduce to a copy "D".
 W. Balbank.

Figure 6-1. Human Engineering Observation Assessment.

PLANT

EVALUATOR

HED#:

11grim NPS

E.Gagnon/R.Saben

TASK:

HEO

Verif./Valid.

6.1.032

CL:

CL-ITEMS

DATE:

REV:

6.1

6.1.1.1a

6/1/84

CL TITLE:

HEO CATEGORY:

Control Room Workspace

BOARD TITLE:

BOARD#:

N/A

NCR

HEO DESCRIPTION

- GUIDELINE- (MA) ACCESSIBILITY OF INSTRUMENTATION/EQUIPMENT
- (MB) (PRESENT IN THE CONTROL ROOM):
- (MC) In executing the task "control DW temperature" (2T:35.00),
- (NA) verification that DW cooling fans are operating must
- (NB) be done outside control room.
- (NC)
- (OA)
- (OB)
- (OC)
- (PA)
- (PB)

POTENTIAL OPERATOR ERROR(S)

- (QA) Delay in completing task contributing to uncertainty in
- (QB) critical safety function status during emergency events.
- (QC)
- (RA)
- (RB)

RECOMMENDED REVISION

- (SA) Provide DW cooling fan status in control room.
- (SB)
- (SC)
- (TA)
- (TB)
- (TC)
- (UA)
- (UB)

HUMAN ENGINEERING'S OBSERVATION ASSESSMENT

Of Babcock
 Dist. 9
 2573A York 6/5/84

OBSERVATION

EVALUATOR: _____ TOPIC: _____

TASK: _____

CL: _____ CL ITEM: _____

CL TITLE: _____

CONTROL BOARD LOCATION: _____

HEED#: ~~#0130~~ #0130
 HEED#: 61.032
 DATE: 6/1/84 REV: _____
 HEED CATEGORY: B Duty

HEED DESCRIPTION

GUIDELINE-

SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERR(S)

SUGGESTED CORRECTIVE ACTION

[x] OTHER (SPDS integration)

ALL REVIEW

Concur. CHAIRMAN: S. Luna DATE: 6/5/84

Concur With Comment/Note.

Do Not Concur for Following Reasons:

The AIT does not necessarily concur with the recommended revision because the intended cooling of the DW is easily observed on panel C7. The AIT recommends further review with the panel design improvement assessment.

RECOMMENDED IMPLEMENTATION

PRIOR TO OR AT NEXT REFUELING

AT CONVENIENT OUTAGE

AT EARLIEST OPPORTUNITY

NON-MANDATORY

MANAGEMENT REVIEW

Concur. CHAIRMAN: W. Babcock DATE: 6/9/84

Concur With Comment/Note.

Do Not Concur for Following Reasons:

The MRT team recommends investigation of including the DW fan status and temperatures on SPDS display.

2nd Mgt. Team meeting 9/10/84: Not practical to add to SPDS. DW temperature is available; no need for further action. Reduce to category "D".

Figure 6-1. Human Engineering Observation Assessment Form

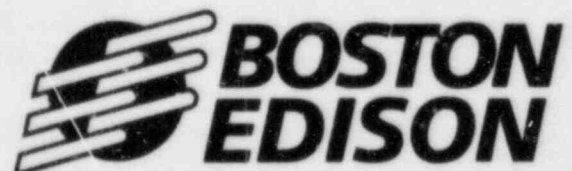
ATTACHMENT A

August 1984

Detailed Control Room Design Review

Main Control Room Initial Panel Layout Report

Pilgrim Station



August 1984

Detailed Control Room Design Review

***Main Control Room
Initial Panel Layout Report***

Pilgrim Station



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SUMMARY

An initial panel layout design effort was performed under the direction of a special task team. Forty-two panel layout related human engineering discrepancies (HEDs) were addressed. This effort was performed with full-scale representations of proposed solutions to HEDs on the full-scale Pilgrim main control board mock-up.

The initial effort produced sufficient data to show that the HEDs can be resolved using most of the existing hardware but with some hardware changes in switches and recorders. A firm basis has been developed for a final panel layout which will be undertaken as part of an overall plan for the Pilgrim control room design improvement.

The reader is reminded that the solutions presented are conceptual only and may be changed as the design evolves.

1.0 INTRODUCTION

This report summarizes the results of a special task team to produce initial main panel layouts to address those Human Engineering Discrepancies (HEDs) resulting from the detailed control room design review of the Pilgrim Station. These HEDs involve:

1. The recommendations for panel equipment rearrangements within present configurations.
2. The relocation of back panel equipment to the main panels to reduce the current operator traffic patterns used in the execution of emergency procedures.
3. The addition of new panel devices to improve operator feedback.

This effort was intended primarily to show the general conceptual approach to the resolution of the 42 panel layout related HEDs.

This effort was conducted by a special task team and relied on the input of experienced Pilgrim Station operations personnel.

2.0 METHODOLOGY

2.1 TASK TEAM

A special task team was assembled to perform the work. It consisted of the following individuals:

W. Babcock
D. Kirby
L. Oliver
L. Nichols
S. Luna
E. Considine

2.2 INITIAL TASK TEAM MEETING

A meeting was held by the task team to establish the program direction as follows:

1. The final main control board arrangements will require several iterations to produce an optimum layout.
2. The task team will review all HEDs to determine which ones affect the main panel layout.
3. The initial main panel board efforts will address the HEDs associated with panel layout.
4. The task team outlined the decision process to be used in this effort (see Figure 2-1). Essentially, there is a need to determine if the current types of equipment can be used in any effort to resolve the

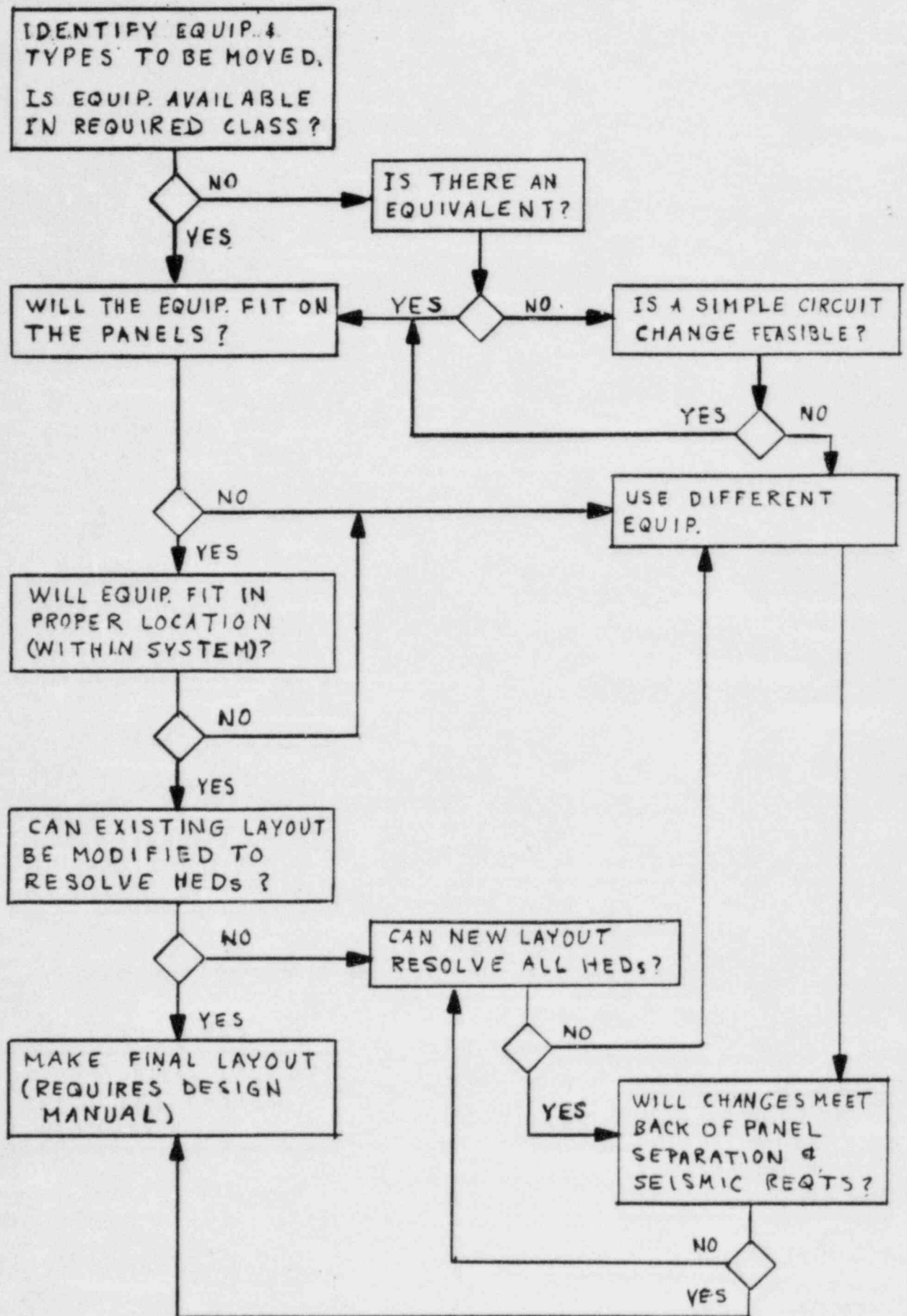


Figure 2-1. Decision Process

panel layout HEDs. This involves the determination that within the present layout structure:

- o can minimal changes be made to correct the HEDs, or
- o will a major layout redesign be required?

2.3 SCOPE VISUALIZATION ON MOCK-UP

The full-scale mock-up will be used for identifying all the areas covered by the panel HEDs. This effort will provide scope visualization of the extent of the deficiencies. The identification will be made using tape to outline the areas of concern. The HED verbage is to be located within the boundaries on 3 x 5 cards.

2.4 PRELIMINARY REVIEW

The mock-up with the HED information on it will be reviewed to determine:

1. What hardware type is to be used for final layout (current or substitute equipment).
2. If a revised panel layout will fit in the present available panel space.

The first layout design effort is to be limited to the panel layouts involving the HED devices without considering the total integrated main panel layout. Full size preliminary layouts of the panel areas on C1, Feedwater and Condensate, will be produced. This process will establish the acceptability of the overall re-layout concepts and provide confidence in undertaking a total main panel layout effort.

The preliminary layout concepts developed for panel C1, Feedwater and Condensate panel will be reviewed with plant engineering, plant operations, and the training department.

2.5 CONTINUED LAYOUT ACTIVITY

Continued panel layout activity is planned following the evaluation of the initial panel layout effort. This activity will be integrated with the major programs planned to correct all HEDs.

3.0 EXECUTION AND RESULTS

3.1 DETERMINATION OF PANEL DEVICES RELOCATION HEDs

The task team reviewed all 153 HEDs to determine which ones were applicable to control panel device relocation layouts. There are a total of 42 HEDs that are layout-related. Five are category A, 34 are category B, and 3 are category C. Table 3-1 lists these HEDs and Appendices A, B, and C of the DCRDR Executive Summary Report describes them. The following summarizes the panel device relocation HEDs:

1. There are 6 HEDs that involve discrepancies in recorder readability, usability, and maintainability.

NOTE: There are 69 recorders on the panels. The final panel layout will consider removing the recorders not needed for trend information during operations.

2. There are 3 HEDs that deal with unnecessary or abandoned equipment.
3. There are 8 HEDs that deal with indication that is inadequate.
4. There are 10 HEDs that deal with equipment mounted on the wrong panel or at a significant distance from the system controls.
5. There are 14 HEDs dealing with equipment that must be rearranged. Two of them require a complete rearrangement of C7: Containment Purge and Test and CP600, Augmented Off-Gas Panel. This will be completed as part of the final layout effort.
6. There is one HED that deals with the need for either switch hardware or circuit changes.

TABLE 3-1
PANEL DEVICES RELOCATION HEDs

CATEGORY A HEDs

5A004.5
8A007.5
8A008.5
5A010.5
1A011.5

CATEGORY C HEDs

5C019.5
1C003.5
5C018.5

CATEGORY B HEDs

1B001.5 8B102.5
4B049.5 8B103.5
4B050.5 8B105.5
5B070.5 9B017.5
5B110.5 9B109.5
8B094.5 4B115.5
2B095.5 5B119.5
1B015.5 8B122.5
4B053.5 5B119.5
4B057.5 8B122.5
4B060.5 5B124.5
5B061.5 4B126.5
5B066.5 1B128.5
5B067.5 8B129.5
5B071.5 1B130.5
8B097.5 4B132.5
8B098.5 5B133.5
8B110.5 5B135.5

3.2 IDENTIFICATION OF MAIN PANEL AREAS INVOLVED

During the initial phase, all 42 of the HEDs were outlined and described on the full-size mock-up (see Figure 3-1). This took them from an abstract description and put them in a tangible form that would show the scope and interrelationships. This permitted the following determinations:

1. The panel equipment (specific types) that need to be relocated.
2. The equipment will fit on the control panels in a logical (systems or subsystems) manner.
3. In most cases, the equipment will fit in the area of its associated equipment.
4. Modification of almost all control panel arrangements will be necessary to incorporate revisions to resolve HEDs without creating new HEDs.
5. The number of instruments and controls which are not on the back panels (C4-Feedwater Heaters Control, C7-Containment Ventilation, Isolation, and Gas Treatment) and which need to be moved to the main control area will have significant effects on the main panel arrangements.
6. Some new HEDs not yet documented will result from the total panel layout effort. These HEDs are in the area of system location (i.e., is the Main Steam Isolation System in the correct location on 904, the Water Cleanup Panel, or does it belong on C2, the Turbine Panel?). This indicates that panel rearrangement will be an interactive process.
7. Improvements in arrangements, maintainability, readability, and operator efficiency can be made by relocation of several recorders from the main panels to a new "recorder panel" located in the main

area. Information will not be lost by replacing them with meters on the main panels.

8. The reactor operators station at panel 905 needs improvement in both arrangement and equipment. Improvements in this area will require coordination with the NSSS vendor. The need for a redesign Reactor Mode Switch to resolve the lack of feeling for switch position is an example of the need to do this. This will be a future effort with NSSS vendor assistance.
9. The panel layout work involving only the 42 HEDs provides the fundamental basis for a totally integrated panel effort which is in planning.

3.3 HARDWARE CONSIDERATIONS

The development of final panel layouts will require the use of an approved design manual. A design manual will provide a standardized basis to assure that all work is being done to meet good human factors principles. The design manual will address the following:

1. Control Room Environmental Criteria
2. Control Room Arrangement and Anthropometry
3. Display Equipment
4. Switches
5. Annunciator
6. Computers and Keyboards
7. Post-Accident Monitoring
8. Safety Parameter Display System
9. Standard Abbreviations
10. Label Lettering
11. Location Aids
12. Demarcation
13. Meter Scales
14. CRT Criteria
15. Color Conventions

The preliminary system arrangements made as part of this effort used smaller switches than are presently used for valve control. They are compatible with the present switches electrically and mechanically. They do, however, have the following advantages:

1. Valve control switches are all the same size and type in appearance, but are different than motor and breaker controls.
2. They require about one-fourth the area of the original switches permitting improved layouts in the same area.

3.4 INTERFACES WITH OTHER SYSTEMS

The final control panel layouts will be coordinated with several other systems that have a major impact on the control panels and that will be worked on at the same time. A milestone schedule is in preparation to assure that the work is coordinated with other plant improvement programs.

3.4.1 Annunciator

A new annunciator design and preparation of the specification is scheduled to start in the third quarter of 1984. The design will take into account:

- o the interrelationship between the computer, annunciator windows, and equipment mounted on the panels
- o the association of window boxes with other system equipment
- o labeling
- o prioritization of alarms

3.4.2 Computer

The computer work involves replacing the present computer and the addition of a Safety Parameter Display System. This work will be coordinated with the annunciator and control panel layouts.

3.4.3 Post-Accident Monitoring

The results of the Reg. Guide 1.97 study will be integrated into the main control panel layouts.

3.4.4 Simulator

An order for the simulator has been placed. The simulator effort will be coordinated with the control room design effort. The results of this will permit retraining of operators prior to the installation of the revised control panel sections.

3.4.5 Upgraded Communications

The communications system will be upgraded to correct known HEDs. This will be coordinated with the control room design effort.

3.5 FEEDWATER AND CONDENSATE (PANEL C1) INITIAL FULL-SCALE MOCK-UP

The Feedwater and Condensate Panel, C1, has 7 of the 42 HEDs associated with it. The HEDs are directly associated with 58 components. Correction of the HEDs will require 121 component relocations. There are 130 components on this panel. The HEDs are:

HED No.	Description
5A004.5:	Chart recorder problems. Recorder study.
4B053.5:	TBCCW pumps and outlet valves are mirror imaged.

- 4B126.5: Relocate the Reactor Feed Pump Auto Trip selector switch 43/TCOS from panel 904 to C1 with the feed pump controls.
- 5C019.5: The condenser Conductivity Recorders need to have the door opened and paper advanced to tell what channel is recording.
- 8B097.5: Loops A and B RBCCAW and TBCCW system layouts are mirror imaged.
- 8B101.5: The RBCCW supply valves to the RHR heat exchangers are to be relocated to panel 903 with the RHR system.
- 8B122.5: The indicator lights for the feedwater heater drain valves do not have the same appearance as other valve position indication.

The HEDs have been outlined and briefly described on the Front Panel Layout, Figure 3-1.

3.5.1 Recorders

Figures 3-2 and 3-3 show the recorders associated with HED 5A004.5 as they are at present. Also Included in the figure are brief descriptions of the proposed solutions to the problems. The general concept of removing recorders to a recorder panel and replacing them with meters will provide genuine improvements in arrangements, maintainability, readability, and operator efficiency. Each recorder and its inputs will be evaluated to assure that required information is not lost to the operator; for example, condenser conductivity is a critical parameter. The condenser failure made can be quite slow and would be picked up earliest by a recorder trend. Feedwater temperature, on the other hand, is a monitoring parameter. A historical trace would be of benefit later, but is not required during operations.

3.5.2 Reactor Feed Pumps (RFP)

Figure 3-4 shows the control equipment for the reactor feed pumps as it presently is. Included is a brief description of the change brought on by the addition of the Auto Trip (43/TCOS) switch relocated to this area by HED 4B126.5. The switch cannot be added to the panel without moving something else because there is no room to put it near the RFP controls. To put it anywhere else would not resolve the reported discrepancy. The layout of the RFP controls will need to be revised in order to fit the switch in. Figure 3-5 is the proposed Reactor Feed Pump (RFP) arrangement. The valve controls have been changed to a smaller switch so that the arrangement will meet minimum switch separation requirements. Smaller RFP ammeters have been incorporated into the layout. This will increase operator comprehension and make the total required panel area about the same.

3.5.3 Circulating Water

The revised reactor feed pump arrangement creates a domino effect on the arrangements for the condensate pumps which in turn affects the arrangement for the circulating water system. Figure 3-4 shows the condensate pumps and circulating water system controls as they presently are. It also has a brief description of the change required.

Figure 3-6 is the proposed circulating water system arrangement. The value controls have been changed to a smaller switch so that the arrangement will meet minimum switch separation requirements and still occupy about the same area.

The original circulating water system arrangement was judged to be good; i.e., it made good use of graphics. The proposed revision uses the basic layout concept, but accommodates the smaller control switches to differentiate pumps from valves and provides easier subsystem recognition.

Figure 3-3 shows the present condenser conductivity arrangement. The proposed circulating water system arrangement is an integral part of the new Condenser

Conductivity arrangement shown in Figure 3-7. The basis for the integrated layout development is:

1. Conductivity is a very important measurement; chlorides must be kept out of the feedwater and reactor vessel.
2. High conductivity in the condenser is caused by tube leaks. Knowing which condenser section associates it with one of the circulating water pumps. The circulating water pump shown on the left side of Figure 3-6 is associated with the conductivity recorders located in line with the switch (shown on the left side of Figure 3-7). In case of an indication of high conductivity in these recorders, this switch is used to trip the correct circulating water pump.
3. The water box associated with the leak can be determined by which set of recorders indicates high conductivity. This creates more positive operator action.
4. The proposed condenser conductivity layout in Figure 3-7 also features color recognition techniques. All inlet conductivity measurements are on the blue pen and all bank measurements are on the green pen. This will permit instant recognition of a problem; the order of magnitude of the problem and where the problem is.

3.5.4 Reactor Building Cooling Water - Turbine Building Cooling Water - Service Water System

The Reactor Building Cooling Water (RBCCW), Turbine Building Cooling Water (TBCCW), and Service Water (SW) systems are interrelated. Figures 3-8 and 3-9 show the present systems arrangement and give a brief description to the proposed solution to the mirror image problem described in HEDs 4B053.5 and 8B097.5.

Figure 3-10 is the proposed TBCCW arrangement. It features a graphic presentation to show the interrelationship with the service water system and the

various systems coolers that it supports. Temperature control has been integrated into this layout, thus eliminating the disassociation of the controller with the remainder of the components of the system. Header pressure was also relocated into the arrangement to provide an integrated layout and provide indication feedback at the same location that the control action takes place. Since low header pressure and the TBCCW head tank level are annunciated, this is a desirable feature. Figure 3-12 shows the present location of these components.

Figure 3-11 is the proposed arrangement for the RBCCW and Service Water Systems. It features a graphic representation to show the interrelationships that the service water system has with RBCCW Loops A and Loop B. It also shows the tie-in with the TBCCW, Screen Wash System, Circulating Water Pumps, and city water. It is intuitive from the arrangement that alternate lineups can be made and what they are.

Temperature control and several meters have also been incorporated into the arrangement to enhance the association of system components in one location. Screen well level and service water header pressure indication have been put adjacent to each other in a common bezel because of the interrelationship of the sea level and the pump discharge pressure. Both parameters have low alarms. Figure 3-12 shows their current location on the panel.

3.6 TURBINE CONTROL (PANEL C2)

The Turbine Control Panel, C2, has 6 of the 42 HEDs associated with it. The HEDs are directly associated with 45 components. Correction of the HEDs will require 52 component relocations. There are 103 components on the panel. The HEDs are:

5A004.5: Chart recorder problems. Recorder study.

5C018.5: Condenser vacuum recorder provides confusing indication.

- 8B122.5: The indicator lights for the turbine and drain valves position do not have the same appearance as other valve position indication.
- 8B103.5: The oil lift pumps and the gland seal condenser exhausters are in the wrong sequence.
- 4B060.5: Turning gear engaged push button has been abandoned.
- 9B109.5: Turbine lube oil and control oil meters are too far from the controls. Turbine bearing wear meter is too far from the selector switch. Steam seal meters are too far from their controls.

The HEDs listed above have been outlined and briefly described on the Front Panel Layout, Figure 3-14.

3.6.1 Recorders

Figures 3-14, 3-15, 3-16, 3-18, 3-19, 3-20, and 3-21 show the recorders associated with HED 5A004.5 and 5C018.5 as they are at present. Also included in these figures is also a brief description of proposed solutions.

3.6.2 Valve Position Indication

Figures 3-15 through 3-18 show valve position indication associated with HED 8B122.5 as it is at present. Also included in these figures is a brief description of the proposed changes. Consideration is being given to replacing the turbine valve position lights with meters.

3.6.3 Oil Lift Pumps

Figure 3-22 shows the oil lift pumps as they are at present. HED 9B109.5 requires that they be rearranged to be pumps A and B on top, and pumps C and D on the bottom.

3.6.4 Lube Oil System

Figure 3-22 shows the lube oil pumps control associated with HED 9B109.5. Incorporation of the bearing oil pressure and control oil pressure meters will require rearrangement of the equipment on the panel. This will cause a domino effect, requiring several other subsystems to be revised.

3.6.5 Gland Seal Condenser Exhausters

Figure 3-23 shows the gland seal condenser exhausters associated with HED 8B103.5 as they are presently arranged. HED 8B103.5 requires that they be rearranged to be pumps A and B on top, and pumps C and D on the bottom.

3.6.6 Gland Seal System

Figure 3-23 shows the gland seal system components as they are at present. HED 9B109.5 requires that the gland steam seal header pressure meter and gland seal condenser pressure, from Figure 3-17, be integrated with the gland seal system components shown in Figure 3-23 causing a system rearrangement.

3.7 ELECTRICAL DISTRIBUTION (PANEL C3)

The Electrical Distribution Panel, C3, has 5 of the 42 HEDs associated with it.

The HEDs are directly associated with 42 components. Correction of the HEDs will require 41 component relocations. There are 170 components on the panel. The HEDs are:

- 4B053.5: Diesel Generators A and B controls are mirror imaged.
- 8B095.5: Diesel Generators and line indicators exceed a string of five.
- 4B049.5: The 4KV transfer switch does not have a guard.
- 4B050.5: The guard over the 4KV bus tie switch interfaces with operation of the T-G governer speed load changer.

8B097.5: UAT and Start-Up Transformers controls are mirror imaged and the Diesel Generators A and B controls are mirror imaged.

The HEDs listed above have been outlined and briefly described on the Front Panel Layout, Figure 3-24.

3.7.1 Diesel Generators

Figures 3-25, 26, 28, 29, 31, and 32 show the metering and controls associated with HEDs 4B053.5 and 8B097.5 as they are at present. Rearrangement of the controls shown in Figures 3-31 and 3-32 will be required to overcome the mirror image. The meters shown in Figures 3-25, 3-26, 3-28, and 3-29 will require rearrangement to put them in order of importance and compatible with the income line metering shown in Figures 3-27 and 3-30.

3.7.2 Unit Auxiliary Transformer (UAT) and Start-Up Transformers

Figure 3-32 shows the UAT and Start-Up Transformer 1-A2 controls associated with HED 8B097.5 as they are at present. Rearrangement of the controls for 4160V Bus. 1-A2 will be required to overcome the mirror image with 4160V Bus 1-A1.

3.7.3 Generator Output Breakers

Figure 3-33 shows the generator output breakers and generator controls. These are being considered for rearrangement to clarify the interrelationship between the generator controls and incoming lines.

3.8 CONTAINMENT COOLING AND ISOLATION (PANEL C903)

The Containment Cooling and Isolation Panel, C903, has 10 HEDs associated with it. The HEDs are directly associated with 23 components. Correction of the

HEDs will require 24 component relocations. There are 162 components on the panel. The HEDs are:

- 5A004.5: Chart recorder problems. Recorder study.
- 8B101.5: The RBCCW suction isolation valves for the RHR heat exchangers are located on another panel.
- 8B102.5: Relocate the drywell pressure indicator.
- 8B103.5: Relief valve manual controls are not sequentially arranged.
- 4B115.5: The HPCI line nitrogen injection valve control has cheater capability. The core spray testable check valve control switch has cheater capability. (Note: This switch was also recommended for deletion by HED 4B060.5)
- 5B119.5: The Torus Temperature meters TI-5021 and TI-5022 are to be replaced.
- 8B129.5: RHR suction valves are common for Loops A and B. They need to be located adjacent to each other.
- 5B124.5: The amber lights for the relief valve manual controls have been abandoned in place.
- 4B060.5: The following controls have been abandoned: Item Nos. 638, 663, 677, 645, 689, and 690.
- 1C003.5: The HPCI vibration meter subpanel is above the maximum height.

The equipment associated with the HEDs has been highlighted and briefly described on Figure 3-34.

3.8.1 Recorders

Figures 3-35, 38, and 41 show the recorders associated with HED 5A004.5 as they are at present. Included in the figure is a brief description of the proposed solutions.

3.8.2 Containment Purge

Figures 3-36 and 3-37 show containment purge and isolation monitoring. The mimic and valve position indication are part of the systems and equipment associated with HEDs 1A010.5, 1A011.5, 1B001.5, 8B102.5, and 5B119.5. These HEDs and solutions are discussed in Section 3.9.2 with the Water Cleanup Systems and Section 3.11 Augmented Off-Gas Panel CP600.

3.8.3 Automatic Blowdown

Figure 3-42 shows the automatic blowdown system controls associated with HED 8B124.5 as they are at present. The amber light for the relief valve manual controls have been abandoned. HED 8B103.5 requires that the two bottom controls (Nos. 750 and 751) be reversed.

3.8.4 RHR Loops A and B

Figures 3-42 and 3-44 show the RHR systems associated with HEDs 8B101.5 and 8B129.5 as they are at present. HED 8B101.5 requires the relocation of the RBCCW suction isolation valves for the RHR heat exchangers. The valve controls are presently located on the Feedwater and Condensate panel C1. HED 8B101.5 requires that the common suction isolation valves be located adjacent to each other. The equipment relocation is being evaluated for a complete rearrangement.

3.8.5 Core Spray System

Figure 3-43 and 3-45 shows the core spray system loops A and B. HED 4B060.5 deletes the testable check valve controls.

3.8.6 High-Pressure Core Injection

Figure 3-43 shows the HPCI line nitrogen injection valve control associated with HED 4B115.5 as it is at present. Correction of the deficiency will require revising the switch or the control circuit.

3.9 WATER CLEANUP (PANEL C904)

The Water Cleanup Panel, C904 has 13 of the 42 HEDs associated with it. The HEDs are directly associated with 98 components. Correction of the HEDs will require 121 component revisions. There are 203 components on the panel. The HEDs are:

- 5A004.5: Chart recorder problems. Recorder study.
- 8B094.5: The valve position indication for Primary Containment, Analyzing systems, Standby Gas Treatment, Secondary Containment and Access Lock are in strings of more than five components in a row.
- 4B060.5: The following equipment has been abandoned: RCIC testable check valve, RCIC loops A and B equalizer valve, Recirculation System Loops A and B equalizer bypass valve, and Recirculation System loops A and B bypass valves.
- 4B050.5: The reactor vent valve switch covers interfere with adjacent controls.
- 5A010.5: There is inadequate indication of drywell temperature above and below the 40-ft level.
- 1A011.5: There is no drywell sump flow indication.
- 1B001.5: Drywell temperature and purge control on panel 904 is inadequate.

- 1B128.5: There is inadequate containment nitrogen purge information.
- 5B133.5: Suppression pool pressure indication is inadequate.
- 8B098.5: The cleanup and sample system controls should be relocated.
- 5B071.5: The recycle blower lights (870 and 871) are not used.
- 8B105.5: The valve position lights for the primary and secondary containment are not in sequence.
- 5C019.5: The condenser demineralizer conductivity recorder gives confusing indication.

The equipment associated with the HEDs has been highlighted and briefly described in Figure 3-46.

3.9.1 Recorders

Figures 3-49, 50, 51, and 55 show the recorders associated with HEDs 5A004.5 and 5C019.5 as they are at present. Included in the figures is a brief description of the proposed solutions.

3.9.2 Containment Controls

Figures 3-47, 48, 53, and 54 show the containment controls mounted in the main panel area. HEDs 5B071.5, 8B094.5, 5A010.5, 1A011.5, 1B001.5, 1B128.5, 8B105.5, and 5B133.5 all deal with relocation of equipment from panel C7, the addition of indication and the rearrangement of the panel 903 equipment. The containment purge and test equipment requires further study to develop an integrated approach to the layout and proper control panel location. Additional equipment to be considered are drywell level and temperature, drywell level, containment purge ventilation fan controls, drywell sump flow, and nitrogen purge controls.

3.9.3 Reactor Core Isolation Cooling

Figure 3-56 shows the RCIC system arrangement. The testable check valve controls have been deleted by HED 4B060.5.

3.9.4 Cleanup and Sample System Controls

Figures 3-57 and 3-58 show the cleanup and sample system controls associated with HEDs 8B098.5 and 4B050.5. This system will be modified as part of the final main control panel layout.

3.9.5 Recirculation System

Figure 3-59 shows the recirculation system arrangement associated with HED 4B060.5. The loops A and B bypass valves control switches have been abandoned.

3.10 REACTOR CONTROL (C905)

The Reactor Control Panel, C905, has 12 of the 42 HEDs associated with it. The HEDs are directly associated with 47 of the components. Correction of the HEDs will require at least 47 component relocations. There are 147 components on this panel. The HEDs are:

- 5A004.5: Chart recorder problems. Recorder study.
- 1B001.5: There is no indication of Scram Solenoid status (included with panel C-905).
- 1B015.5: There is no indication of Scram Solenoid status (included with panels 915 and 917).
- 4B060.5: The master recirculation flow control switch has been abandoned.
- 5B067.5: Feedwater block valve control and indication is not in the correct location.

- 8B097.5: The IRM-APRM recorders are mirror imaged.
- 9B107.5: The steam flow/reactor level recorder selector switch is not associated with its recorders. The reactor level mode selector switch is not associated with the reactor water level controllers.
- 4B057.5: Barriers are not provided for contiguous push buttons.
- 4B126.5: The reactor feed pump auto trip switch is located on panel 905; it should be on panel C1 Feedwater and Condensate.
- 8B094.5: The rod control matrix lights exceed the maximum string length of 20 inches.
- 8B095.5: The control rod drive indicators exceed five in a row.
- 8B102.5: The reactor steam flow/pressure, reactor vessel to flange differential temperature and recirculation system suction temperature recorders are not in close proximity for logging readings every 15 minutes during heatup and cooldowns.

The HEDs have been highlighted and briefly described on the Front Panel Layout, Figure 3-60.

3.10.1 Recorders

Figures 3-64, 65, 66, 68, and 69 show the present locations of the recorders. They are associated with HEDs 5A004.5, 9B107.5, and 8B102.5. The final layout effort will include the optimization of recorders and is in progress. They are being evaluated against the necessity of the recorder being on the panel, integration of the recorders with their associated controls and the capability of the scales on a single recorder. The operational requirements of the recorders will also be evaluated against the need to log values and other alternative solutions.

3.10.2 Control Rods

Figures 3-61, 62, and 63 show the rod control matrix lights and Figure 3-73 shows the rod selector push buttons associated with HEDs 8B094.5 and 4B027.5. The human factors problems of a maximum light string length will be overcome by demarcation; it will also be coordinated with demarcation on the rod selector push buttons. The barrier problem for the push buttons will be included in the final layout.

3.10.3 RPS Scram Lights

Figure 3-64 shows the location that the RPS Scram Lights will be added. These are associated with HEDs 1B001.5 and 1B015.5.

3.10.4 Nuclear Instrumentation

Figures 3-65, 66, 68, 71, and 73 show the equipment associated with the nuclear instrumentation recorders as it is presently arranged. This equipment is associated with HEDs 5A004.5 and 8B097.5. The final layout will include a coordinated evaluation to determine the recorder indication requirements and resolve the mirror image deficiency.

3.10.5 Control Switch

Figure 3-69 shows the present location of the steam flow/reactor level recorder selector switch. HED 9B107.5 requires that it be relocated in close proximity to the recorders shown on Figure 3-70. This requirement is part of the final layout.

3.10.6 Control Rod Drive

Figure 3-70 shows the control rod drive indicators. HED 8B095.5 requires these to be rearranged to break the meter string to less than 5 meters. This requirement is part of the final panel layout.

3.10.7 Master Recirculation Flow

Figure 3-72 shows the master recirculation flow control switch that is deleted by HED 4B060.5.

3.10.8 Reactor Water Level Control

Figure 3-25 shows the reactor water level control equipment arrangement. HED 5B067.5 requires the addition of the two feedwater block valve control switches in close proximity to feedwater controllers. HED 9B108.5 requires the reactor level mode selector switch also be located in close proximity to the feedwater controllers. This requirement is part of the final layout.

HED 4B126.5 requires that the reactor feed pump auto trip switch be relocated to the Feedwater and Condensate panel C1 in the close proximity to the reactor feed pump controls. See Figure 3-6 for the new proposed layout.

3.11 AUGMENTED OFF-GAS (PANEL CP600)

The Augmented Off-Gas Panel CP600 has 2 of the 42 HEDs directly associated with it. The HEDs require a complete panel rearrangement. The containment controls discussed in Section 3.9.2 and 3.8.2 are also associated with the equipment on this panel. Consideration is being given to incorporating these controls into CP600. The combined rearrangement will increase the equipment controlled on this panel from 72 devices to about 135 devices. As a result of this, all equipment on the Containment Purge and Test panel C7, required for operations, will have been brought out to the main panel area. This removes panel C7 from the Control Room Design Review efforts. The HEDs directly associated with this panel are:

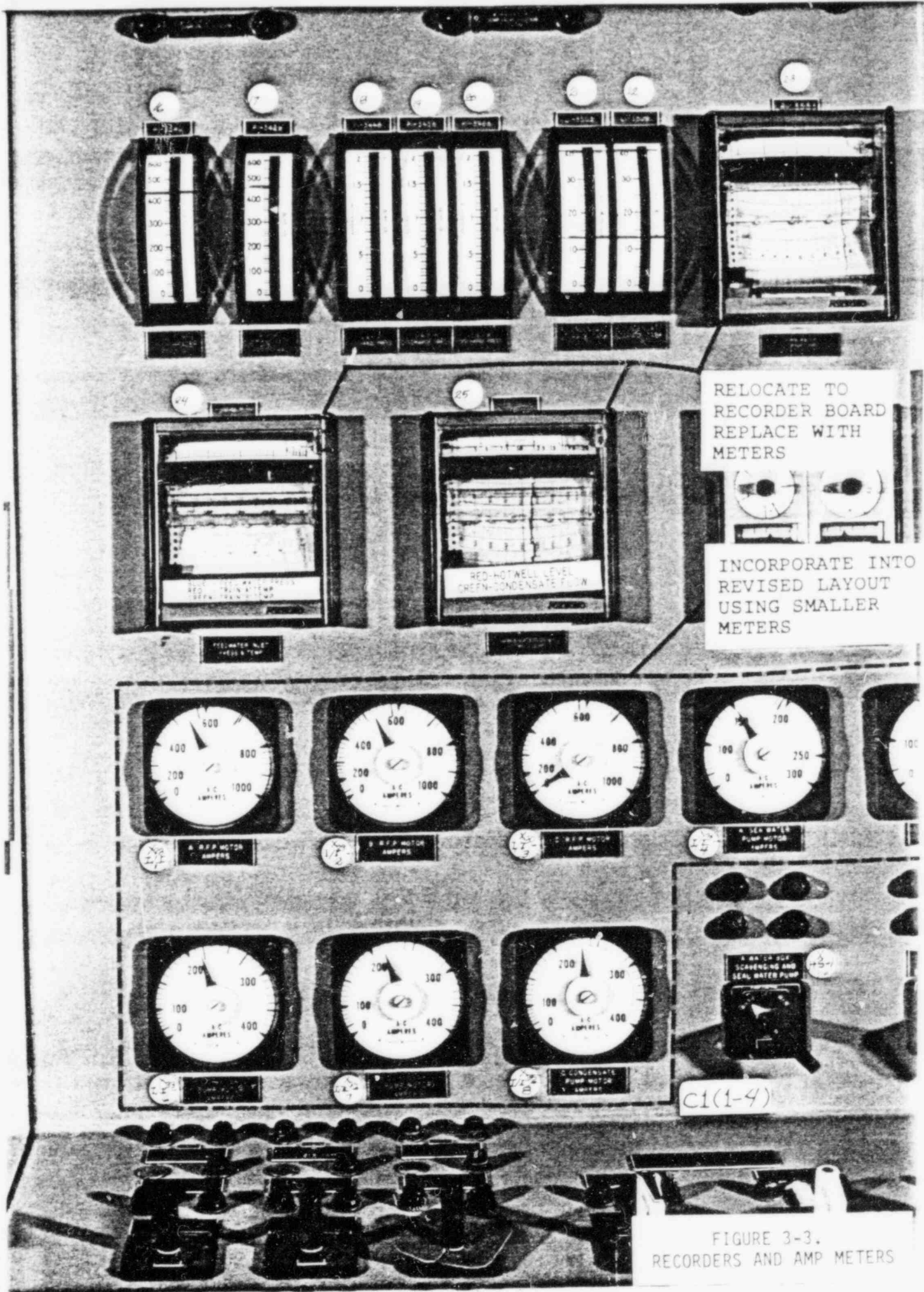
- 8A007.5: The panel is not arranged for sequential operation.
- 5B070.5: The Off-Gas temperature recorder TRS-R602/R613 does not have the capability for selecting a single channel display.

3.12 CONTAINMENT VENTILATION, ISOLATION, AND GAS TREATMENT (PANEL C7)

Panel C7 has two of the HEDs directly associated with it. Although the HEDs require a complete new layout, integration of the equipment required for operations into panel CP600 (refer to Section 3.11, Augmented Off-Gas Panel) will remove panel C7 from the Control Room Design Review Efforts. The HEDs directly associated with this panel are:

8A008.5: All controls are too close and too cluttered.

1B001.5: Instrumentation requiring continuous monitoring during an emergency but is not in the main control area. (Drywell temperatures, containment purge and vent control, torus temperature.)



RELOCATE TO
RECORDER BOARD
REPLACE WITH
METERS

INCORPORATE INTO
REVISED LAYOUT
USING SMALLER
METERS

500
400
200
0
1000
A.C. AMPERES
A. R.F.P. MOTOR
AMPERES
 500
400
200
0
1000
A.C. AMPERES
B. R.F.P. MOTOR
AMPERES
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200
0
1000
A.C. AMPERES
C. R.F.P. MOTOR
AMPERES
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A.C. AMPERES
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A.C. AMPERES
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A.C. AMPERES
 D. CONDENSATE
PUMP MOTOR
AMPERES
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 E. SEA WATER
PUMP MOTOR
AMPERES
 F. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 G. CONDENSATE
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 H. SEA WATER
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SCAVENING AND
SEAL WATER PUMP
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 J. CONDENSATE
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 K. SEA WATER
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SCAVENING AND
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SCAVENING AND
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SCAVENING AND
SEAL WATER PUMP
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SCAVENING AND
SEAL WATER PUMP
AMPERES
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AMPERES
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SCAVENING AND
SEAL WATER PUMP
AMPERES
 AZ. CONDENSATE
PUMP MOTOR
AMPERES
 BA. SEA WATER
PUMP MOTOR
AMPERES
 BB. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BC. CONDENSATE
PUMP MOTOR
AMPERES
 BD. SEA WATER
PUMP MOTOR
AMPERES
 BE. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BF. CONDENSATE
PUMP MOTOR
AMPERES
 BG. SEA WATER
PUMP MOTOR
AMPERES
 BH. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BI. CONDENSATE
PUMP MOTOR
AMPERES
 BJ. SEA WATER
PUMP MOTOR
AMPERES
 BK. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BL. CONDENSATE
PUMP MOTOR
AMPERES
 BM. SEA WATER
PUMP MOTOR
AMPERES
 BN. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BO. CONDENSATE
PUMP MOTOR
AMPERES
 BP. SEA WATER
PUMP MOTOR
AMPERES
 BQ. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BR. CONDENSATE
PUMP MOTOR
AMPERES
 BS. SEA WATER
PUMP MOTOR
AMPERES
 BT. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BU. CONDENSATE
PUMP MOTOR
AMPERES
 BV. SEA WATER
PUMP MOTOR
AMPERES
 BV. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BW. CONDENSATE
PUMP MOTOR
AMPERES
 BX. SEA WATER
PUMP MOTOR
AMPERES
 BX. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 BY. CONDENSATE
PUMP MOTOR
AMPERES
 BZ. SEA WATER
PUMP MOTOR
AMPERES
 BZ. SEA WATER
SCAVENING AND
SEAL WATER PUMP
AMPERES
 C1(1-4)

FIGURE 3-3.
RECORDERS AND AMP METERS

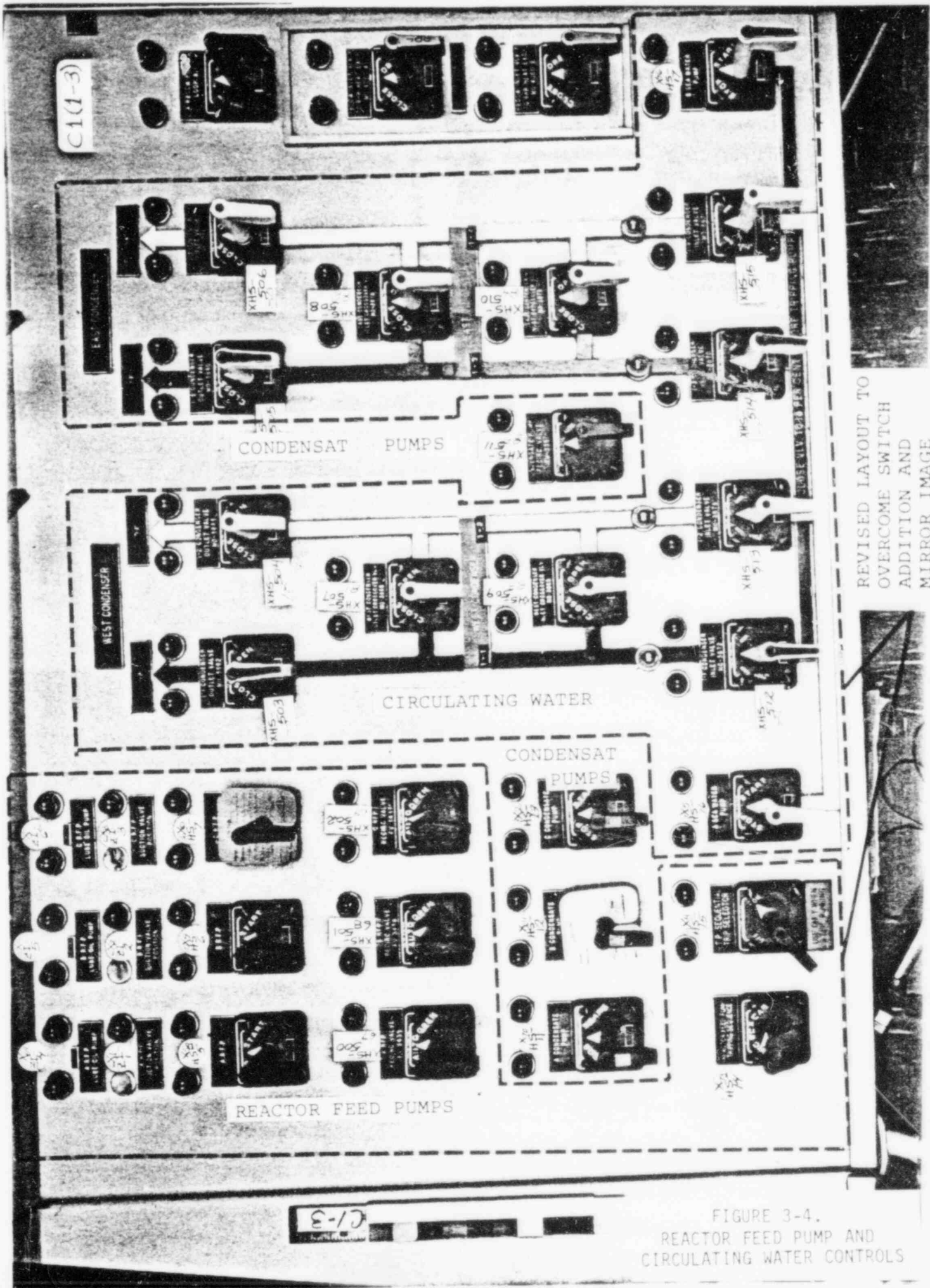


FIGURE 3-4.
 REACTOR FEED PUMP AND
 CIRCULATING WATER CONTROLS

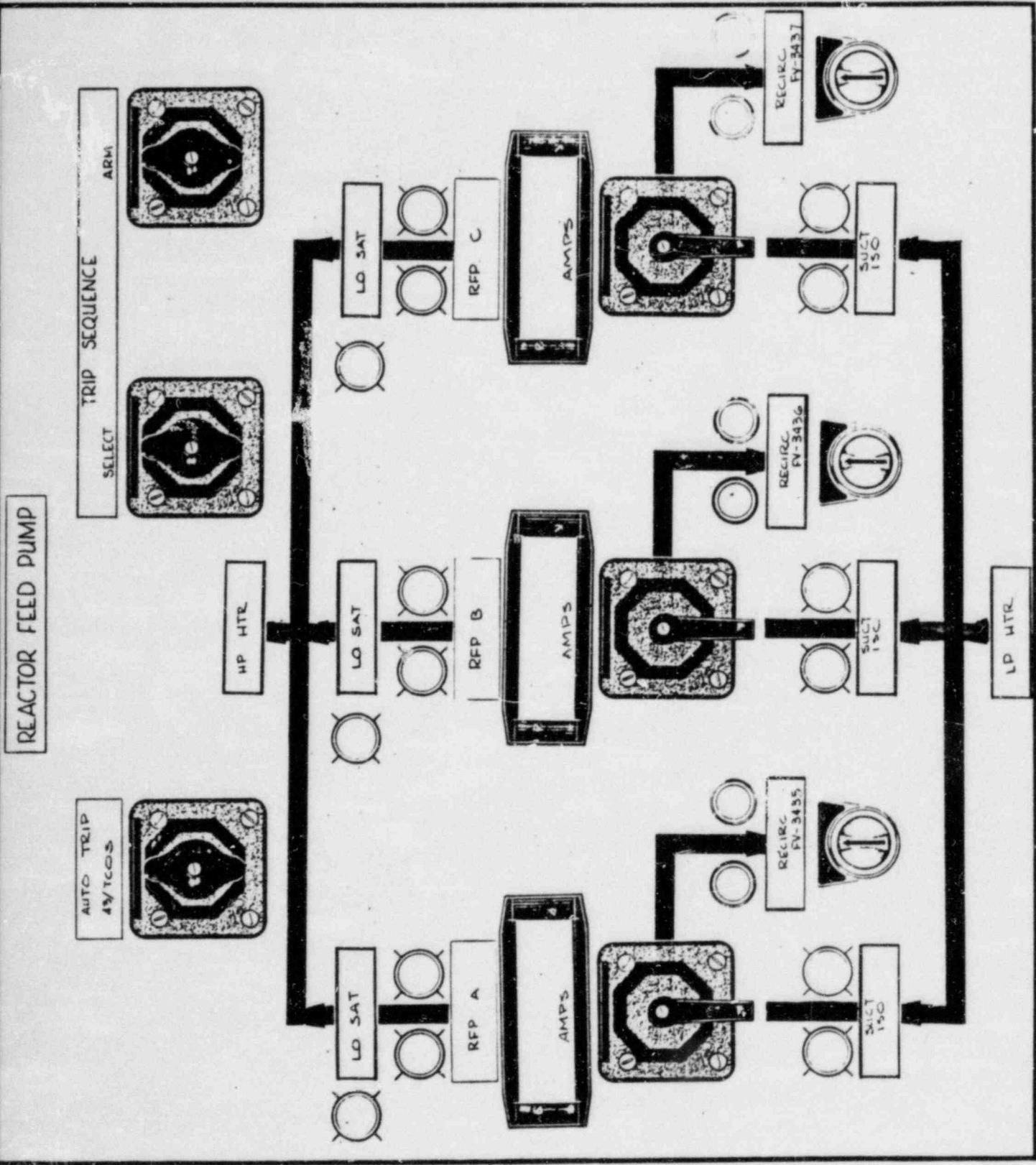


FIGURE 3-5.
PROPOSED REACTOR FEED PUMP ARRANGEMENT

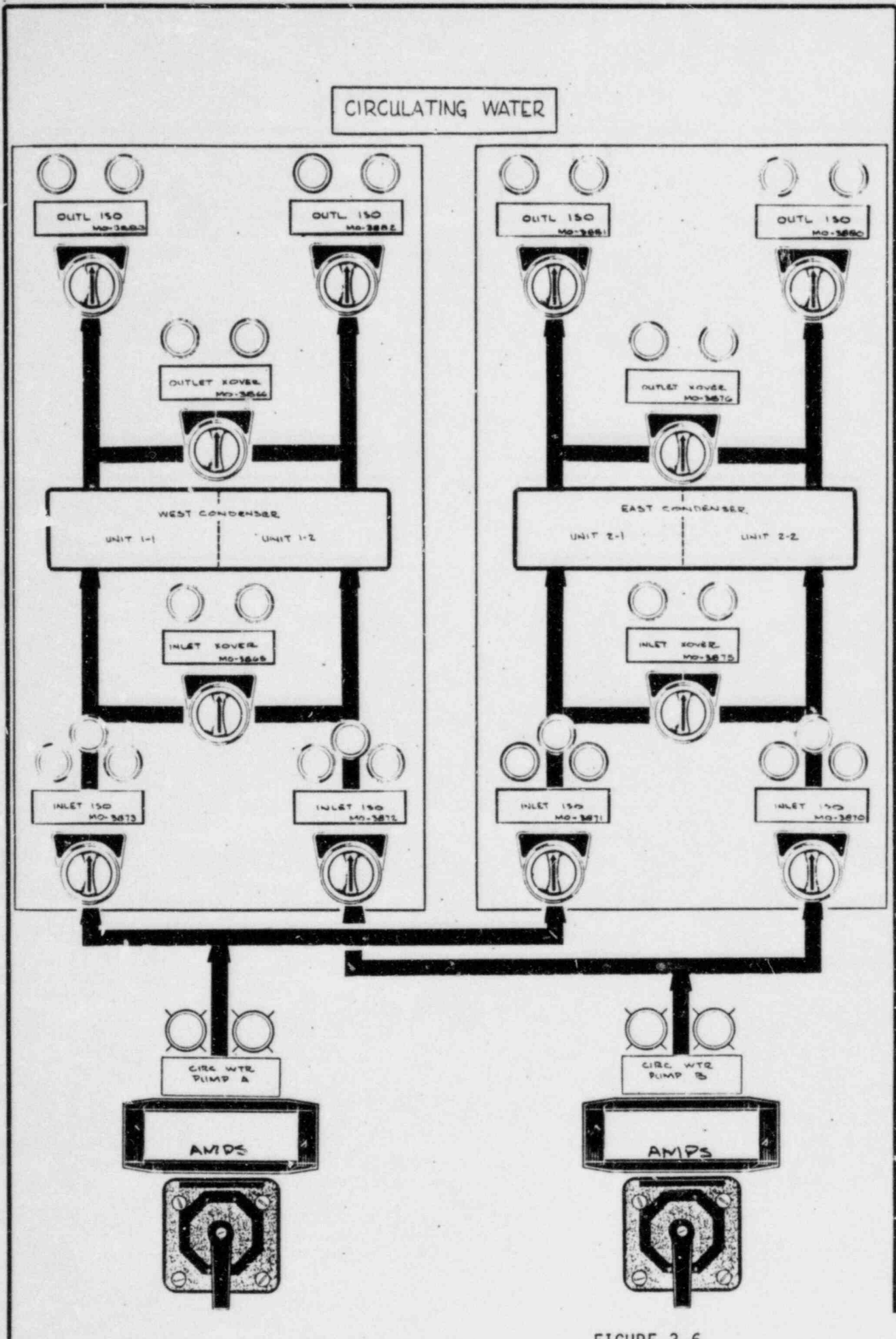
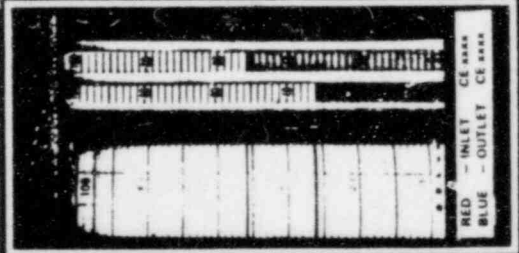
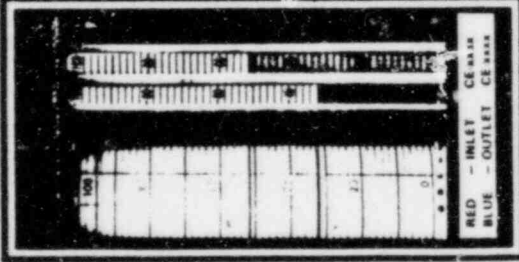


FIGURE 3-6.
PROPOSED CIRCULATING WATER SYSTEM ARRANGEMENT

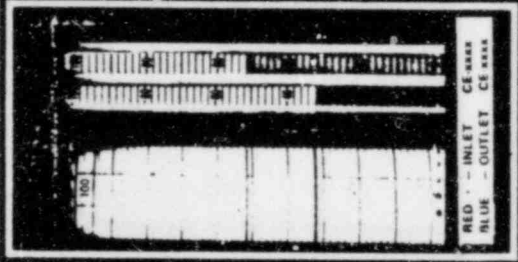
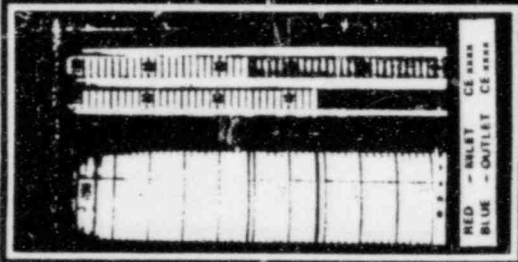
CONDENSER CONDUCTIVITY

WEST

UNIT 1-1
CIRC. PUMP A

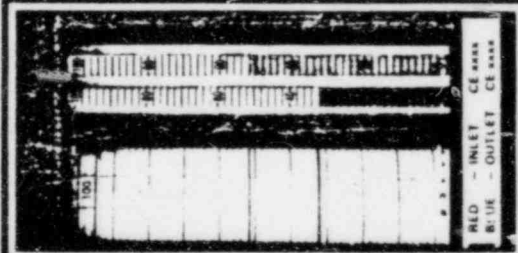
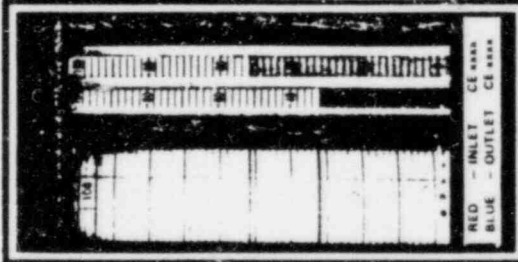


UNIT 1-2
CIRC. PUMP B



EAST

UNIT 2-1
CIRC. PUMP A



UNIT 2-2
CIRC. PUMP B

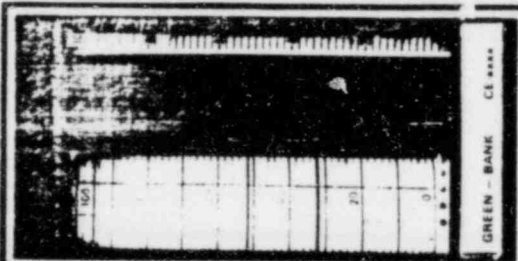
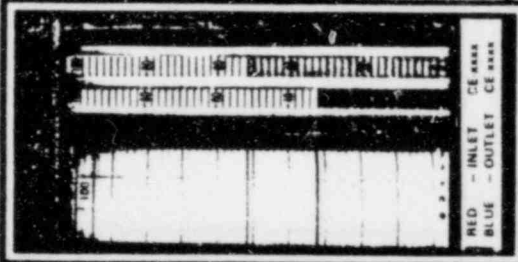
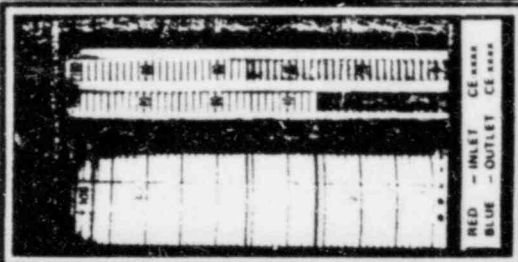


FIGURE 3-7.
CONDENSER CONDUCTIVITY

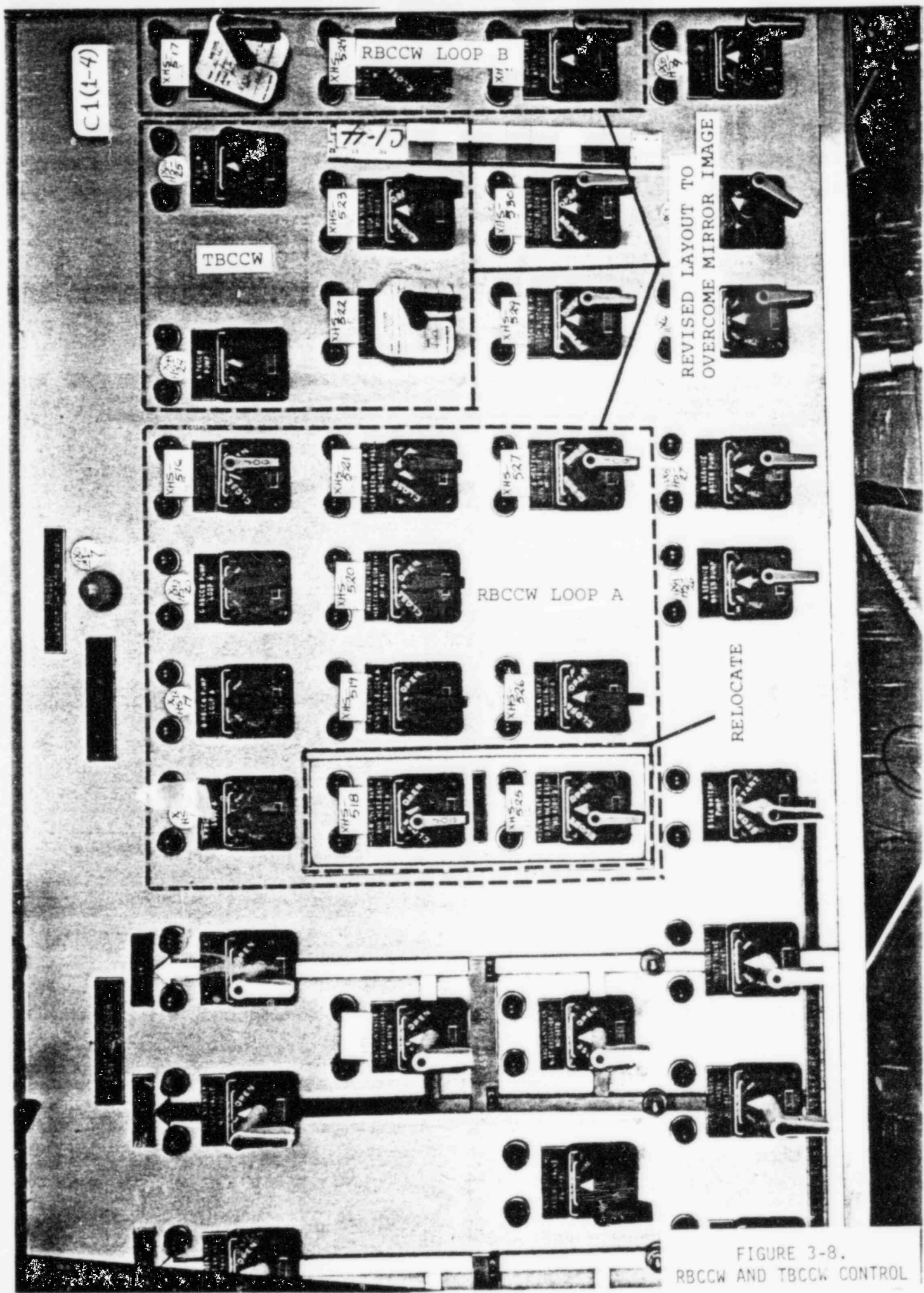
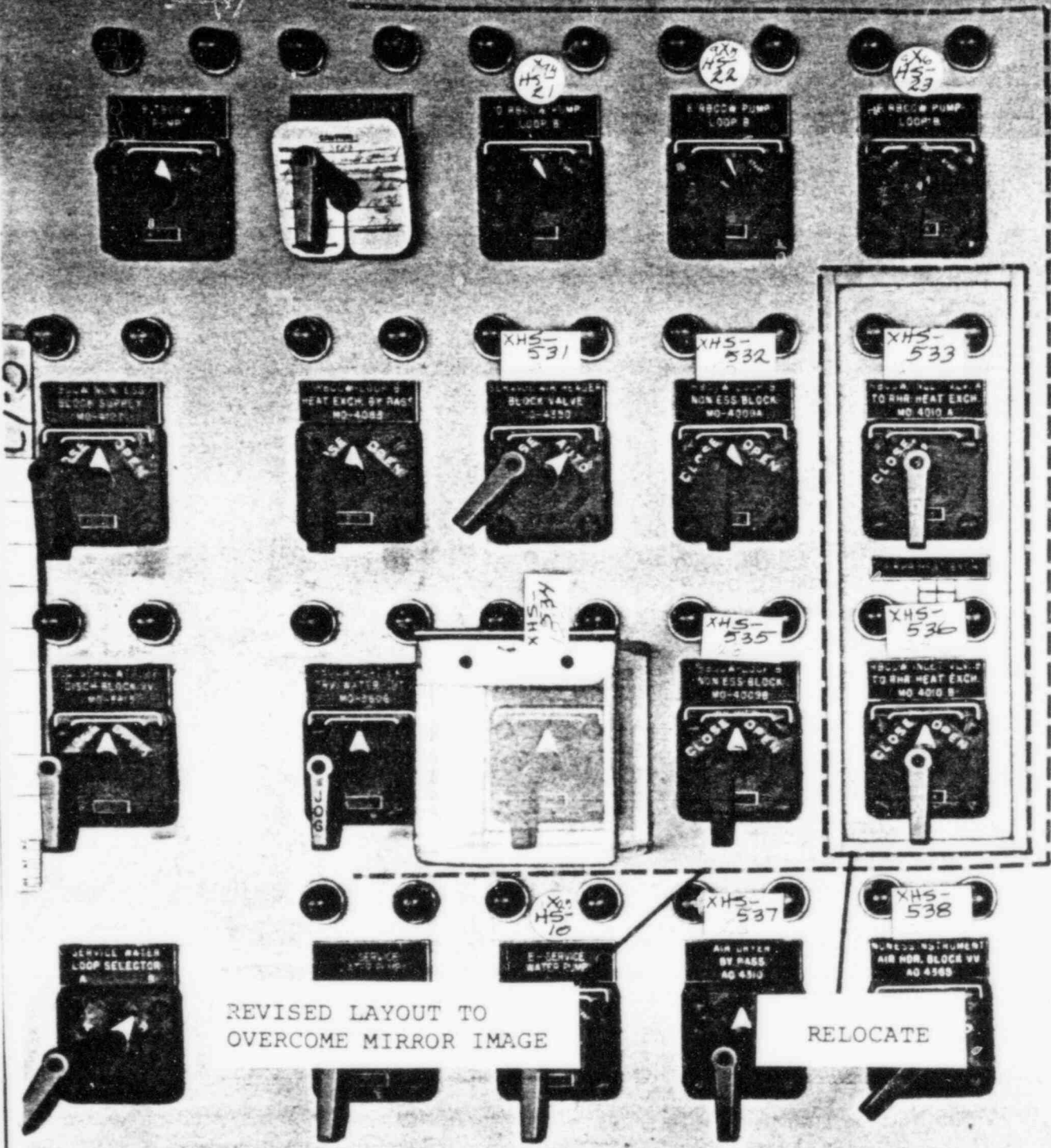


FIGURE 3-8.
RBCCW AND TBCCW CONTROL

C1(1-5)



REVISED LAYOUT TO
OVERCOME MIRROR IMAGE

RELOCATE

FIGURE 3-9.
RBCCW LOOP B CONTROL

TURB BLDG COOL WTR

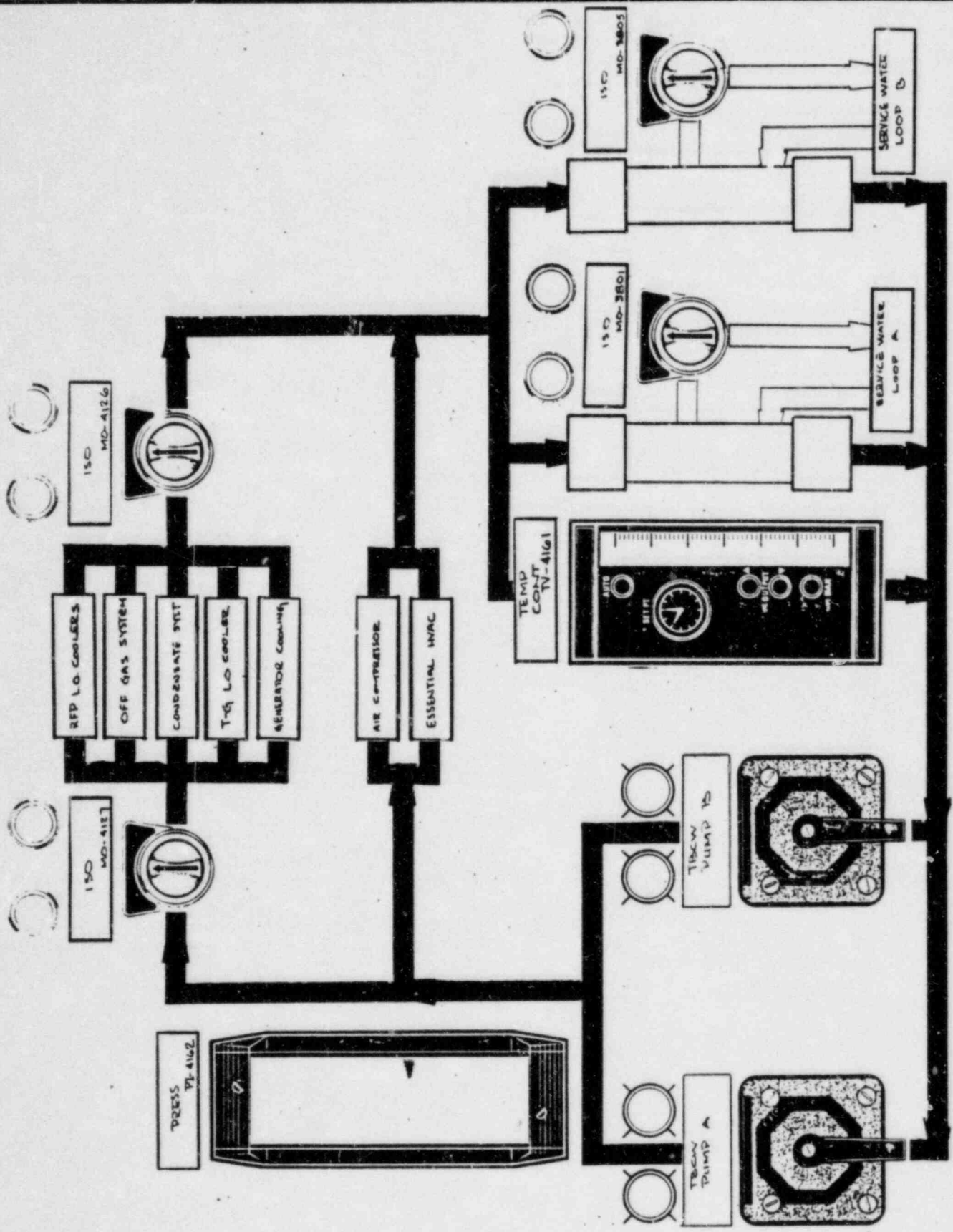


FIGURE 3-10.
PROPOSED TBCCW ARRANGEMENT

RBCCW LOOP B

RBCCW LOOP A

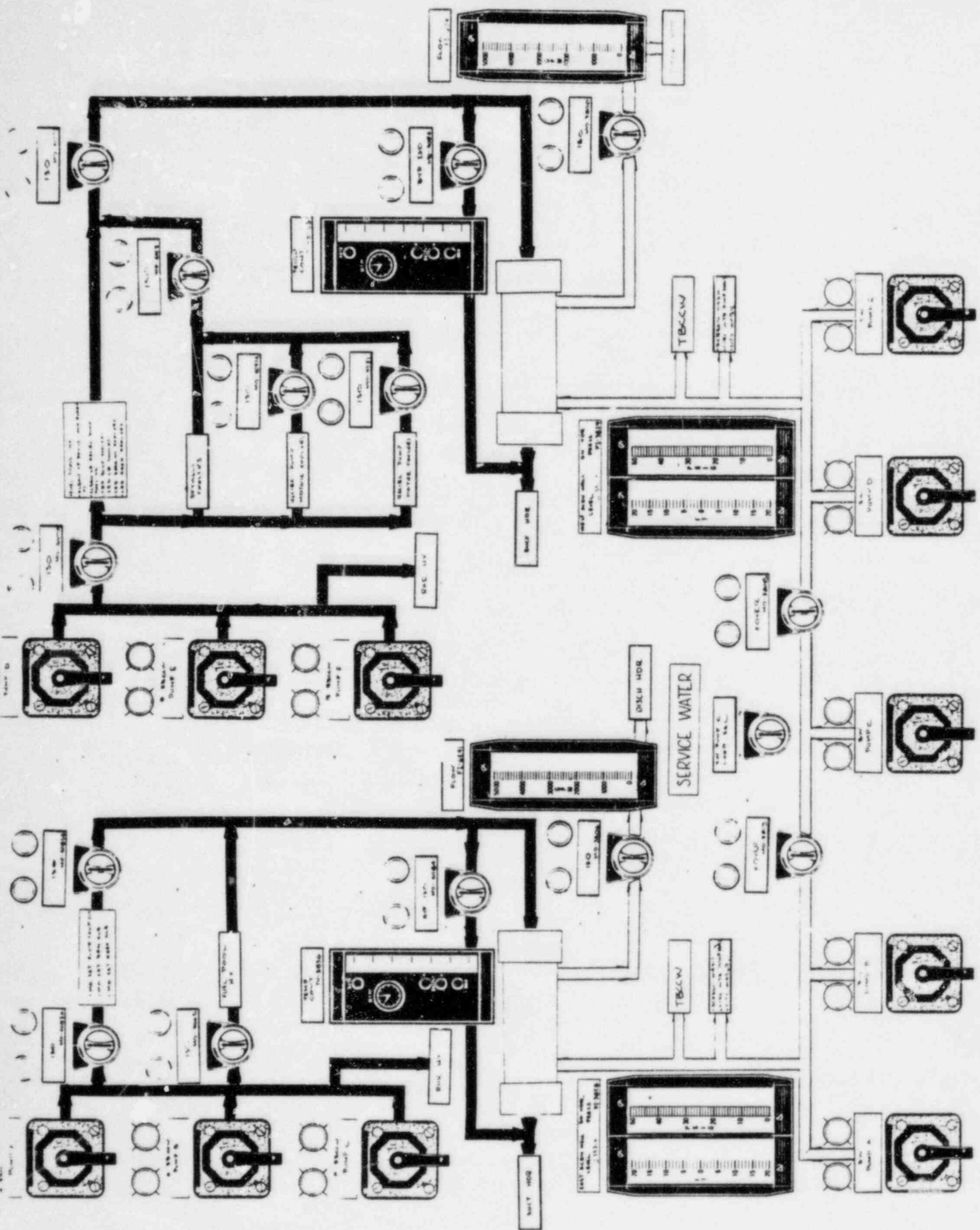
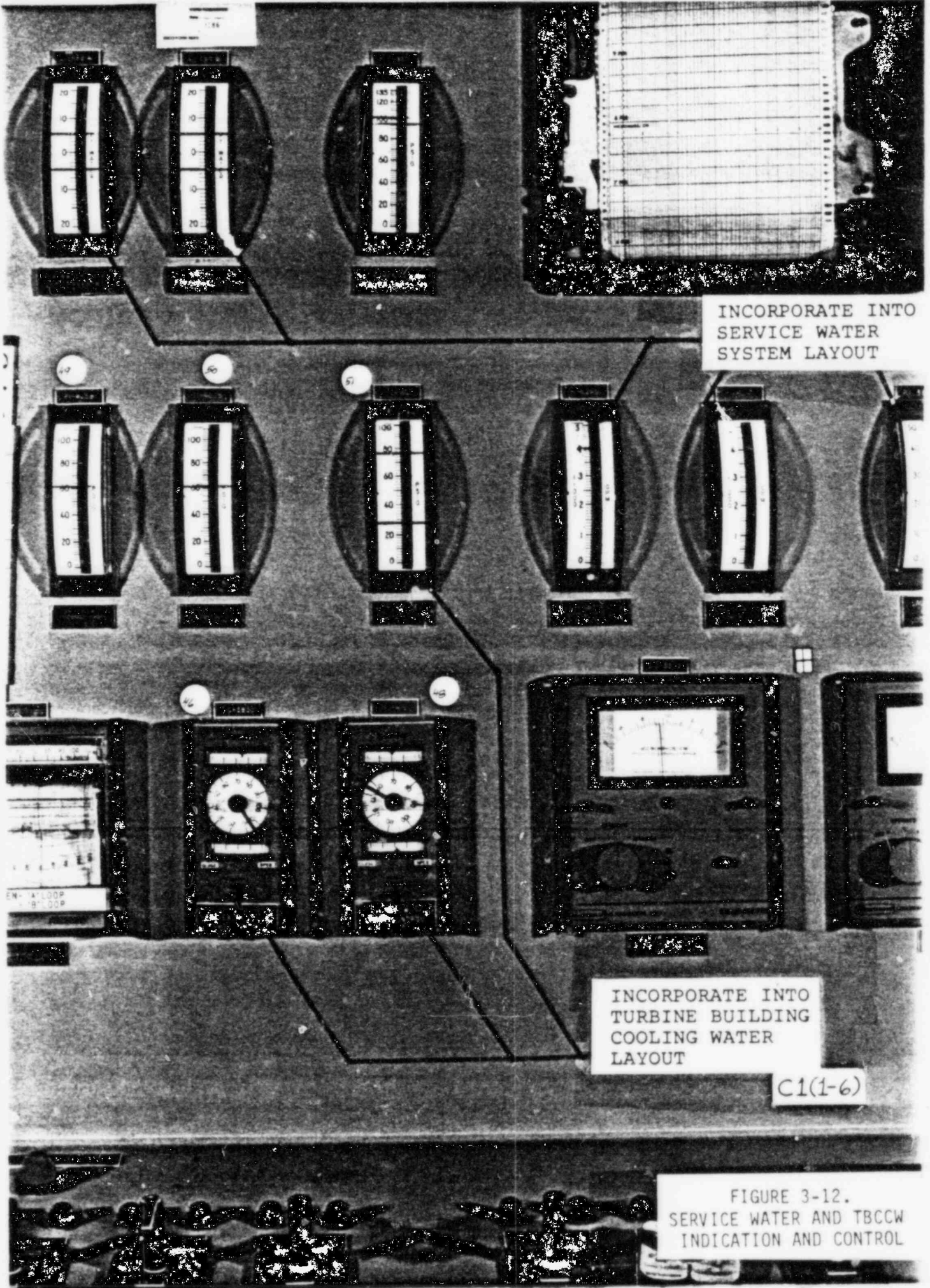


FIGURE 3-11.
PROPOSED RBCCW AND SERVICE
WATER ARRANGEMENT



INCORPORATE INTO
SERVICE WATER
SYSTEM LAYOUT

INCORPORATE INTO
TURBINE BUILDING
COOLING WATER
LAYOUT

C1(1-6)

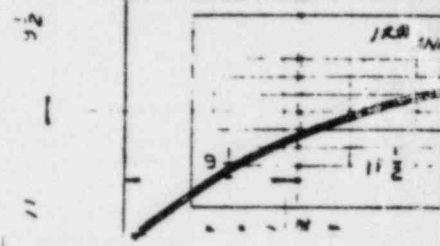
FIGURE 3-12.
SERVICE WATER AND TBCCW
INDICATION AND CONTROL

Also Available On
Aperture Card

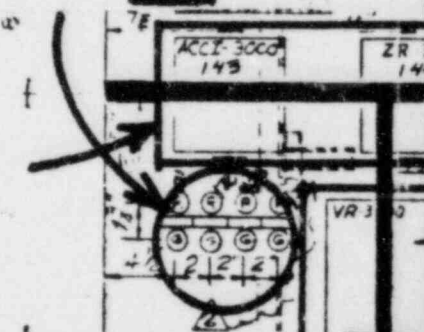
1) SUGGEST THAT

1. MAIN STEAM
2. STEAM DRAINS

BE PLACED ON
THIS PANEL

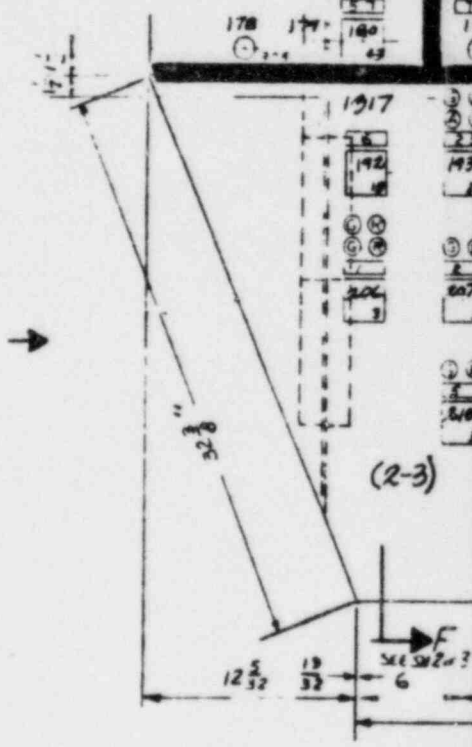


REVISE VPI
LAYOUT
USE

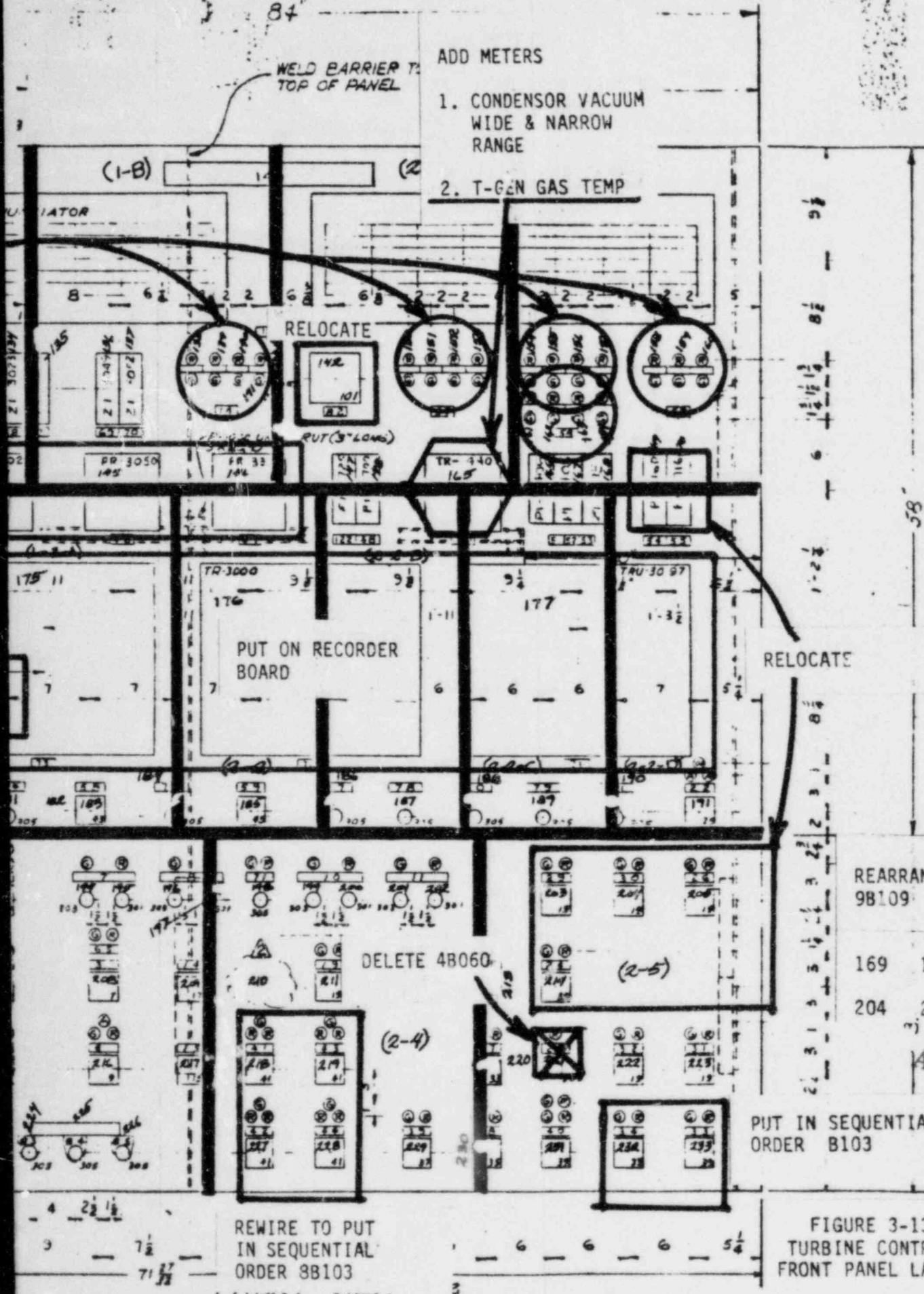


RECORDER BOARD
REPLACE WITH
METERS

PUT IN ONE
VIBRATION METER &
ONE ECCENTRICITY
METER



4409280249 05



- ADD METERS
1. CONDENSOR VACUUM WIDE & NARROW RANGE
 2. T-GEN GAS TEMP

WELD BARRIER TO TOP OF PANEL

RELOCATE

PUT ON RECORDER BOARD

DELETE 4B060

RELOCATE

REARRANGE 9B109

169	170
204	208

PUT IN SEQUENTIAL ORDER B103

REWIRE TO PUT IN SEQUENTIAL ORDER 8B103

(EXPANDED VIEW A & B)

FIGURE 3-13. TURBINE CONTROL FRONT PANEL LAYOUT

TI APERTURE CARD

PANELS

C2(1A)

XAN-3
1.5

CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL
CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL
CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL
CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL
CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL
CONDENSATE STORAGE TANK A - HI LEVEL	CONDENSATE STORAGE TANK A - LO LEVEL	CONDENSATE STORAGE TANK B - HI LEVEL	CONDENSATE STORAGE TANK B - LO LEVEL	CONDENSATE STORAGE TANK C - HI LEVEL	CONDENSATE STORAGE TANK C - LO LEVEL

29 30 31 32 33

REPLACE WITH METER
& INTEGRATE INTO
TURBINE VPI
RELOCATE RECORDER
TO RECORDER BOARD

34 35

43

44

FIGURE 3-14.
TURBINE VALVE
POSITION RECORDER

C2(1B)

TURBINE

1 LIFT PUMP LOW OIL PRESS	2 LIFT PUMP LOW OIL PRESS	3 LIFT PUMP LOW OIL PRESS	4 LIFT PUMP LOW OIL PRESS
5 BEARING OIL PUMP OUT OF SERVICE	6 BEARING OIL PUMP OUT OF SERVICE	7 TURBINE OIL PUMP MOTOR HIGH TEMP	8 TURBINE OIL PUMP MOTOR TRIP
9 TURBINE OIL PUMP MOTOR HIGH TEMP	10 TURBINE OIL PUMP MOTOR HIGH TEMP	11 TURBINE OIL PUMP MOTOR HIGH TEMP	12 TURBINE OIL PUMP MOTOR HIGH TEMP
13 TURBINE OIL PUMP MOTOR HIGH TEMP	14 TURBINE OIL PUMP MOTOR HIGH TEMP	15 TURBINE OIL PUMP MOTOR HIGH TEMP	16 TURBINE OIL PUMP MOTOR HIGH TEMP

A TURBINE BEARING OIL PUMP MOTOR TRIP
B TURBINE BEARING OIL PUMP MOTOR HIGH TEMP
C TURBINE BEARING OIL PUMP MOTOR HIGH TEMP
D TURBINE BEARING OIL PUMP MOTOR HIGH TEMP

REVISE MAIN STEAM DRAIN VALVE VPI

36 37

REPLACE WITH METERS, RELOCATE RECORDER TO RECORDER BOARD

X21-9 X21-10 X21-11

X21-1

45

46

47 48

FIGURE 3-15. MISCELLANEOUS RECORDERS AND VALVE POSITION INDICATION

C2(2A)

XAW-4

GENERAL ALARM

TURBINE AIR OIL PUMPS DRAINING	AIR DRYER HIGH TEMP	AIR DRYER HIGH SUFF PRESS	SEWER OVERFLOW	SERVICE AIR HEADER ISOLATION	FRIGORANT AIR HEAD LOW PRESS	TURBINE STEAM PACKING
TURBINE AIR OIL PUMPS TRIP	AIR DRYER END OF CYCLE	IMPROVED SUPPLY TO TURBINE AIR OIL PUMPS	AIR ON RD TO DRYWELL VALVE CLOSED	SERVICE AIR GLOMER LOW PRESS	FRIGORANT SUBSEQUENT AIR HEAD ISOLATION	RELOCATE TO BE ADJACENT TO THRUST BEARING WEAR TEST SWITCH
TURBINE AIR OIL PUMPS HIGH SUFF PRESS	SEWER TRASH PUMP HIGH SUFF PRESS	FIRE WATER STE TURBINE HIGH LEVEL	FIRE PUMP TURBINE	NO ANALYSE A LOW FLOW	STANDBY COMPRESS TURBINE	

RELOCATE TO BE ADJACENT TO LUBE OIL CONTROLS	FIRE WATER STE TURBINE LOW LEVEL	REVISE TURBINE VALVES POSITION INDICATION	SEWER FLOW	TURBINE CLAND SEAL CONDENSER HI FLOW	TURBINE CLAND SEAL CONDENSER HI LEVEL
	CONDENSER EXHAUSTION TROUBLE		FUEL PUMP TROUBLE		MEGREL FINE PUMP FUEL OIL DAY TANK LOW LEVEL
	COOLER STAGE A DENSITY HIGH		DRYING POLYMER FINISHED		MEGREL FINE PUMP FUEL OIL DAY TANK HIGH LEVEL

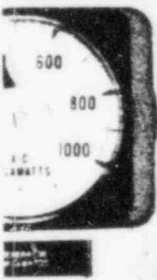
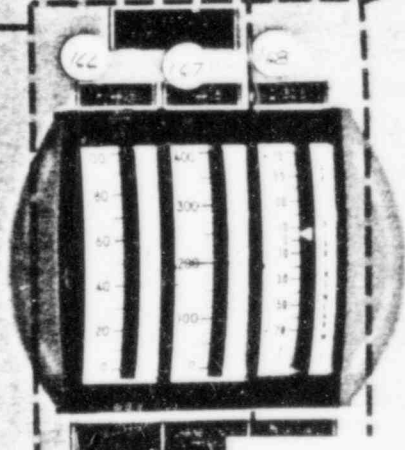
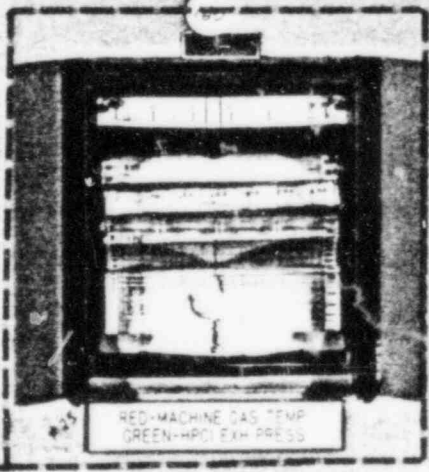
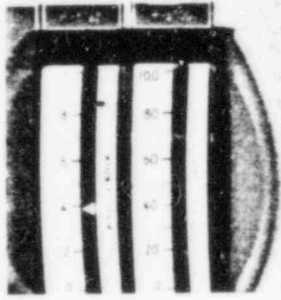


Diagram of a control panel with 20 valve position indicators labeled X21-02 through X21-20. Each indicator consists of a circular dial with a needle and a label below it. The labels are arranged in two rows of ten. The top row labels are X21-02, X21-03, X21-04, X21-05, X21-16, X21-17, X21-18, X21-19, X21-20. The bottom row labels are X21-23, X21-24, X21-25, X21-26.



REPLACE WITH METERS,
PUT HPCI EXHAUST PRESS
ON PANEL 903
RELOCATE RECORDER
TO RECORDER BOARD

FIGURE 3-16.
RECORDERS AND VALVE
POSITION INDICATION

C2(2B)

1 TURBINE 4 BEARING 16 PRESS.	1 TURBINE STEAM PADDING CONDENSER BLOWER A 17P	1 TURBINE 17P
1 CENTRAL MOTOR 1 BEARING 1 MOTOR	1 TURBINE STEAM PADDING EXHAUSTED BLOWER B 17P	1 TURBINE 17P
1 TANGENT 1 PRESSURE	1 TURBINE 17P	1 TURBINE 17P
1 CLAND SEAL 1600 IN FLOW	1 TURBINE CLAND SEAL CONDENSER IN LEVEL	1 TURBINE 17P
1 TURBINE 17P	1 TURBINE 17P	1 TURBINE 17P
1 TURBINE 17P	1 TURBINE 17P	1 TURBINE 17P

R.F.P. A LOW R.P.S.A.	R.F.P. B LOW R.P.S.B.
R.F.P. A MOVING VALVE FAILURE	R.F.P. B MOVING VALVE FAILURE
R.F.P. A LOW OIL LOW PRESS.	R.F.P. B LOW OIL LOW PRESS.
R.F.P. A OILING WATER LOW FLOW	R.F.P. B OILING WATER LOW FLOW
CONDENSATE PUMPS OVERLOAD	CONDENSATE PUMP TRIPPED
CONDENSATE PUMP DISCH. HEADERS LOW PRESS.	NO. 1 EJECTOR STEAM SUPPLY LOW PRESS.

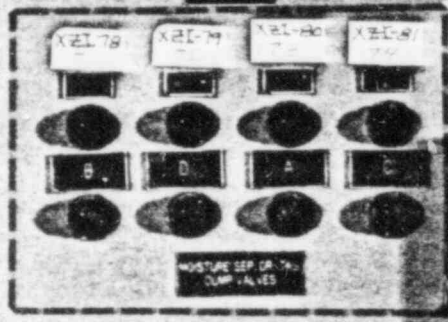
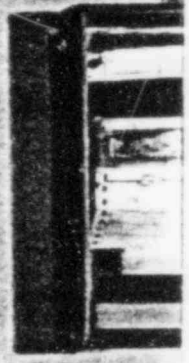
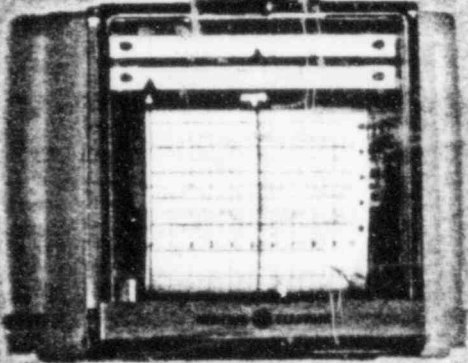
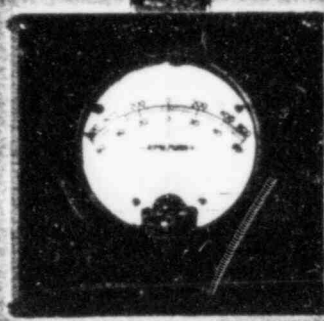
REVISE TURBINE VALVES POSITION INDICATION

Handwritten labels: X2-21, X2-22

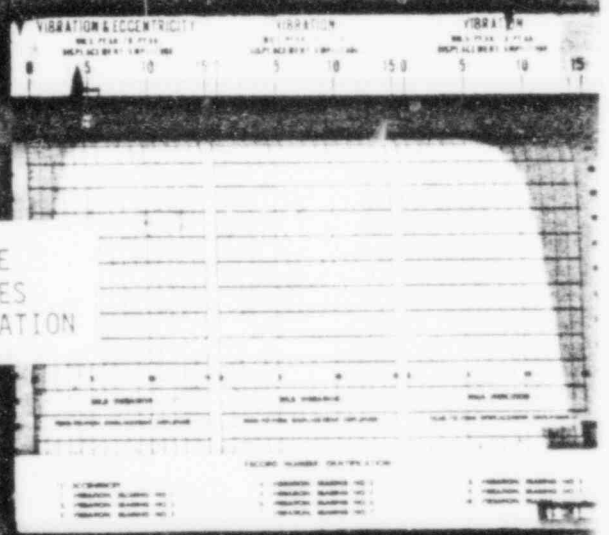
RELOCATE AND INTEGRATE INTO STEAM SEALS CONTROLS

FIGURE 3-17. TURBINE VALVE POSITION INDICATION AND STEAM SEAL INDICATION

C2(1-3)



REVISE MOISTURE SEPARATOR VALVES POSITION INDICATION



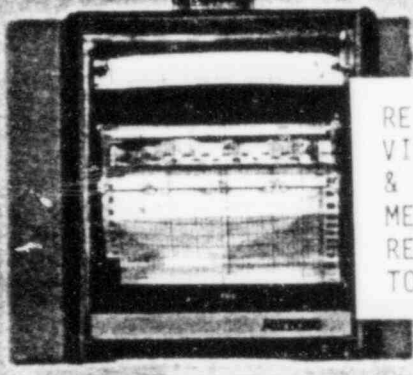
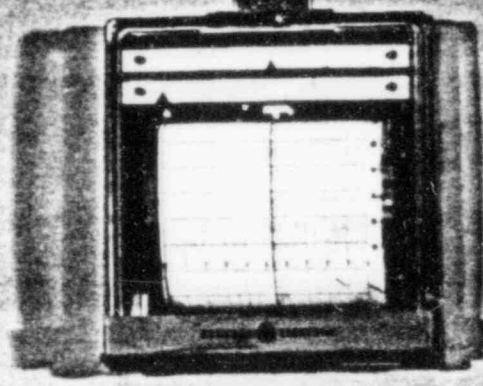
CAUTION

DO NOT VIBRATE AND ETC.

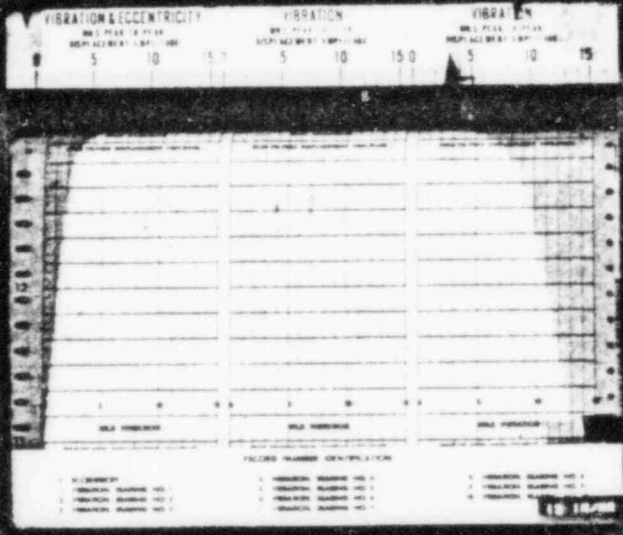


FIGURE 3-18. VALVE POSITION INDICATION

C2(1-3A)



REPLACE WITH
VIBRATION METER
& ECCENTRICITY
METER
RELOCATE RECORDER
TO RECORDER BOARD



CAUTION

DO NOT TOUCH
AND ECC

XPS-5

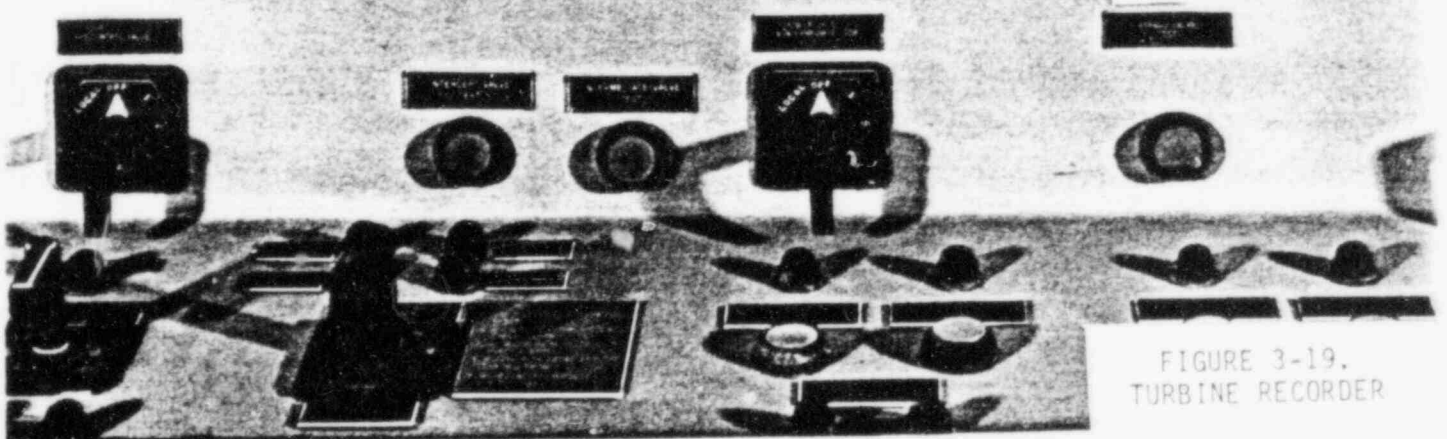


FIGURE 3-19.
TURBINE RECORDER

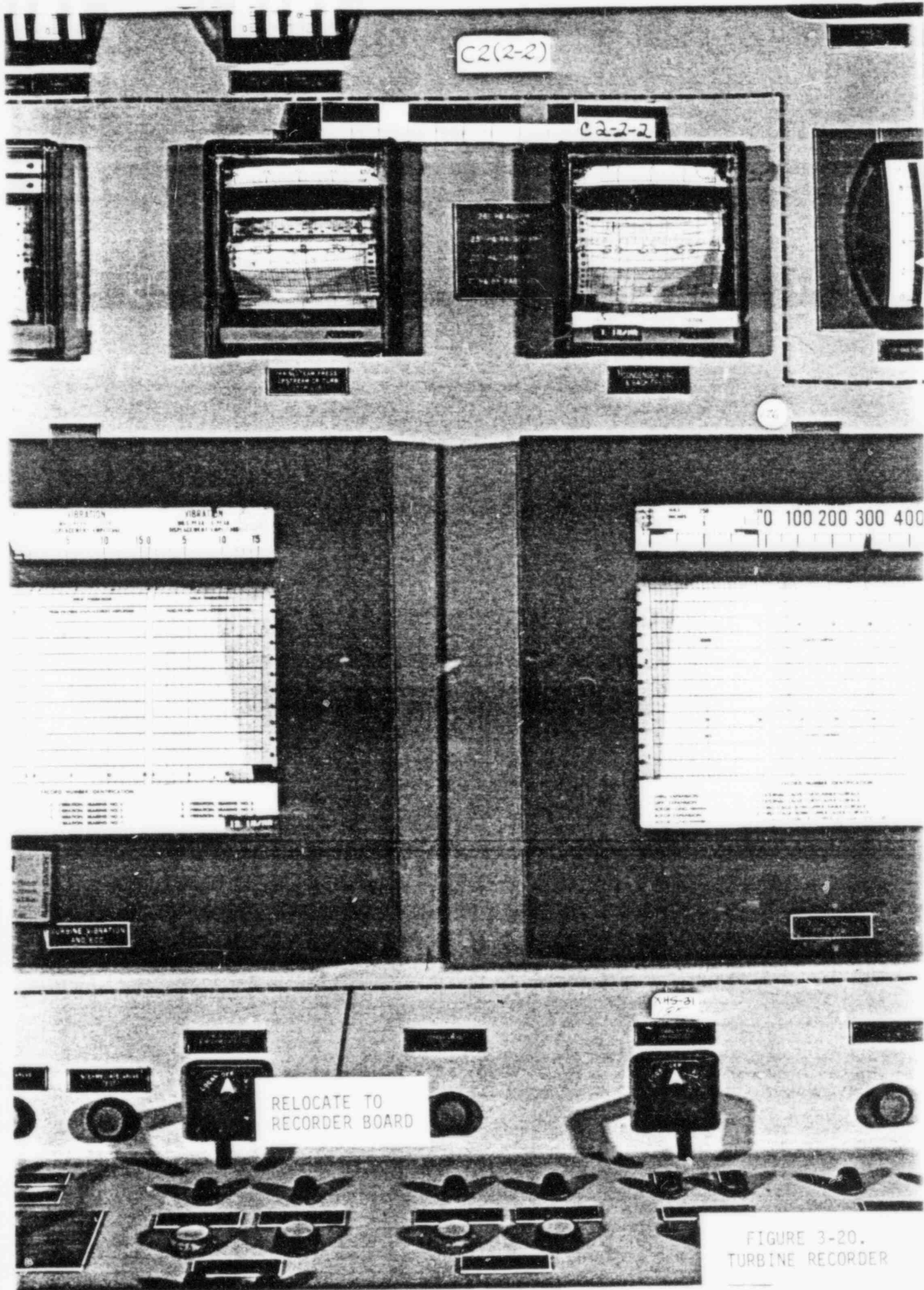
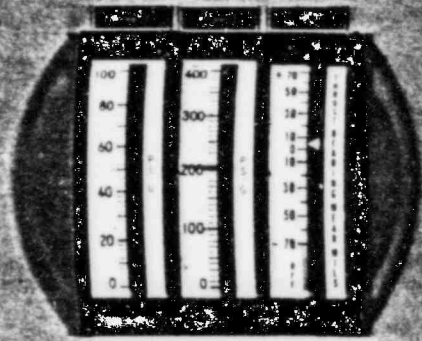


FIGURE 3-20.
TURBINE RECORDER

C2(2-2D)

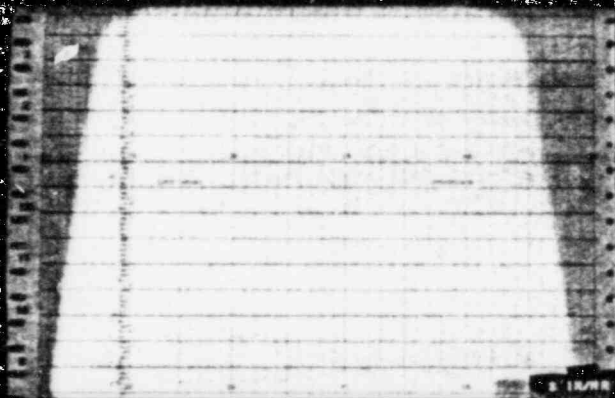
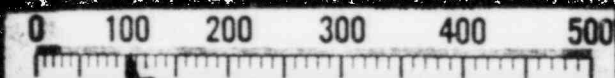


RELOCATE TO RECORDER BOARD

TEMP PRESS

77

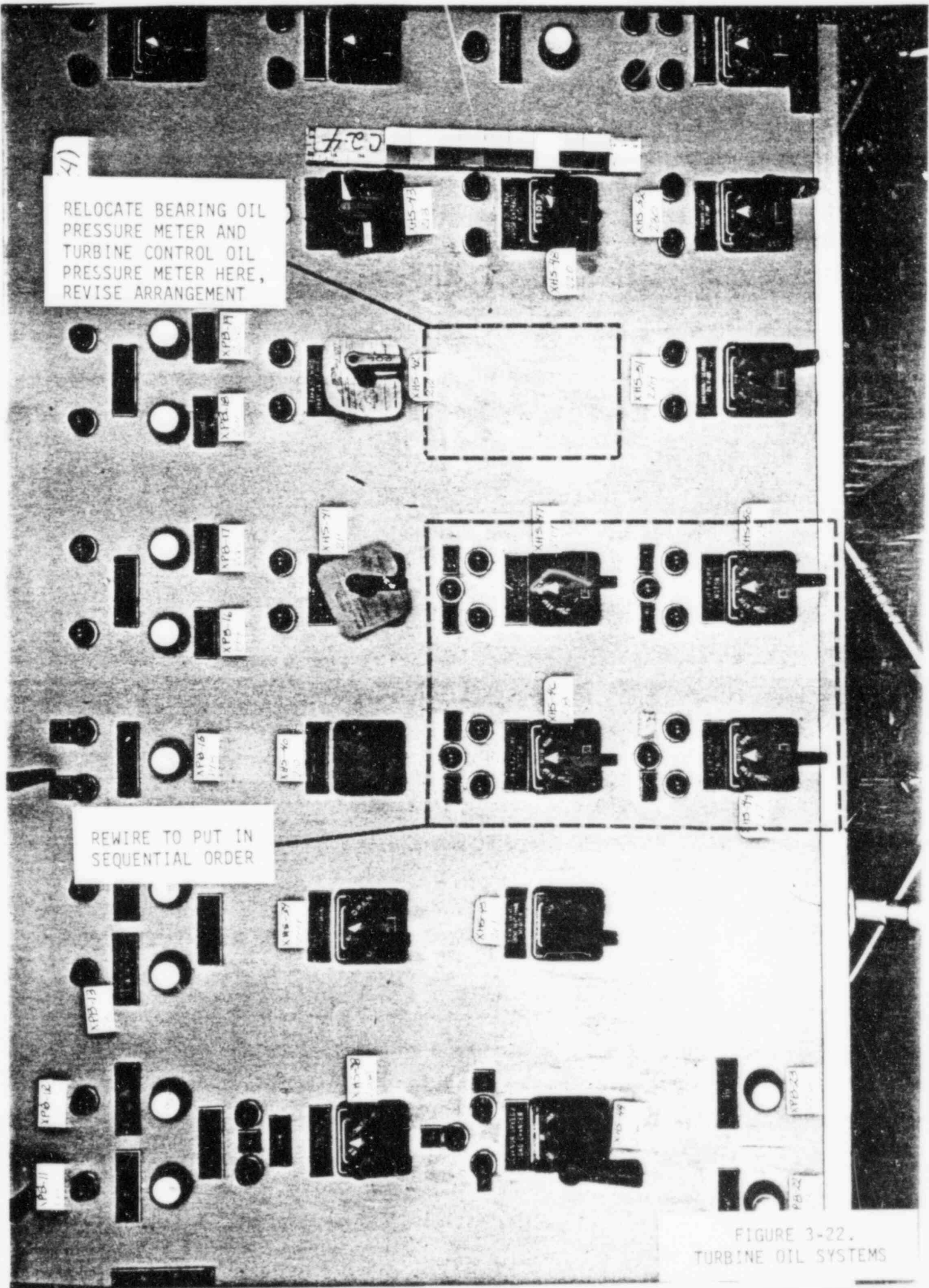
RELOCATE THRUST BEARING WEAR METER TO HERE



C2(2-2D)

195-9

FIGURE 3-21. TURBINE RECORDER



4)
RELOCATE BEARING OIL PRESSURE METER AND TURBINE CONTROL OIL PRESSURE METER HERE, REVISE ARRANGEMENT

REWIRE TO PUT IN SEQUENTIAL ORDER

FIGURE 3-22. TURBINE OIL SYSTEMS

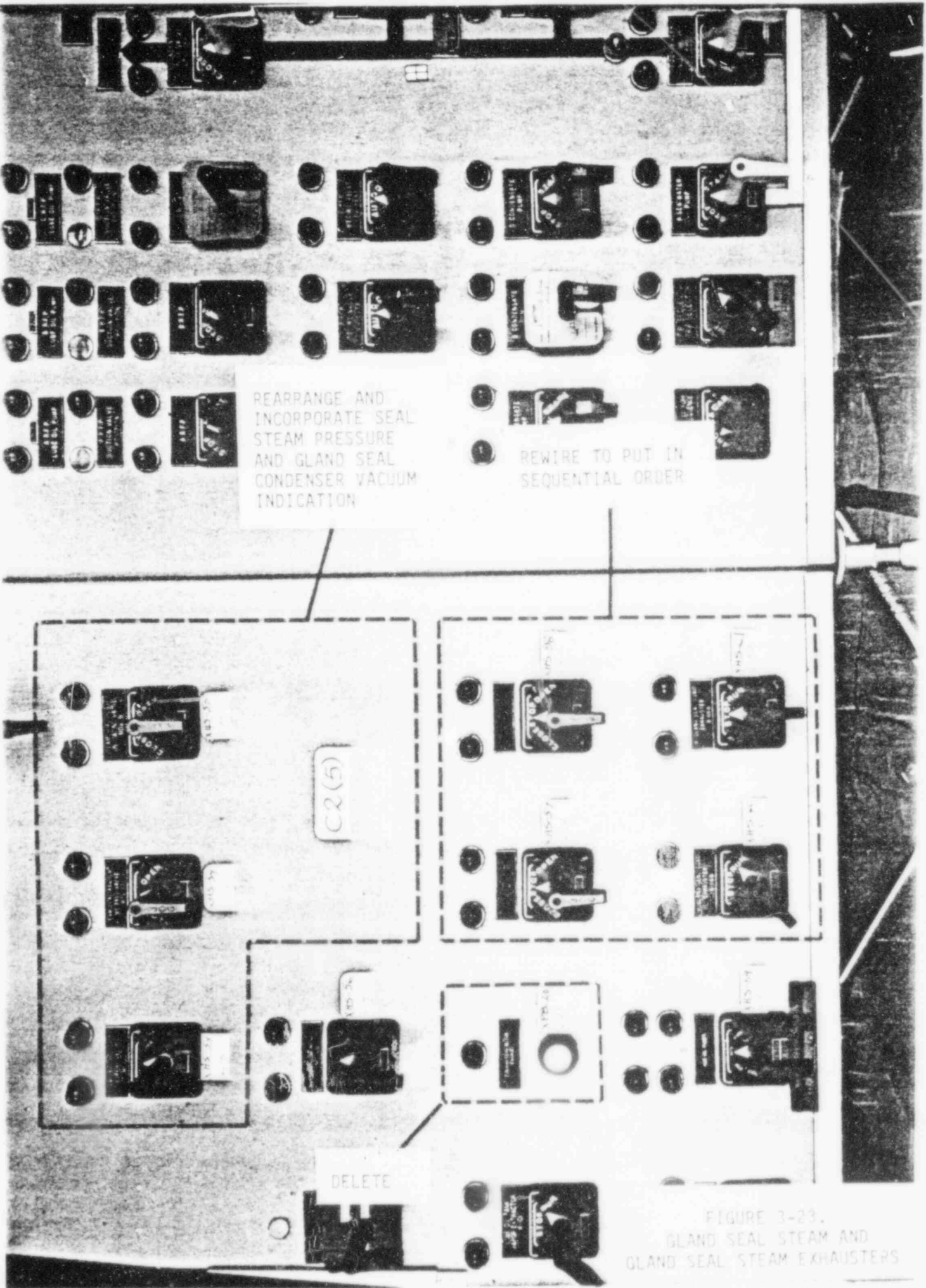
REARRANGE AND
INCORPORATE SEAL
STEAM PRESSURE
AND GLAND SEAL
CONDENSER VACUUM
INDICATION

REWIRE TO PUT IN
SEQUENTIAL ORDER

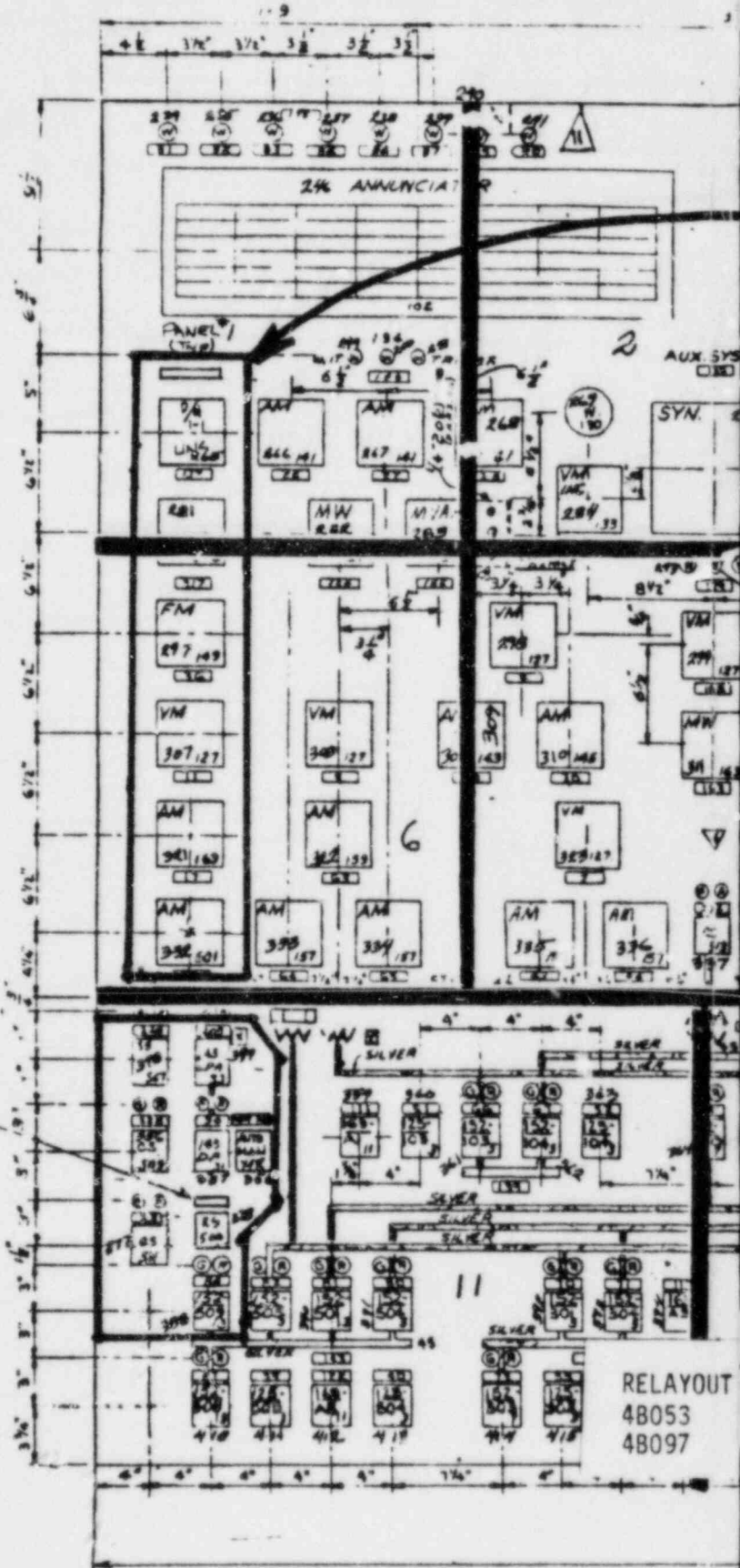
C2(5)

DELETE

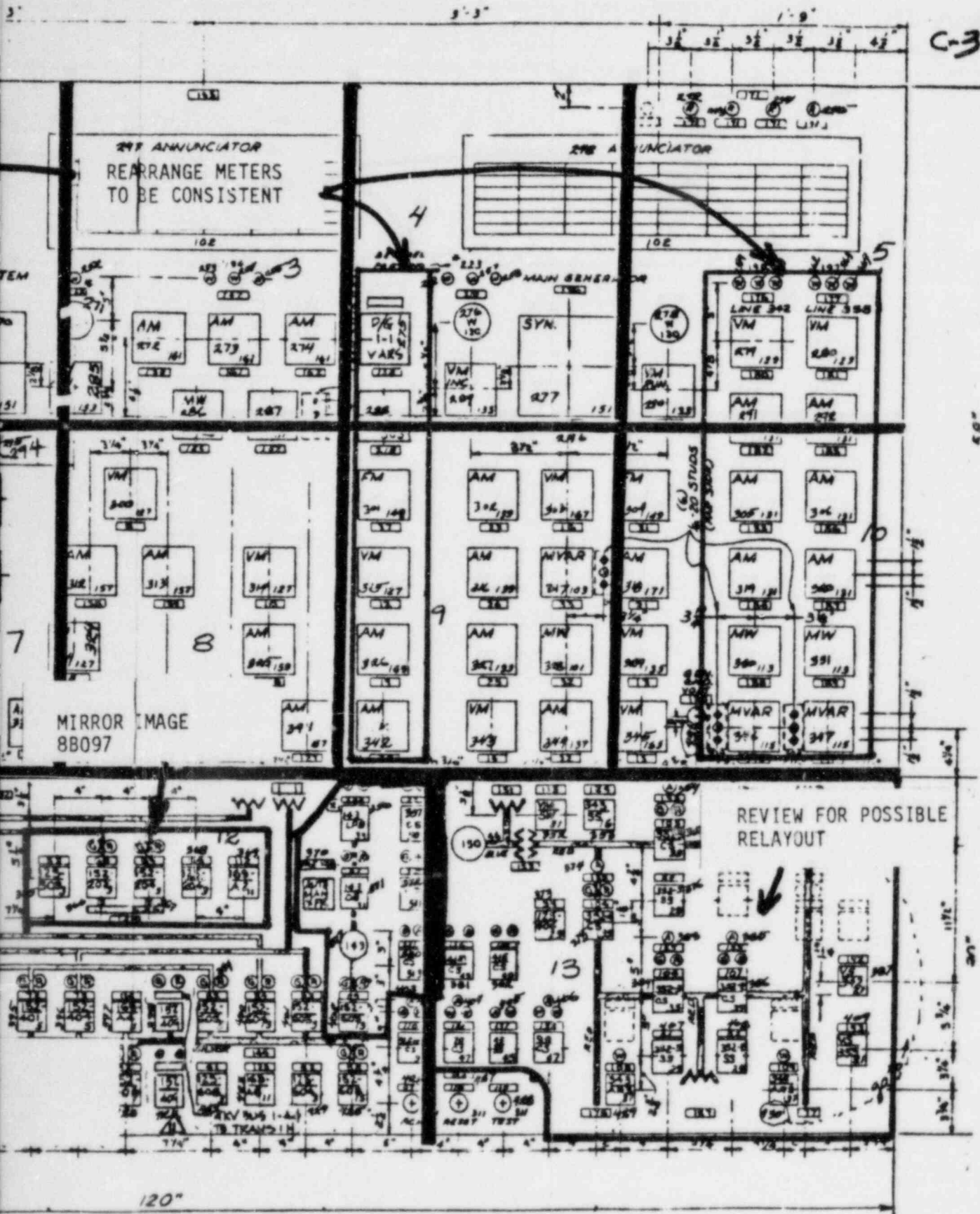
FIGURE 3-23.
GLAND SEAL STEAM AND
GLAND SEAL STEAM EXHAUSTERS



Also Available On
Aperture Card



8409280249-06



BOARD
FRONT VIEW C-3
(EXPANDED VIEWS A, B, & C)

FIGURE 3-24.
ELECTRICAL DISTRIBUTION
FRONT PANEL LAYOUT

XW-1 XW-2 XW-3 XW-4 XW-5 XW-6 XW-7
 BUS 2-1 BUS 2-2 BUS 2-3 BUS 2-4 BUS 2-5 BUS 2-6 BUS 2-7

XAN-5T

PANALARM

UNIT A-1
 UNIT A-2
 UNIT A-3
 UNIT A-4

OVERLOAD
 TRIP RELAY

TRIP
 TRIP

DIESEL GEN. A
 CONTROL

DIESEL GEN. B
 CONTROL

TRIP
 TRIP
 TRIP
 TRIP
 TRIP
 TRIP
 TRIP
 TRIP
 TRIP
 TRIP

REARRANGE TO PUT METERS IN ORDER BY IMPORTANCE AND CONSISTENT WITH THE OTHER DIESEL GENERATOR AND INCOMING LINE METERING

C-3-1

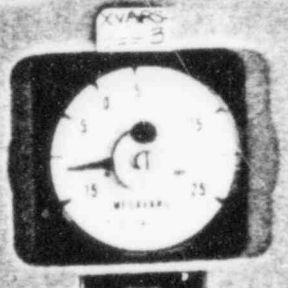
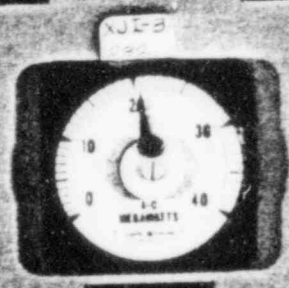
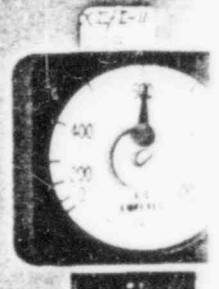
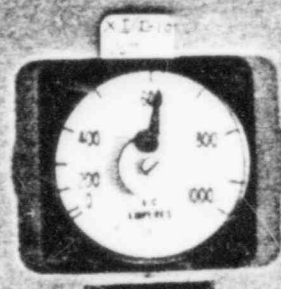
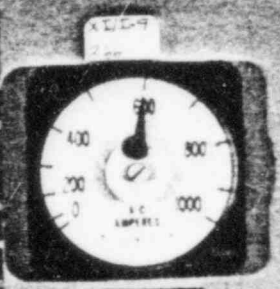
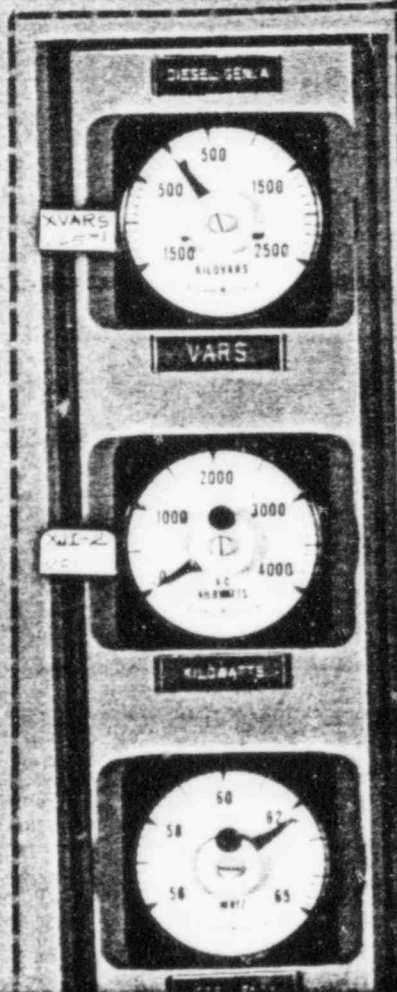


FIGURE 3-25. DIESEL GENERATOR "A" METERING

C3(5)

XW-9

XW-10

XW-11

XW-12

XAN-7

UNIT #1 VOLT REGULATOR TEMP	UNIT #2 COLLECTOR MOTOR WINDING	UNIT #3 COOLING WATER SYSTEM LOW FLOW	UNIT #4 GENERATOR FIELD REST	UNIT #5 GENERATOR FIELD OVERVOLT	UNIT #6 GENERATOR HIGH FIELD TEMP	UNIT #7 GENERATOR HIGH FIELD TEMP	UNIT #8 GENERATOR HIGH FIELD TEMP	UNIT #9 GENERATOR HIGH FIELD TEMP	UNIT #10 GENERATOR HIGH FIELD TEMP	UNIT #11 GENERATOR HIGH FIELD TEMP	UNIT #12 GENERATOR HIGH FIELD TEMP	UNIT #13 GENERATOR HIGH FIELD TEMP	UNIT #14 GENERATOR HIGH FIELD TEMP	UNIT #15 GENERATOR HIGH FIELD TEMP	UNIT #16 GENERATOR HIGH FIELD TEMP	UNIT #17 GENERATOR HIGH FIELD TEMP	UNIT #18 GENERATOR HIGH FIELD TEMP	UNIT #19 GENERATOR HIGH FIELD TEMP	UNIT #20 GENERATOR HIGH FIELD TEMP	UNIT #21 GENERATOR HIGH FIELD TEMP	UNIT #22 GENERATOR HIGH FIELD TEMP	UNIT #23 GENERATOR HIGH FIELD TEMP	UNIT #24 GENERATOR HIGH FIELD TEMP	UNIT #25 GENERATOR HIGH FIELD TEMP	UNIT #26 GENERATOR HIGH FIELD TEMP	UNIT #27 GENERATOR HIGH FIELD TEMP	UNIT #28 GENERATOR HIGH FIELD TEMP	UNIT #29 GENERATOR HIGH FIELD TEMP	UNIT #30 GENERATOR HIGH FIELD TEMP
-----------------------------------	---------------------------------------	--	------------------------------------	--	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

REARRANGE TO PUT METERS IN ORDER BY IMPORTANCE AND CONSISTENT WITH THE DIESEL GENERATOR METERING

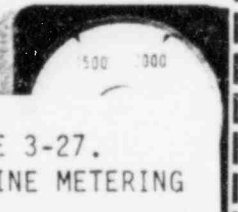
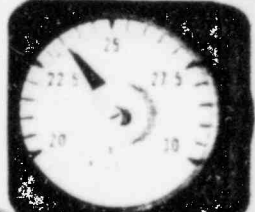
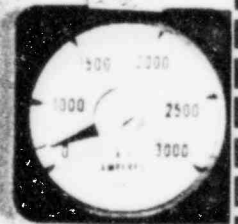
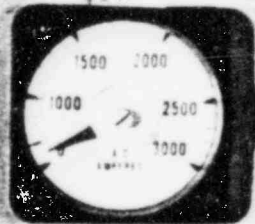
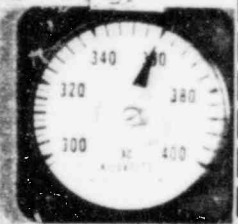
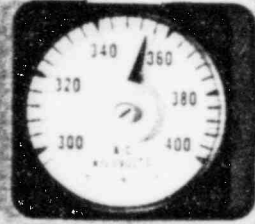


FIGURE 3-27. INCOMING LINE METERING

C-3-6

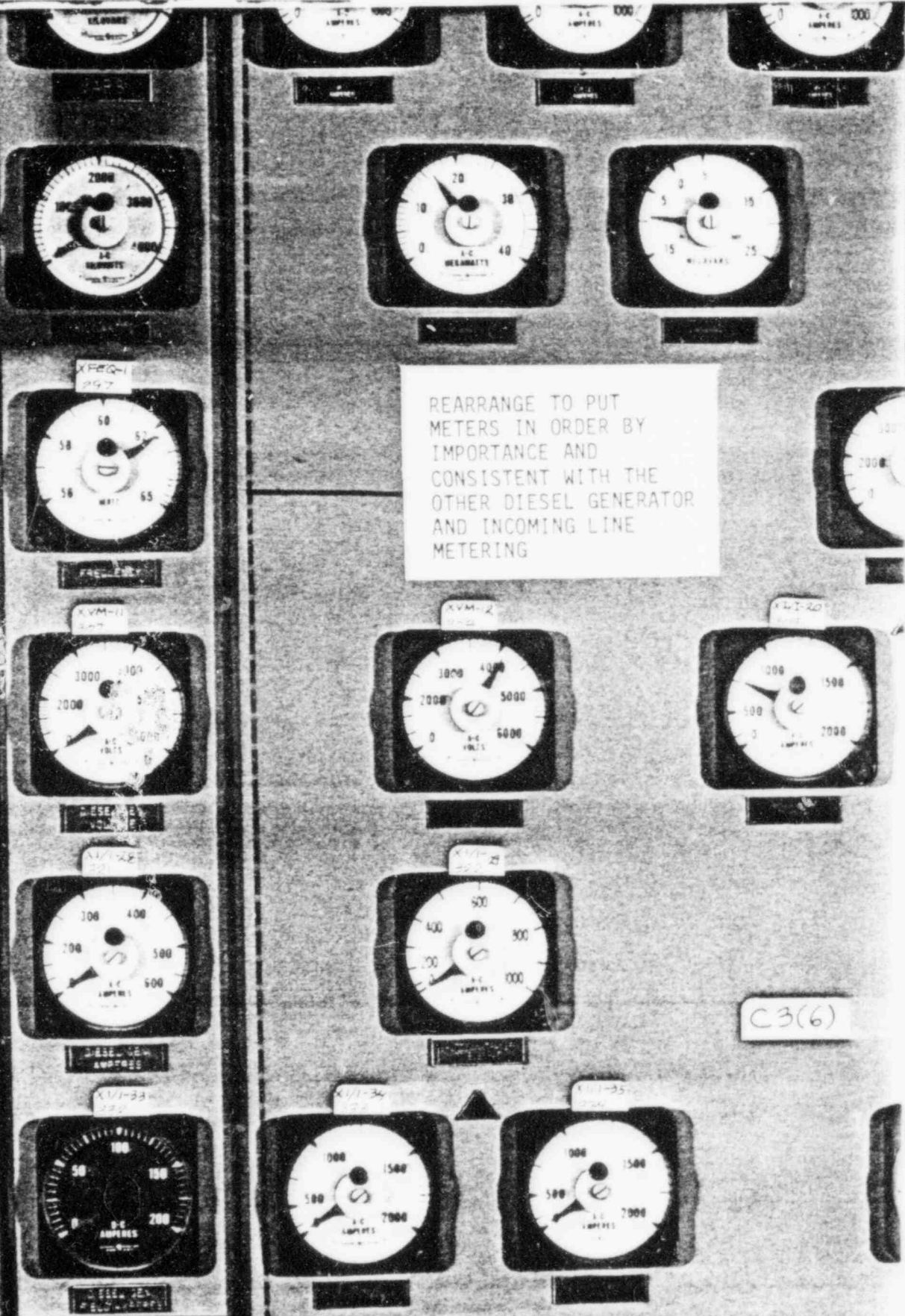
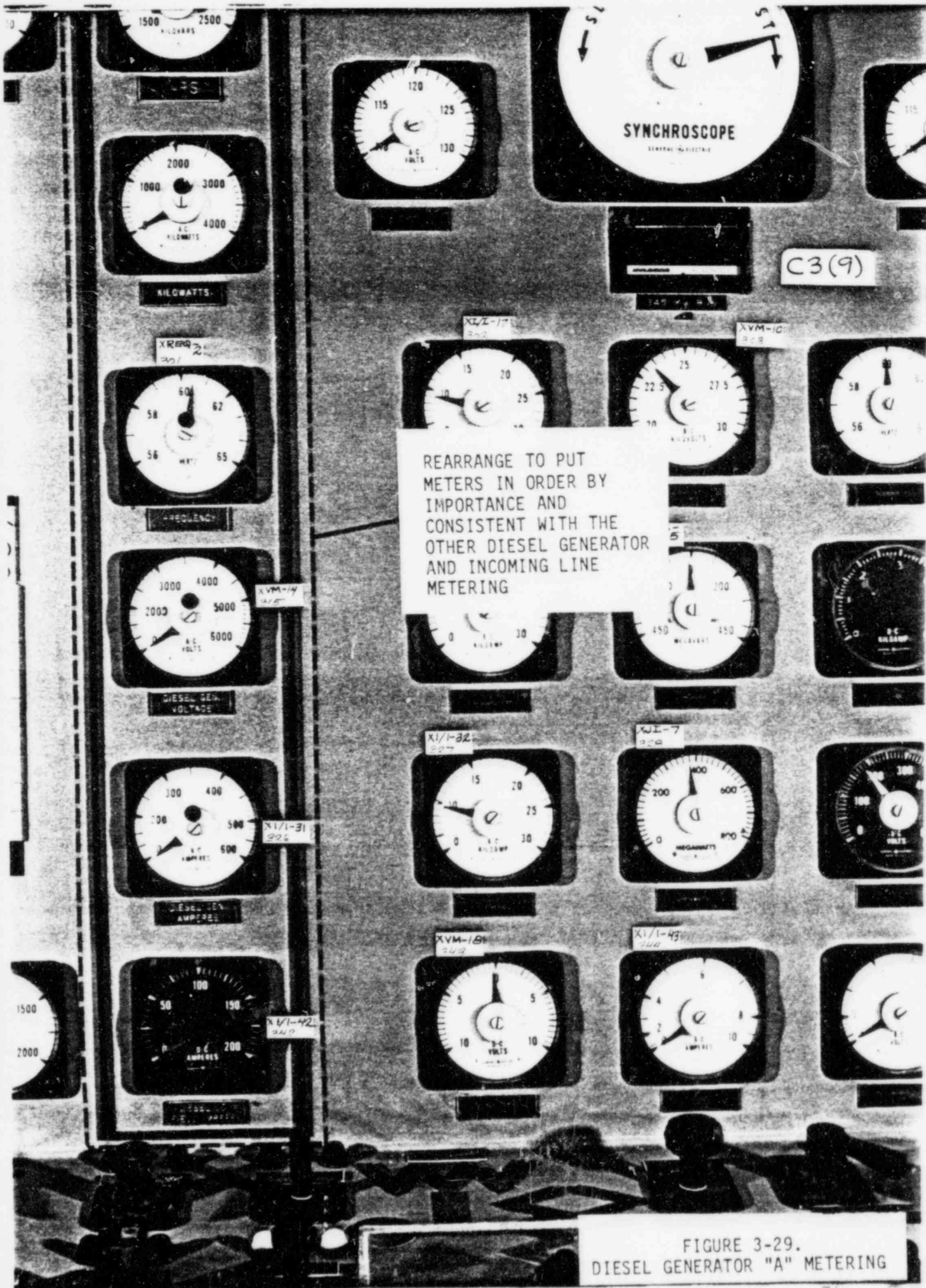


FIGURE 3-28. DIESEL GENERATOR "A" METERING



REARRANGE TO PUT METERS IN ORDER BY IMPORTANCE AND CONSISTENT WITH THE OTHER DIESEL GENERATOR AND INCOMING LINE METERING

FIGURE 3-29.
DIESEL GENERATOR "A" METERING

ROSCOPE

ELECTRIC

27.5

150

1400

600

870

MEGAWATTS

5

10

15

20

25

30

35

40

45

50

55

60

65

70

75

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

155

160

165

170

175

180

185

190

195

200

205

210

215

220

225

230

235

240

245

250

255

260

265

270

275

280

285

290

295

300

305

310

315

320

325

330

335

340

345

350

355

360

365

370

375

380

385

390

395

400

405

410

415

420

425

430

435

440

445

450

455

460

465

470

475

480

485

490

495

500

505

510

515

520

525

530

535

540

545

550

555

560

565

570

575

580

585

590

595

600

605

610

615

620

625

630

635

640

645

650

655

660

665

670

675

680

685

690

695

700

705

710

715

720

725

730

735

740

745

750

755

760

765

770

775

780

785

790

795

800

805

810

815

820

825

830

835

840

845

850

855

860

865

870

875

880

885

890

895

900

905

910

915

920

925

930

935

940

945

950

955

960

965

970

975

980

985

990

995

1000

1005

1010

1015

1020

1025

1030

1035

1040

1045

1050

1055

1060

1065

1070

1075

1080

1085

1090

1095

1100

1105

1110

1115

1120

1125

1130

1135

1140

1145

1150

1155

1160

1165

1170

1175

1180

1185

1190

1195

1200

1205

1210

1215

1220

1225

1230

1235

1240

1245

1250

1255

1260

1265

1270

1275

1280

1285

1290

1295

1300

1305

1310

1315

1320

1325

1330

1335

1340

1345

1350

1355

1360

1365

1370

1375

1380

1385

1390

1395

1400

1405

1410

1415

1420

1425

1430

1435

1440

1445

1450

1455

1460

1465

1470

1475

1480

1485

1490

1495

1500

1505

1510

1515

1520

1525

1530

1535

1540

1545

1550

1555

1560

1565

1570

1575

1580

1585

1590

1595

1600

1605

1610

1615

1620

1625

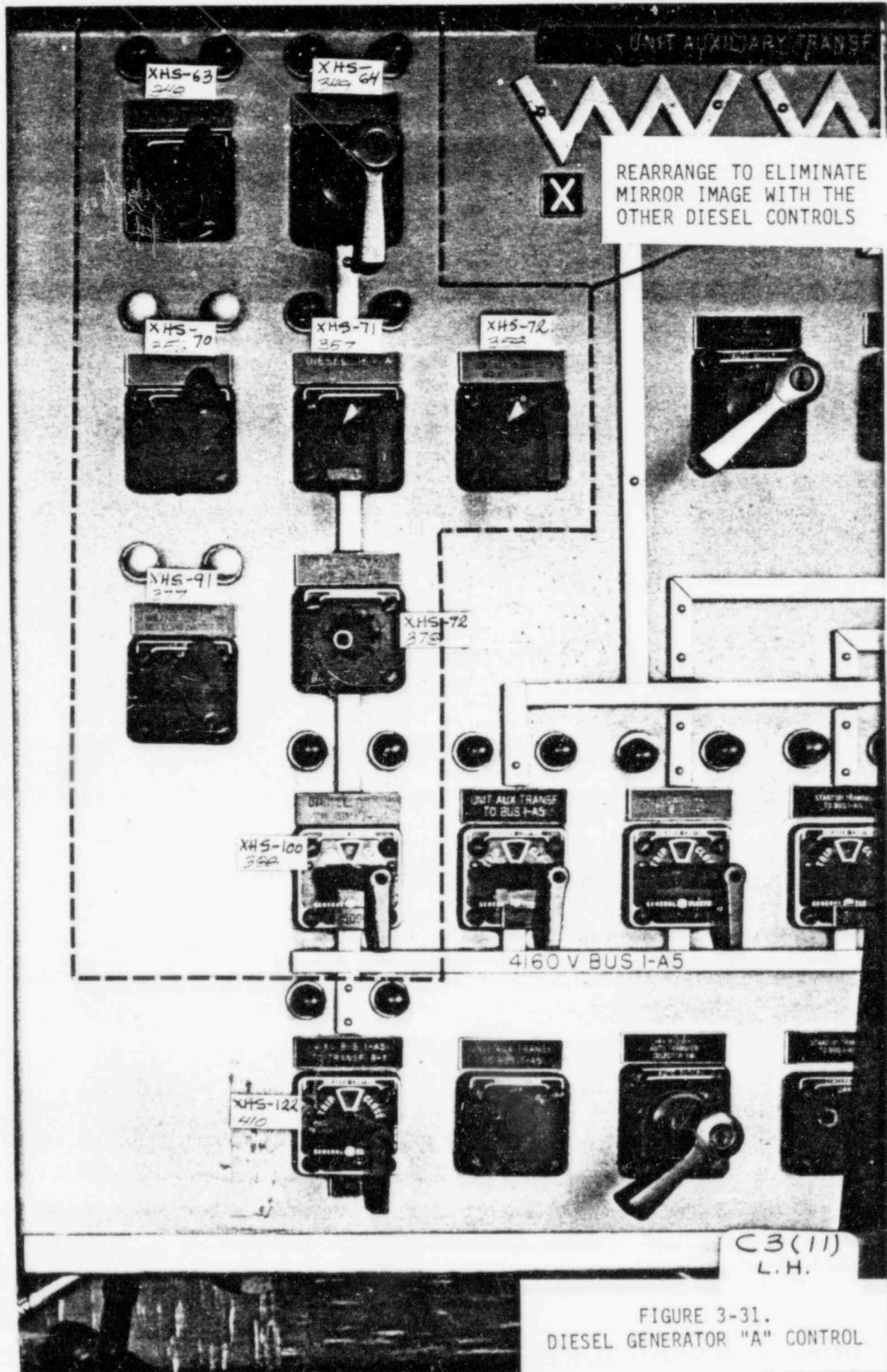
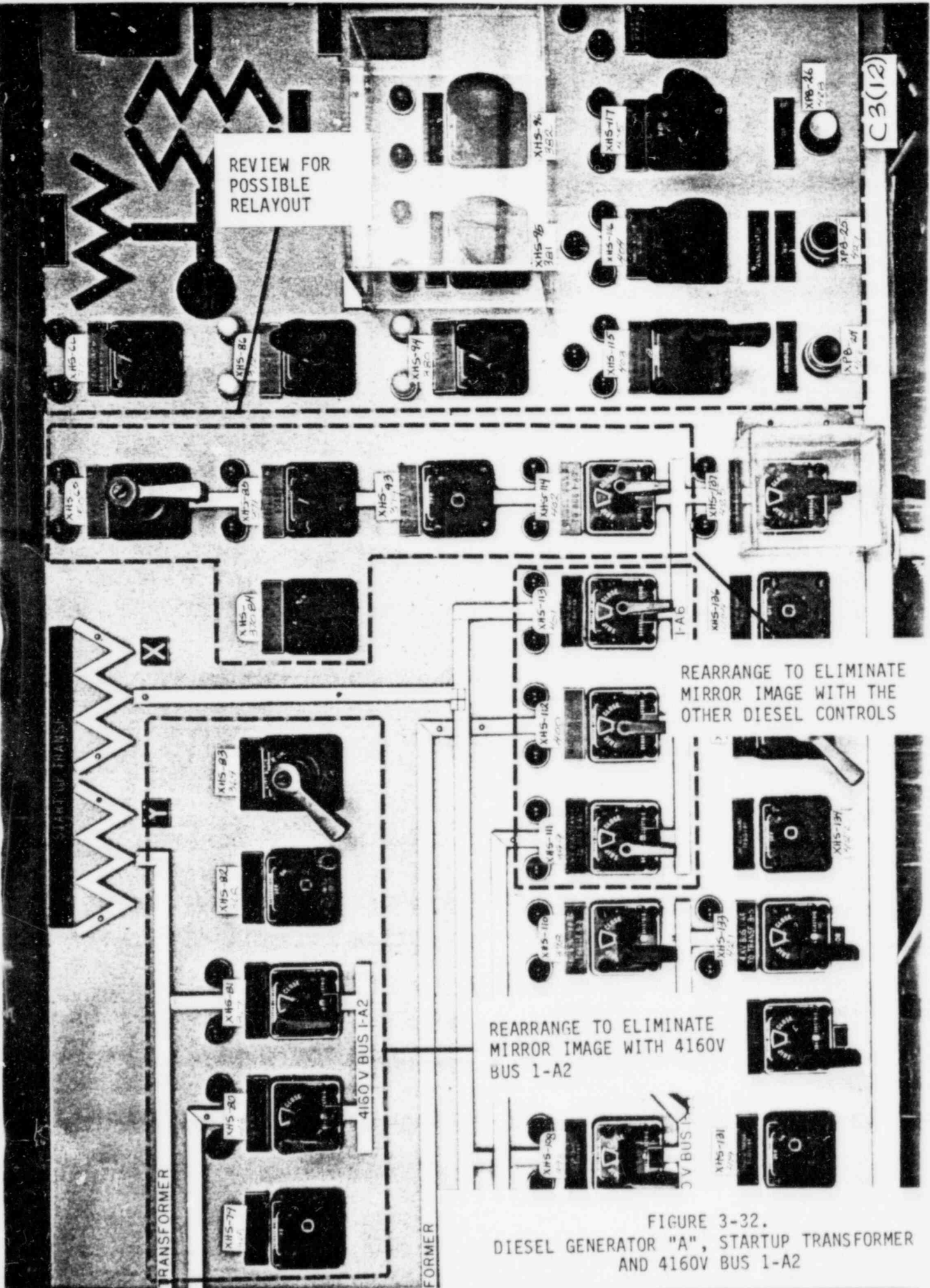


FIGURE 3-31.
DIESEL GENERATOR "A" CONTROL



REVIEW FOR POSSIBLE RELAYOUT

REARRANGE TO ELIMINATE MIRROR IMAGE WITH THE OTHER DIESEL CONTROLS

REARRANGE TO ELIMINATE MIRROR IMAGE WITH 4160V BUS 1-A2

FIGURE 3-32. DIESEL GENERATOR "A", STARTUP TRANSFORMER AND 4160V BUS 1-A2

REVIEW FOR POSSIBLE
REARRANGEMENTS TO
CLARIFY INTERRELATION-
SHIP WITH INCOMING LINES

C3(13)

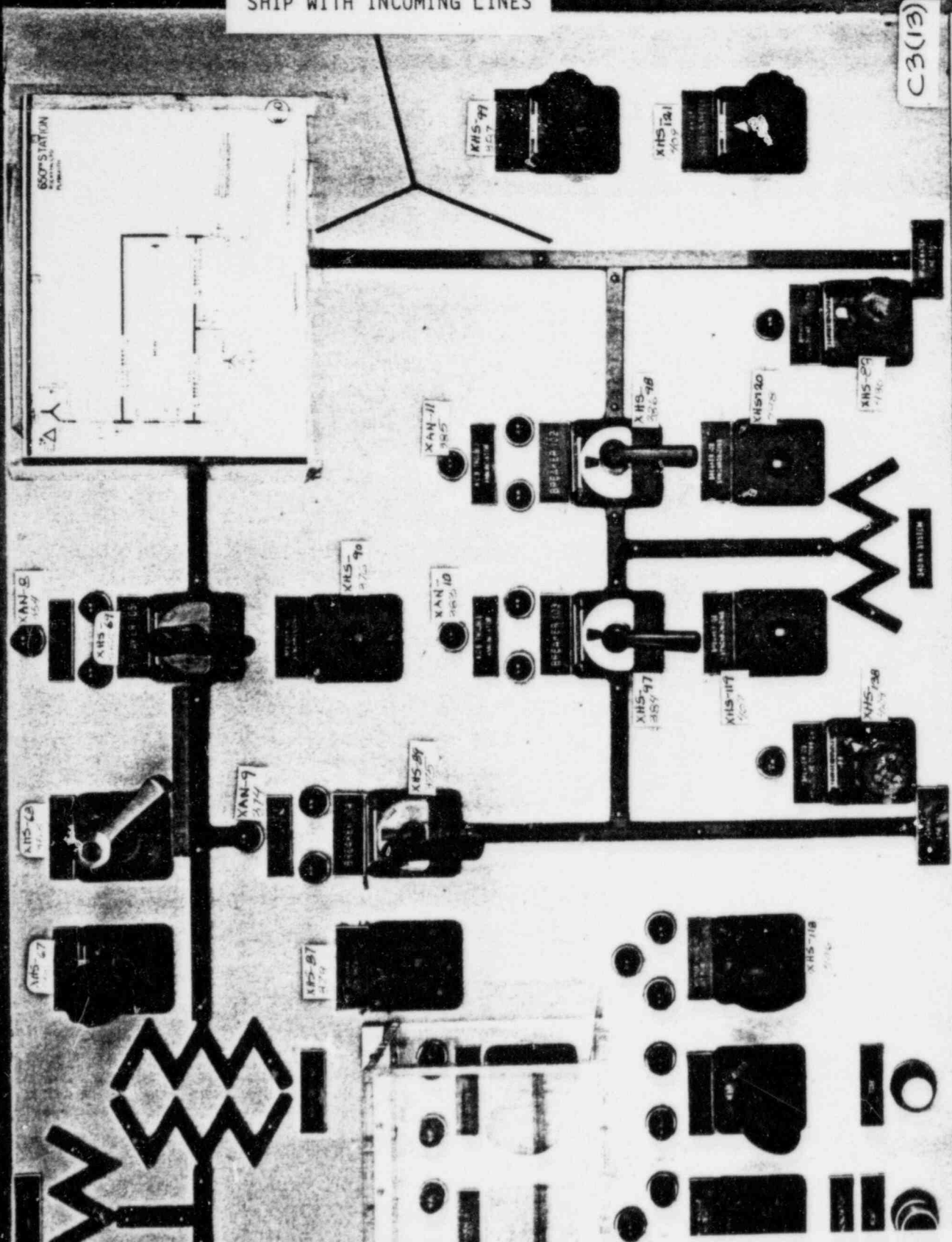


FIGURE 3-33.
GENERATOR OUTPUT BREAKERS

13

903

538

539

METERS

REPLACE

- TORUS WTR TEMP
TI-5022
SB119 610

ADD

- HPCI EXHAUST STM
PRESS FROM RECORDER
ON C2

RELOCATE
1C003

2-1

538

539
587
588
59

602

604

608

609

1-3

DELETE
PCN 8362B

ADD
8B101

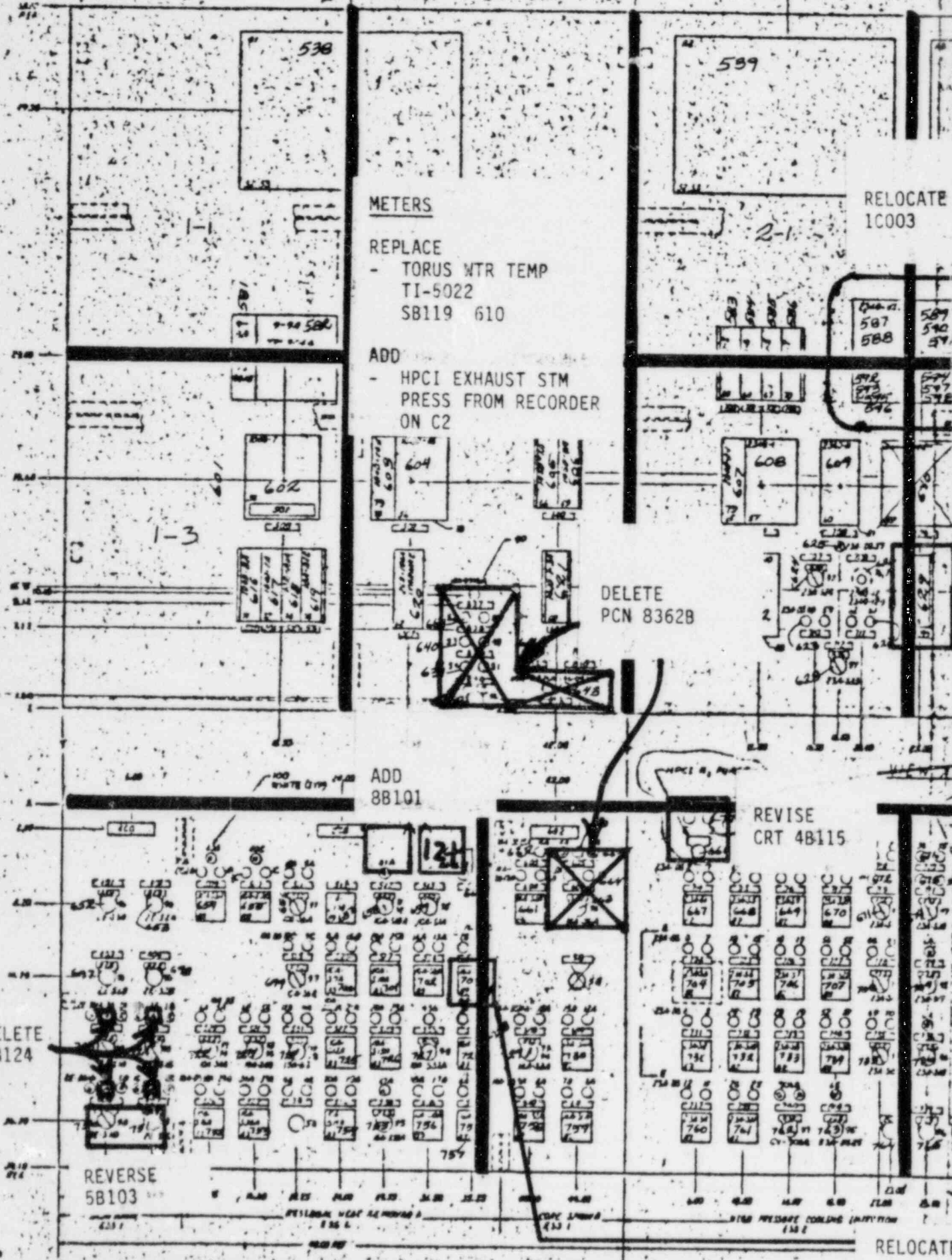
REVISE
CRT 4B115

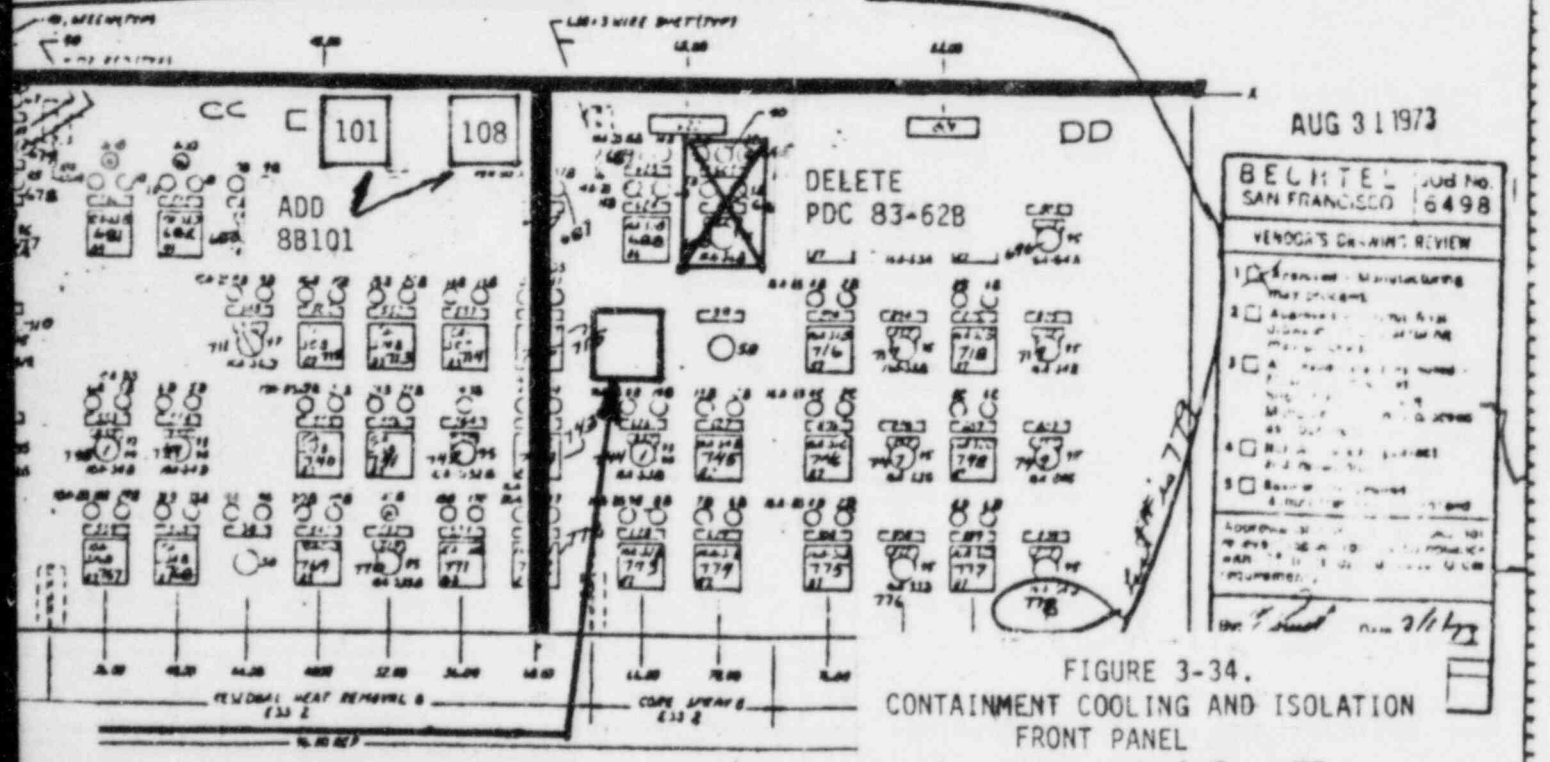
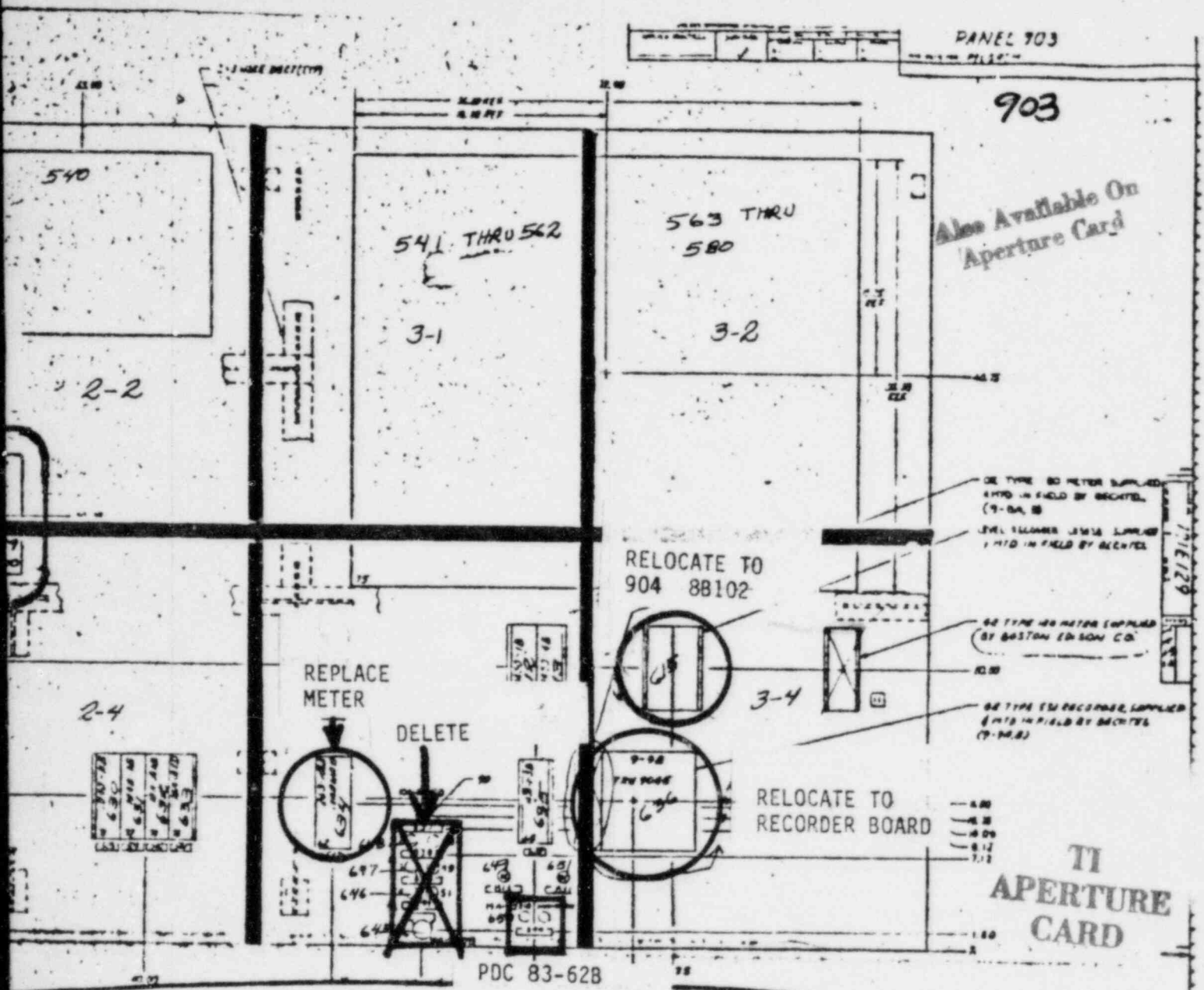
124

DELETE
5B124

REVERSE
5B103

RELOCATE
VIA





6409280249-07

903(1-1)

CAN-...
570

GENERAL ARMY			
A	AUTO BLURST PUMP FAILURE	SWP PUMP A AUTO START	SWP A LOGIC OR SWP PUMP FAILURE
	SWP A RELAY WIRE LOGIC	SWP PUMP B AUTO START	SWP A CORE SPRAY INJECTION
	SWP B WATER DELIVER LEAK	SWP PUMP A TEMP OR SWP	SWP DRYWELL PRESS CSCS INITIATION
B	SWP B TEMP SWP	SWP PUMP C TEMP SWP	SWP DISCHARGE OR WATER COOLING SUCTION HIGH PRESS
	AUTO DISCHARGE SWP DRYWELL PRESS THERM SEALER IN	SWP PUMP A OVERLOAD	SWP SW A OR B OUTLET SWP WATER TEMPERATURE
	AUTO BLURST PERSISITIVE SWP / CORE SPRAY PUMP FAILURE	SWP PUMP Q OVERLOAD	CORE SPRAY PUMP A AUTO START
C	SWP A SWP	SWP LOOP B SWP DRYWELL PRESS SWP FAILURE	SWP SHUTDOWN COOLING WATER HIGH RE PRESS CHANNEL A
	SWP A REACTOR VENT SWP	SWP IN-PORT SWP	SWP SHUTDOWN COOLING WATER HIGH RE PRESS CHANNEL B
	SWP COMMAND SWP A REACTOR VENT SWP	COMMAND SWP SELECTOR B-MANUAL SWP	REACTOR LO LO LEVEL CSCS INITIATION

REPLACE WITH METERS AND RELOCATE RECORDER TO RECORDER BOARD

903-1-1

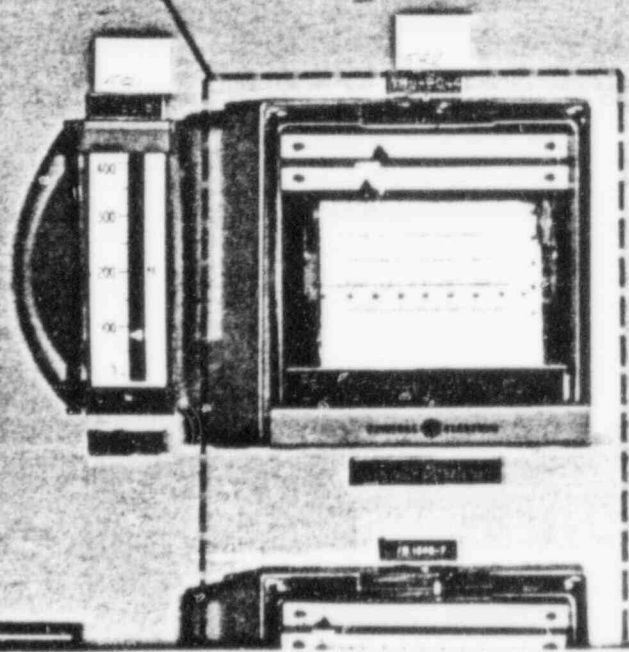
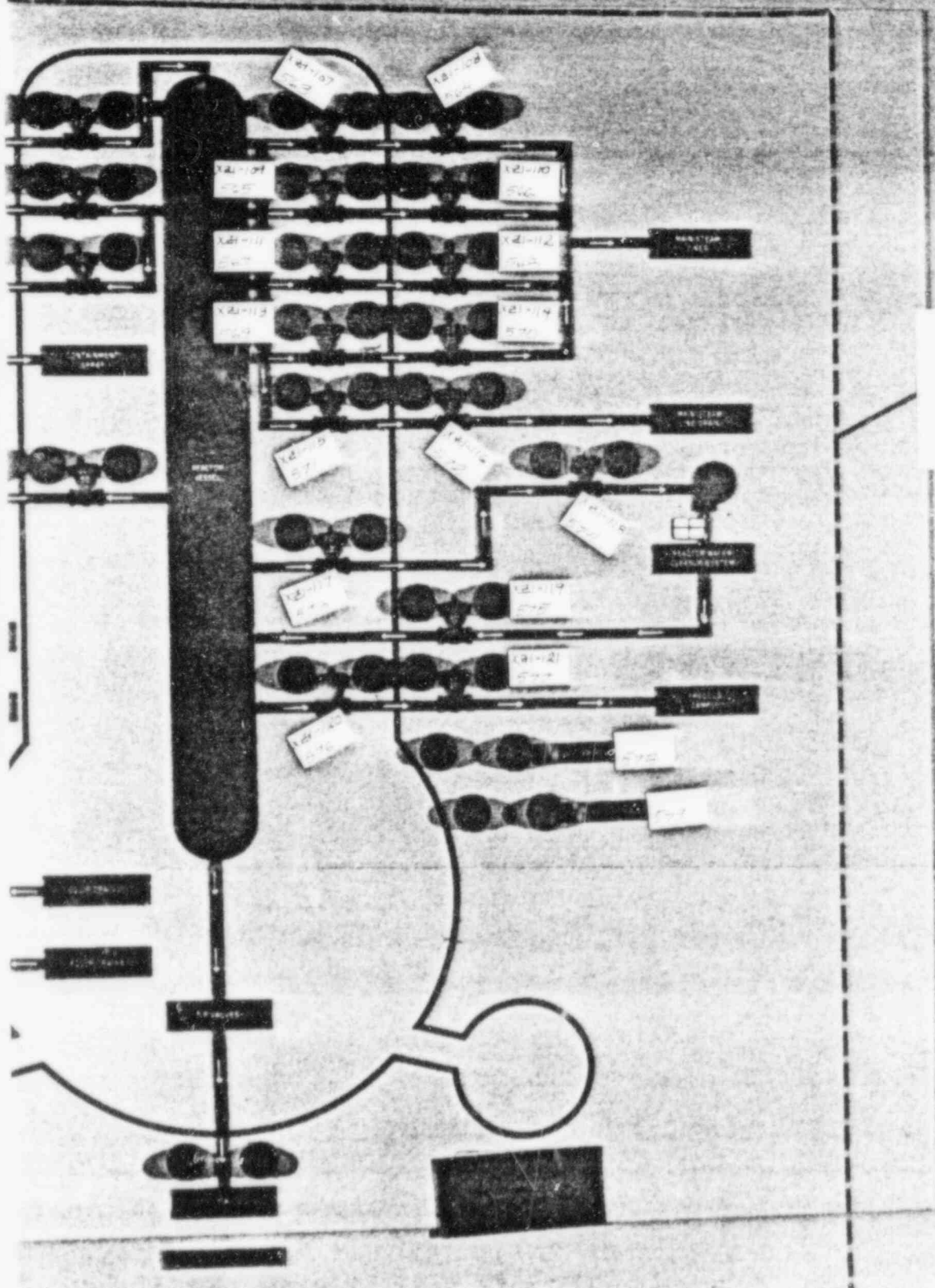


FIGURE 3-35. DRYWELL RECORDER

903(3-2)



INTEGRATE INTO ARRANGEMENT WITH EQUIPMENT FROM C-7 CONTAINMENT PURGE AND TEST

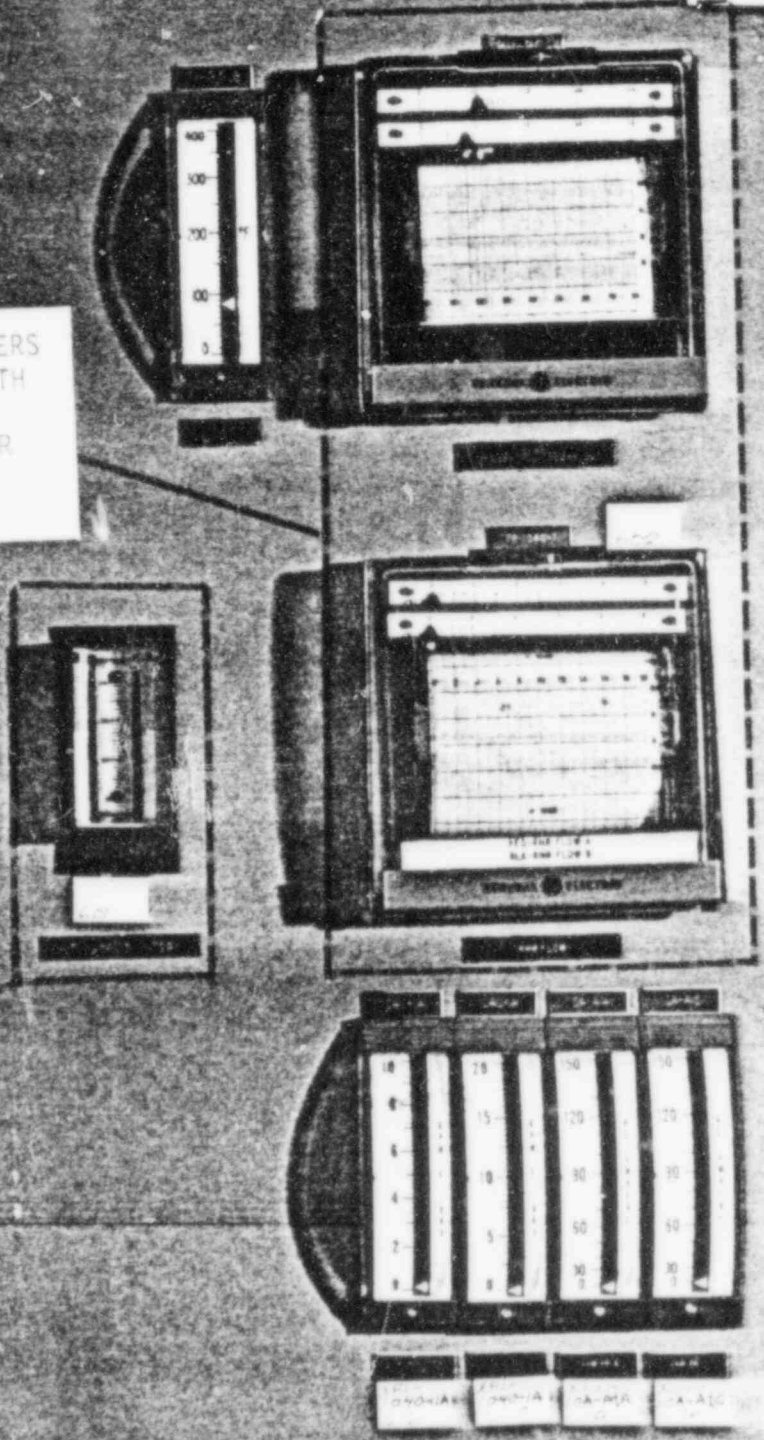


FIGURE 3-37. CONTAINMENT ISOLATION

903(1-3)

REPLACE WITH METERS
AND INTEGRATE WITH
RHR A AND RHR B
RELOCATE RECORDER
TO RECORDER
BOARD

REPLACE WITH
NEW METER



903-1-3

FIGURE 3-38.
RHR RECORDERS AND TORUS
TEMPERATURE INDICATION

903(1-4)

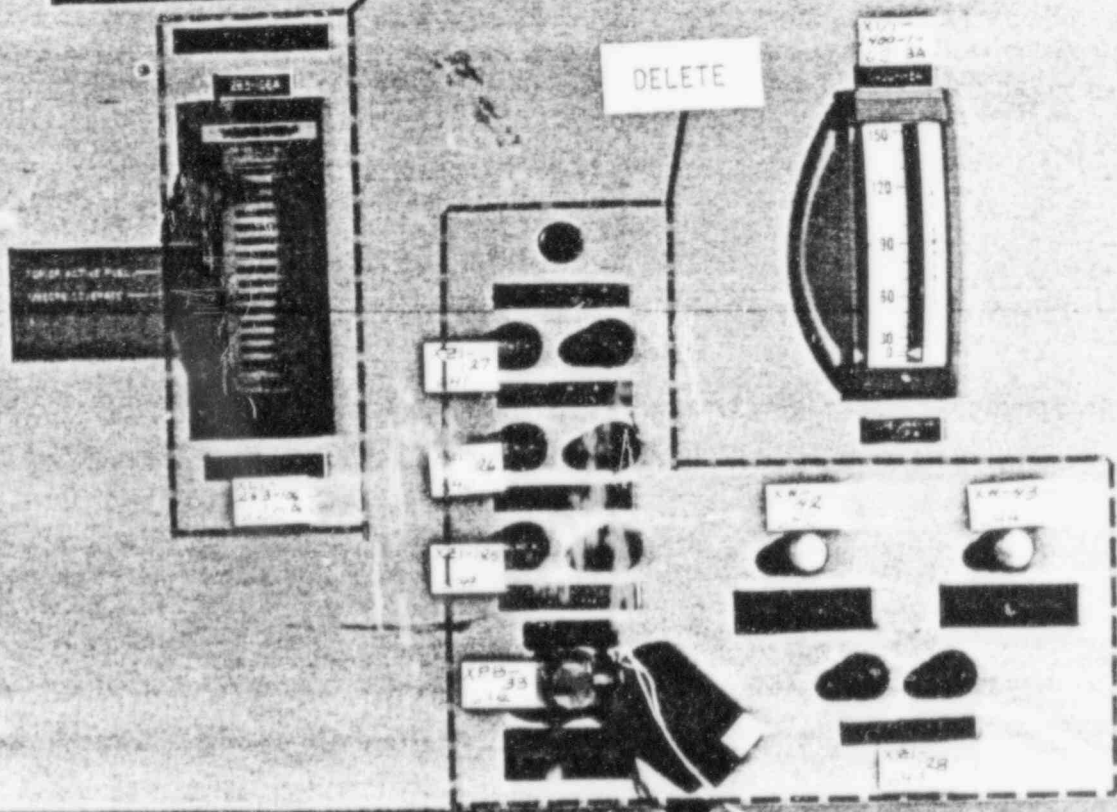
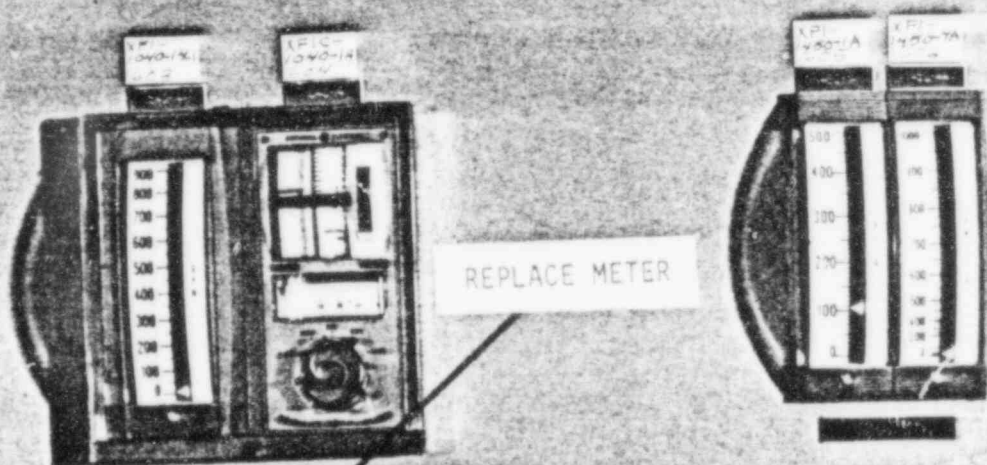
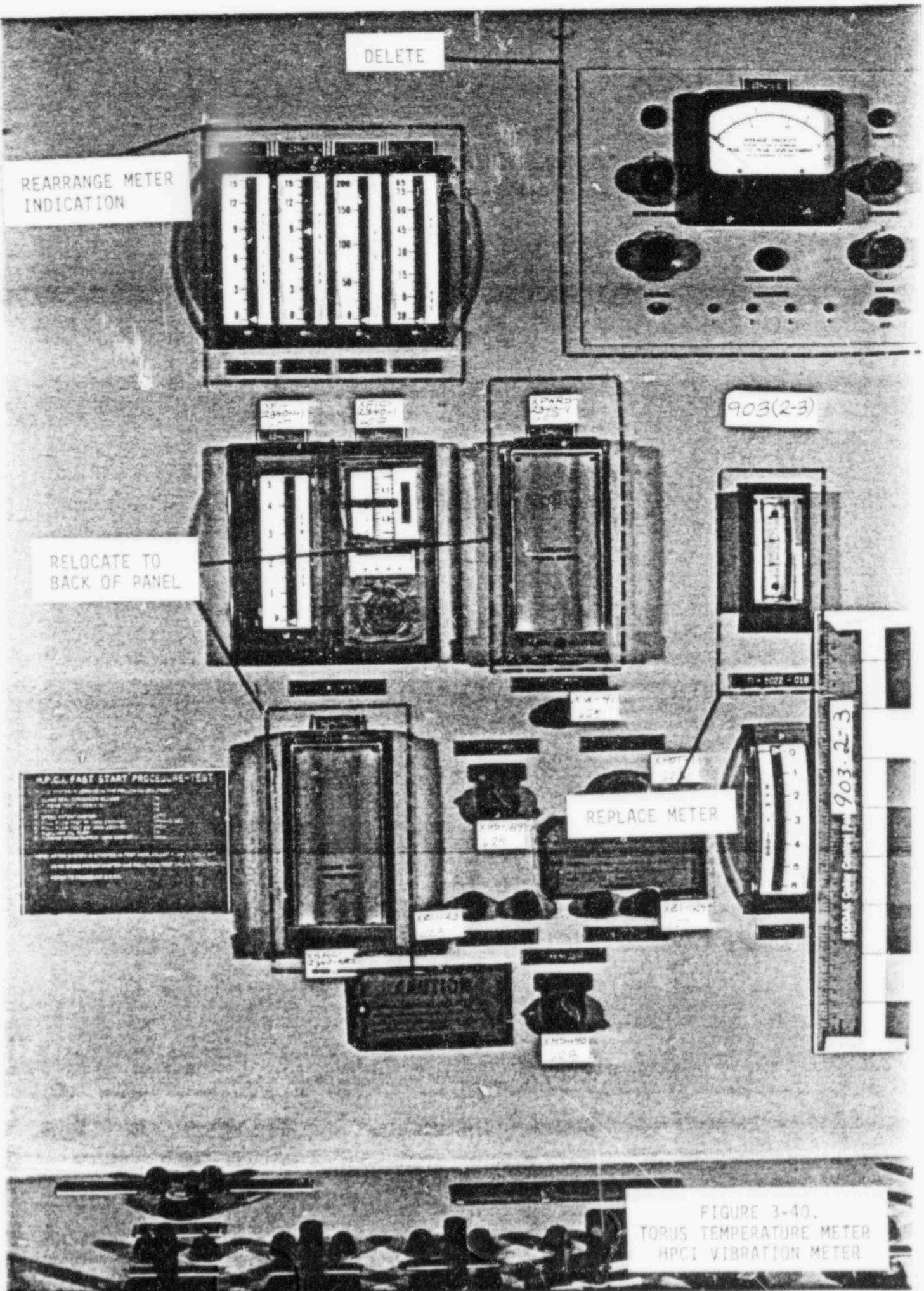
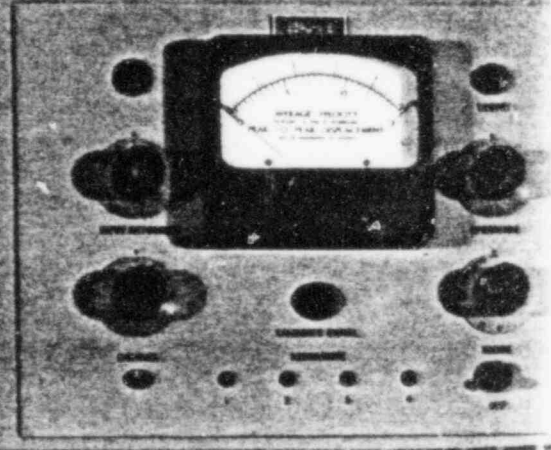


FIGURE 3-39.
TORUS TEMPERATURE METER



DELETE

REARRANGE METER INDICATION



903(2-3)

RELOCATE TO BACK OF PANEL

REPLACE METER

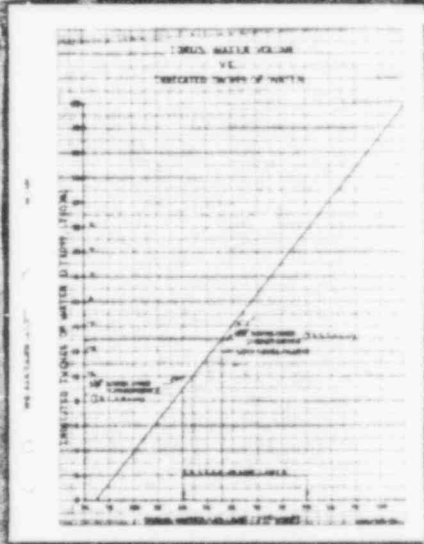
HPCI FAST START PROCEDURE-TEST
 1. Verify engine oil pressure is above 100 PSI.
 2. Verify engine temperature is below 100 degrees F.
 3. Verify engine vibration is below 0.5 G.
 4. Verify engine speed is above 1000 RPM.
 5. Verify engine fuel flow is above 100 GPH.
 6. Verify engine oil pressure is above 100 PSI.
 7. Verify engine temperature is below 100 degrees F.
 8. Verify engine vibration is below 0.5 G.
 9. Verify engine speed is above 1000 RPM.
 10. Verify engine fuel flow is above 100 GPH.

903-2-3
 HPCI Fast Start Panel

FIGURE 3-40.
 TORUS TEMPERATURE METER
 HPCI VIBRATION METER

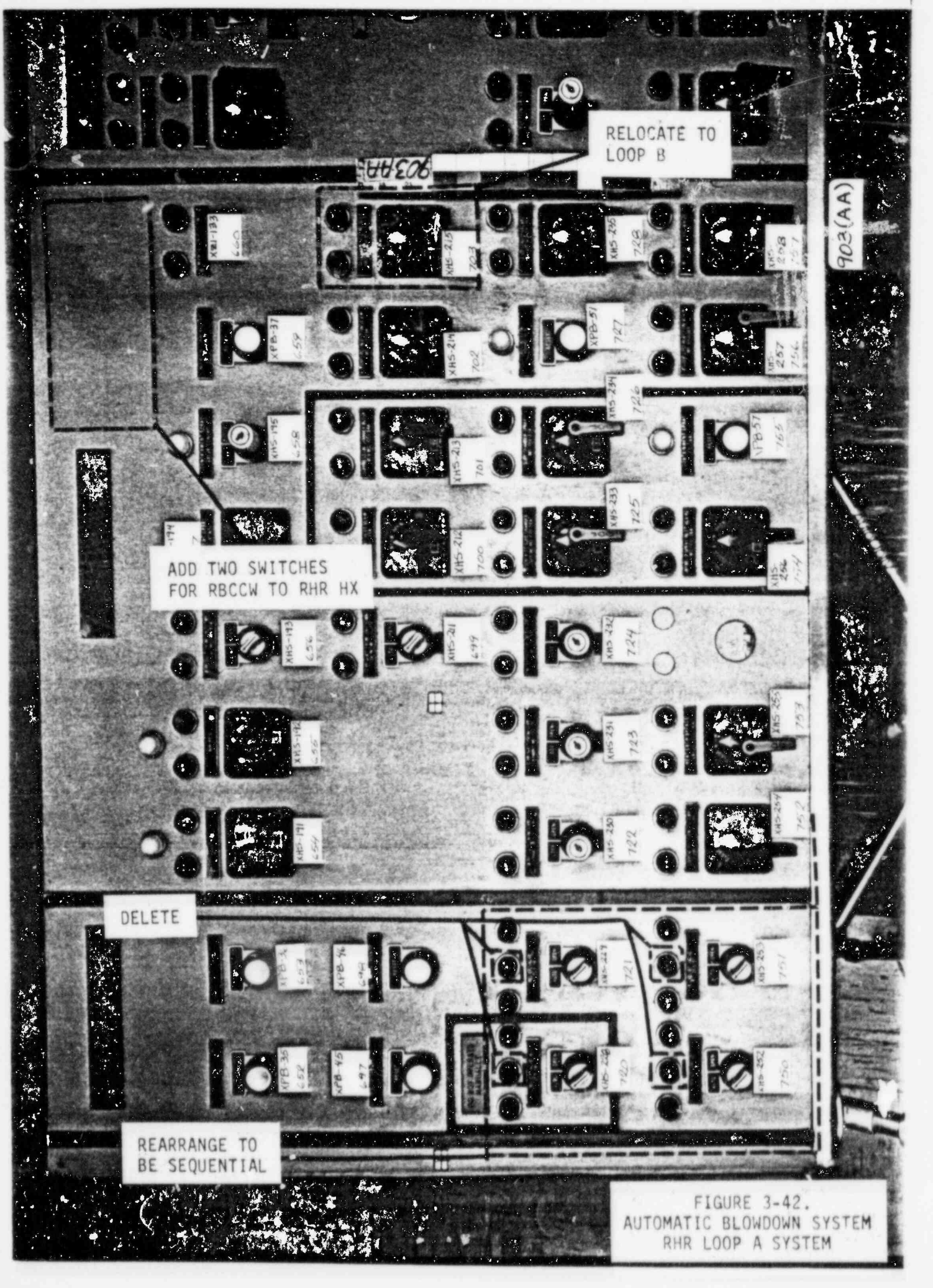
REPLACE WITH
METERS AND
RELOCATE
RECORDER
TO RECORDER
BOARD

903(3-4)



903-3-4

FIGURE 3-41,
TORUS RECORDERS



RELOCATE TO LOOP B

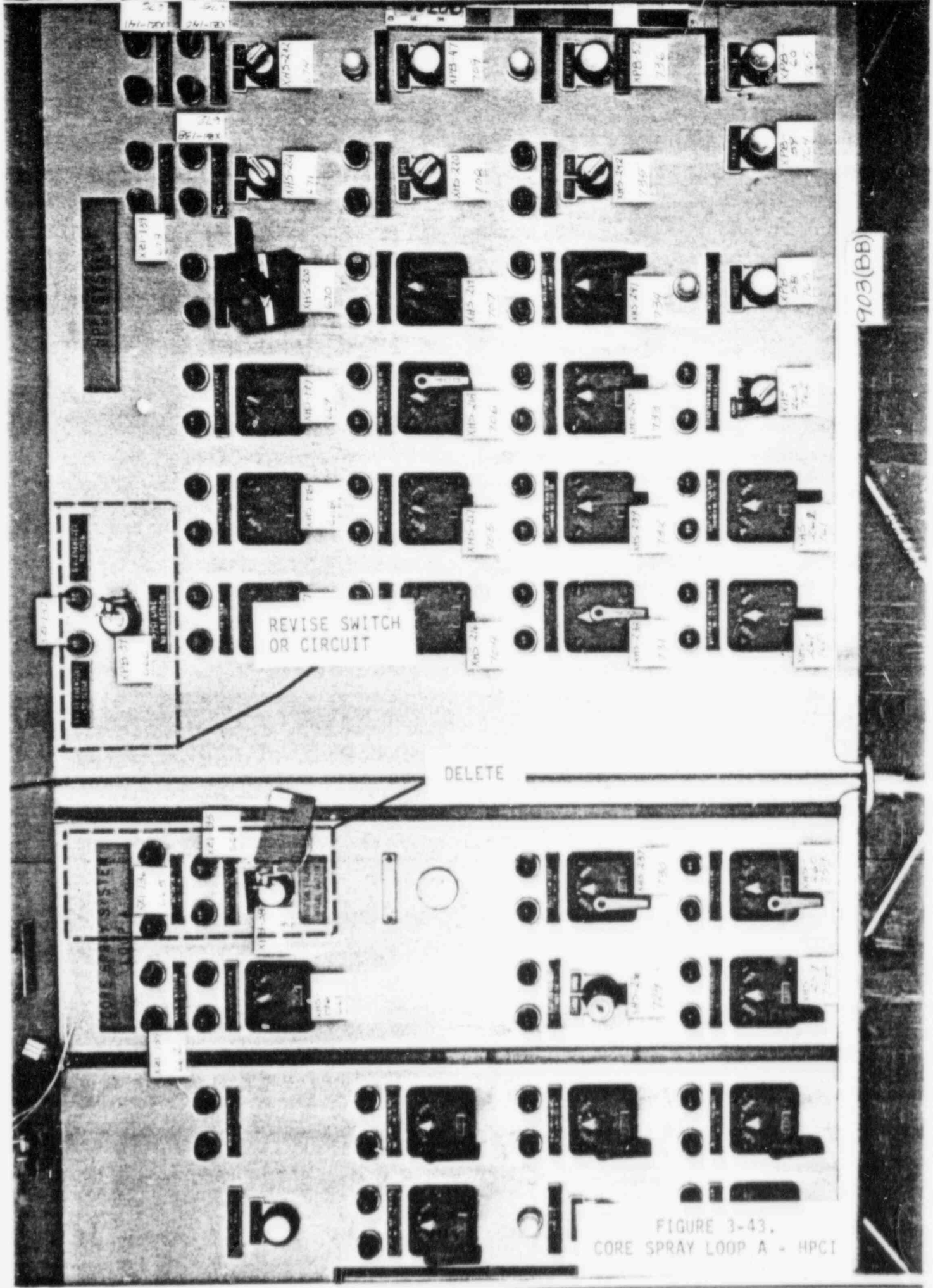
903(AA)

ADD TWO SWITCHES FOR RBCCW TO RHR HX

DELETE

REARRANGE TO BE SEQUENTIAL

FIGURE 3-42. AUTOMATIC BLOWDOWN SYSTEM RHR LOOP A SYSTEM



741-124
741-124

AFB-242
709

AFB-97
709

AFB-50
709

AFB-60
709

741-124
741-124

AFB-242
709

AFB-240
709

AFB-474
709

AFB-59
709

AFB-121
709

AFB-220
709

AFB-217
709

AFB-291
709

AFB-58
709

AFB-171
709

AFB-436
709

AFB-250
709

AFB-243
709

AFB-120
709

AFB-211
709

AFB-237
709

AFB-247
709

REVISE SWITCH
OR CIRCUIT

AFB-216
709

AFB-434
709

AFB-247
709

DELETE

SYSTEM
CONTROL

AFB-120
709

AFB-120
709

AFB-435
709

AFB-247
709

AFB-120
709

AFB-246
709

AFB-247
709

AFB-120
709

AFB-120
709

AFB-120
709

AFB-120
709

AFB-120
709

AFB-120
709

AFB-120
709

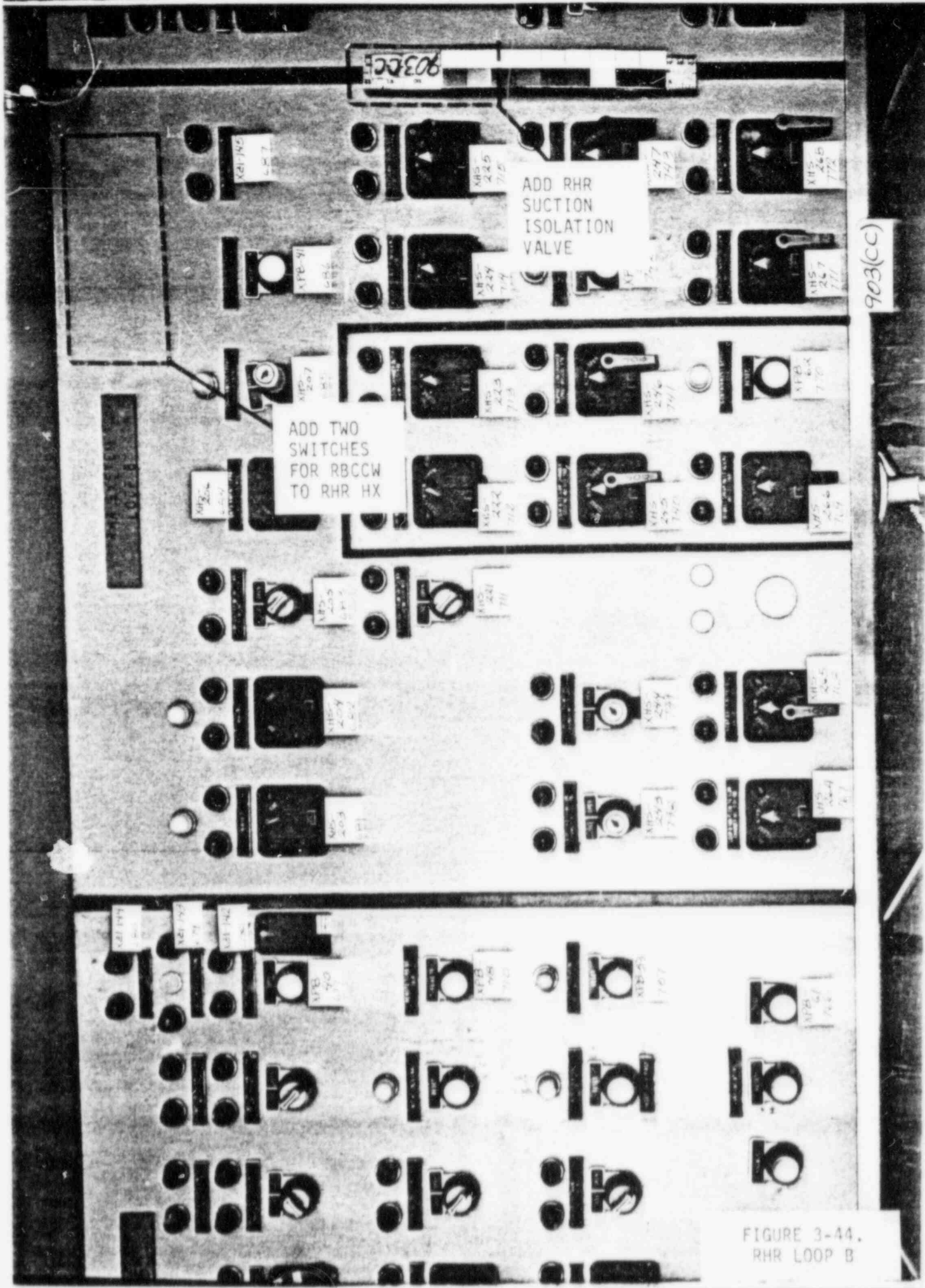
AFB-120
709

AFB-120
709

AFB-120
709

903(BB)

FIGURE 3-43.
CORE SPRAY LOOP A - HPCI



903(CC)

VFB-1
437

VMS-245
715

ADD RHR
SUCTION
ISOLATION
VALVE

VMS-246
712

VFB-2
436

VMS-247
714

VMS-247
711

903(CC)

VFB-3
207

VMS-223
713

VMS-248
717

VFB-4
710

ADD TWO
SWITCHES
FOR RBCCW
TO RHR HX

VMS-249
716

VMS-244
718

VMS-245
712

VMS-250
719

VMS-253
714

VMS-241
711

VMS-254
715

VMS-257
717

VMS-255
712

VMS-255
716

VMS-258
718

VMS-259
719

VFB-5
710

VFB-6
711

VFB-7
712

VFB-8
713

VFB-9
714

VFB-10
715

VFB-11
716

FIGURE 3-44.
RHR LOOP B

903DD

903DD

903(DD)

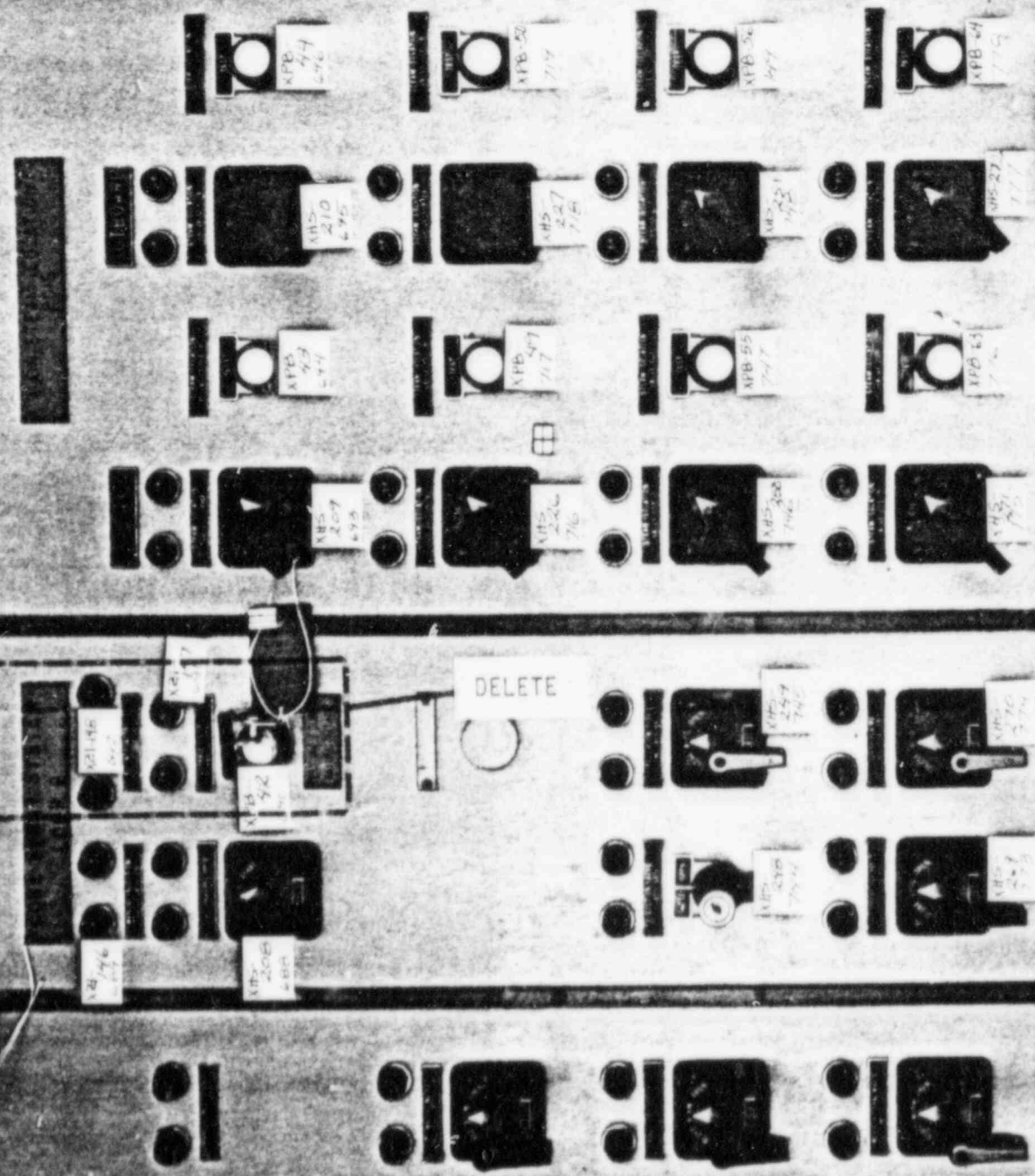


FIGURE 3-45.
CORE SPRAY LOOP B
MAIN STEAM ISOLATION

904

Also Available On Aperture Card

IF IT IS MOV, USE SBM
IF AOV OR SOLENOID, USE PT

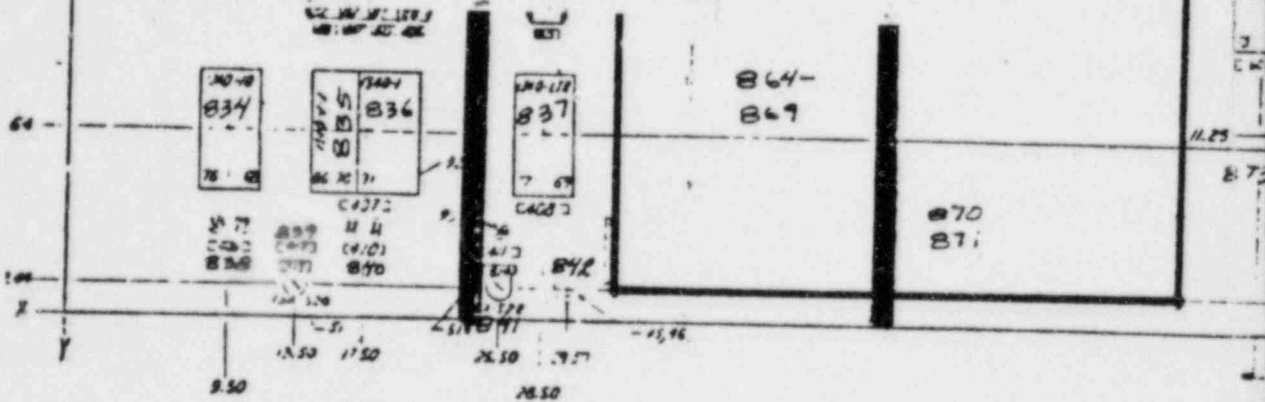
ADD METERS:

- 1) DW PRESS PI-9046 FROM 903 8B102 614
- 2) SUPP POOL TEMP TI-5047 1B001 1427
- 3) DW COOLER TEMP 1B001 1361
- 4) DW COOLER TEMP 1B001 1358
- 5) SUPPRESSION POOL TEMP TI-504B 1B001 1428
- 6) SP LEVEL LI-5049 SFTA 1429
- 7) N₂ PRESS
- 8) N₂ FLOW
- 9) SP PRESS

-2 783 THRU 798 THRU 2-1

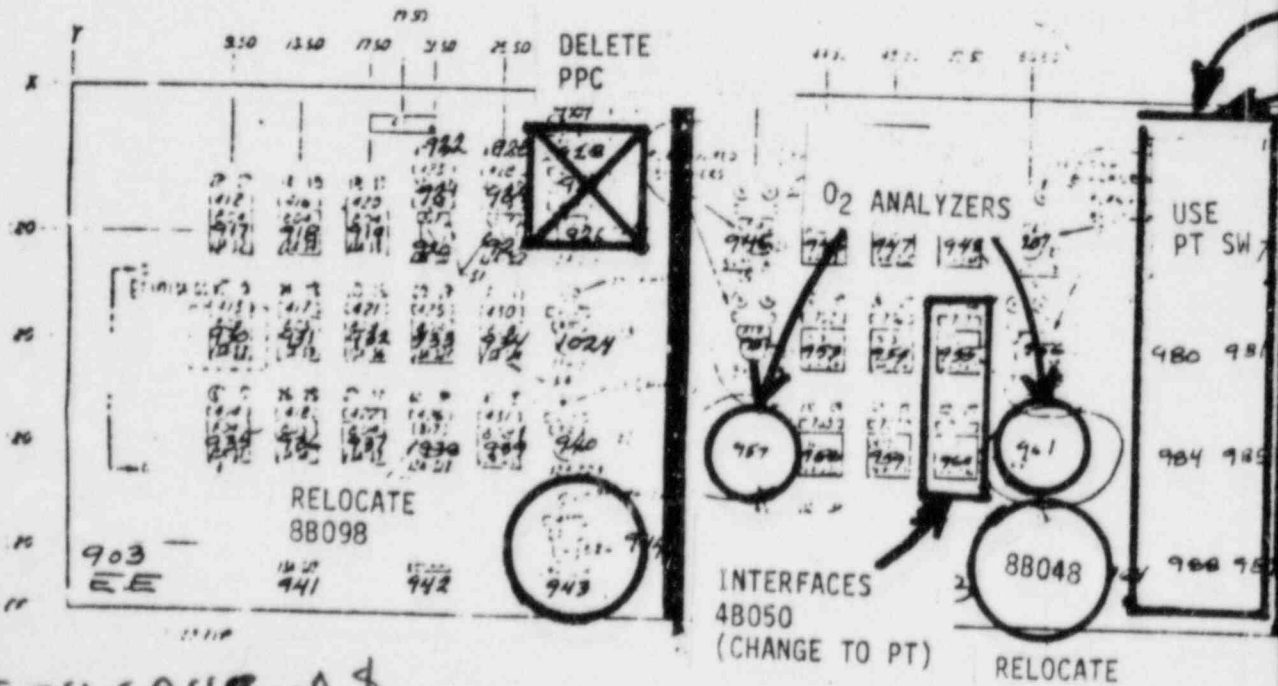
PROPOSE DRAWING ALL OF THIS, REARRANGE LIGHTS SPACE & DEMARCATION 2-3

REARRANGE LIGHTS



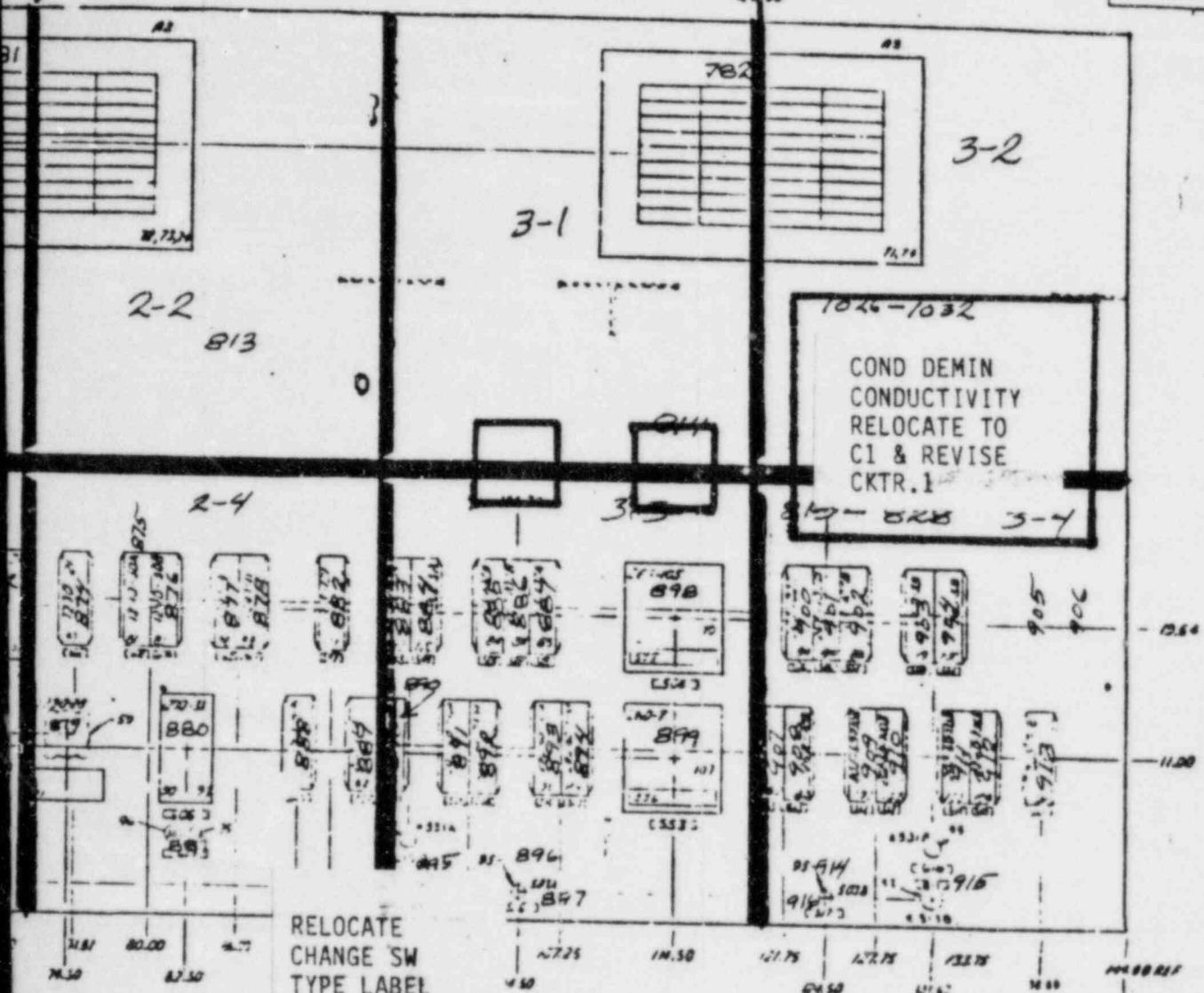
VIEW A 100 3-1

RELOC



8409280249-08

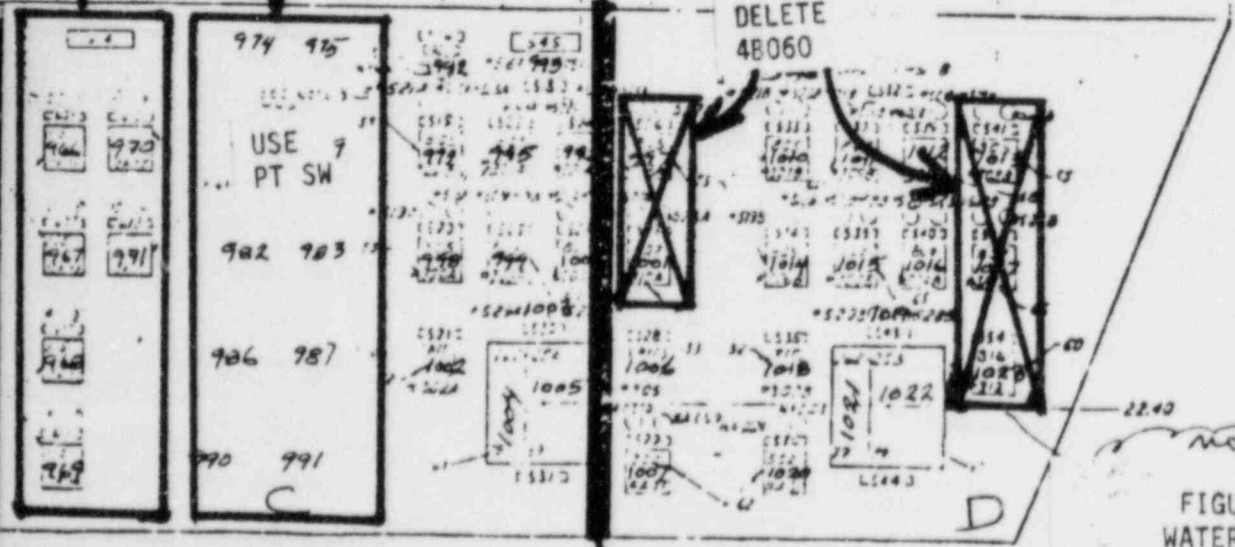
904



RELOCATE
 CHANGE SW
 TYPE LABEL
 UNKNOWN
 8B098

TI
 APERTURE
 CARD

DELETE
 48060



NOV 27
 DISTRICT
 RECEIVED
 ACCY: JCR
 SAN FRANCISCO

FIGURE 3-46.
 WATER CLEANUP
 FRONT PANEL LAYOUT

904(2-1)

XAW-20

REACTOR WATER CLEANUP
REACTOR WASHDOWN

A	CLEAR UP 40-TEMPERATURE MONITORING/ALARM	CLEARUP AREA HIGH TEMP MONITORING FLOW FAIL/ISS	REACTOR PUMP A DEAL LEAKAGE HIGH FLOW
	CLEAR UP CLEANUP/ALARM	CLEARUP LINE/STATUS AN-REACTOR FLUID	REACTOR PUMP A DEAL SET A LOW FLOW LOW PRESS
	REACTOR PUMP NO FLOW MONITOR	REACTOR PUMP A DEAL SET A MONITORING STATUS HIGH TEMP	REACTOR PUMP A DEAL SET A FLOW MONITOR LOW FLOW TEMP
B	CLEARUP PUMP MONITOR TEMP HIGH	REACTOR PUMP A DEAL SET A OR B MONITOR STATUS HIGH TEMP	REACTOR PUMP A DEAL SET A FLOW MONITOR HIGH TEMP
	NOISE MONITOR	REACTOR PUMP A DEAL SET A OR B FLUID MONITOR HIGH TEMP TRIP	REACTOR PUMP A DEAL SET A MONITORING
	CLEAR UP PUMP MONITORING FLUID	CLEARUP SYSTEM IN TEST STATUS	REACTOR PUMP A DEAL SET A MONITORING LEVEL
C	FILTER MONITORING ALERT IN TEMPERATURE	REACTOR PUMP A DEAL SET A SPEED CONTROL MONITOR FAIL/ISS	REACTOR PUMP A DEAL SET A FLOW MONITOR HIGH TEMP
	NOISE FLAME DEAL LEAKAGE	REACTOR PUMP A DEAL SET A MONITORING STARTUP MONITORING	REACTOR PUMP A DEAL SET A FLOW MONITOR HIGH TEMP
	STOP LEAKAGE DEAL MONITORING	REACTOR PUMP A DEAL SET A FLOW MONITOR LOW	REACTOR PUMP A DEAL SET A FLOW MONITOR HIGH TEMP

INTEGRATE INTO
ARRANGEMENT WITH
EQUIPMENT ON STANDBY
GAS TREATMENT PANEL

	X21-164 700	X21-165 700	X21-166 700
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE
	X21-167 800	X21-168 800	X21-169 800
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE
	X21-170 900	X21-171 900	X21-172 900
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE
	X21-173 900	X21-174 900	X21-175 900
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE
	X21-176 910	X21-177 910	X21-178 910
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE
	X21-179 910	X21-180 910	X21-181 910
	NO 1 REACTOR WATER CLEANUP VALVE	NO 2 REACTOR WATER CLEANUP VALVE	NO 3 REACTOR WATER CLEANUP VALVE

180-11

FIGURE 3-48.
ANALYZING SYSTEMS AND
STANDBY GAS TREATMENT

904(2-2)

THE HEALTHY WATER TREATMENT
100% BENCH MARK

CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP
CONDENSATE TEMP. MONITORING HIGH FAILSAFE	RECORD PUMP & NEAL LEAKAGE HIGH FLOW	RECORD PUMP & LEAKAGE MONITORING TEMP

REPLACE RECORDER
AND RELOCATE TO
PANEL C-1, FEEDWATER
AND CONDENSATE

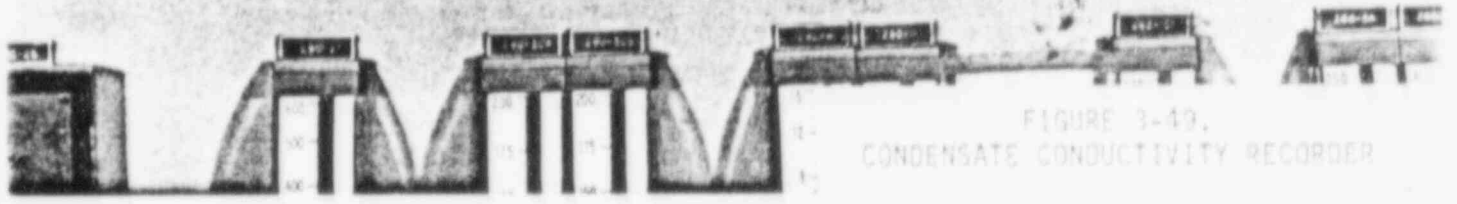
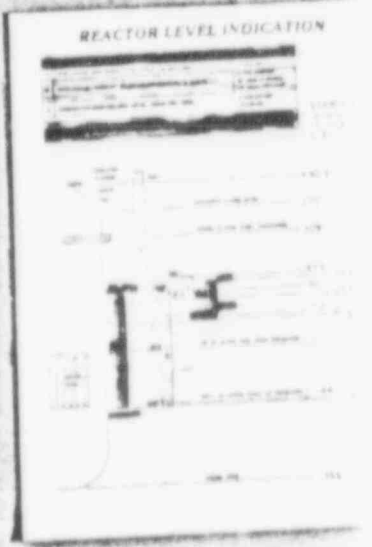
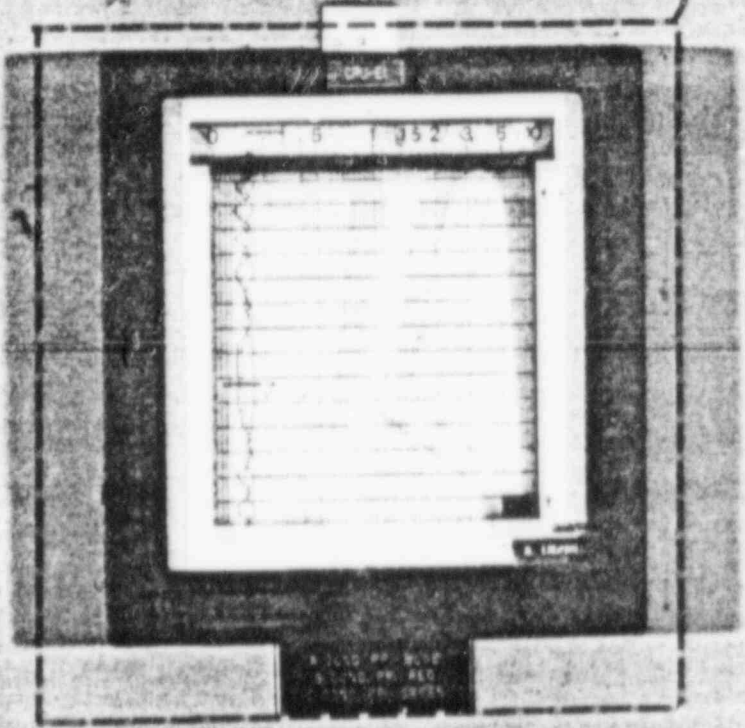


FIGURE 3-49.
CONDENSATE CONDUCTIVITY RECORDER

904(3-1)

1A1-2

904-3

RECORD NO. 2774 SPEED CONTROL RECORD 740 001	RECORD NO. 2775 RECORD 274 001	RECORD NO. 2776 RECORD 274 001
RECORD NO. 2777 RECORD 274 001	RECORD NO. 2778 RECORD 274 001	RECORD NO. 2779 RECORD 274 001
RECORD NO. 2780 RECORD 274 001	RECORD NO. 2781 RECORD 274 001	RECORD NO. 2782 RECORD 274 001
RECORD NO. 2783 RECORD 274 001	RECORD NO. 2784 RECORD 274 001	RECORD NO. 2785 RECORD 274 001
RECORD NO. 2786 RECORD 274 001	RECORD NO. 2787 RECORD 274 001	RECORD NO. 2788 RECORD 274 001
RECORD NO. 2789 RECORD 274 001	RECORD NO. 2790 RECORD 274 001	RECORD NO. 2791 RECORD 274 001
RECORD NO. 2792 RECORD 274 001	RECORD NO. 2793 RECORD 274 001	RECORD NO. 2794 RECORD 274 001
RECORD NO. 2795 RECORD 274 001	RECORD NO. 2796 RECORD 274 001	RECORD NO. 2797 RECORD 274 001
RECORD NO. 2798 RECORD 274 001	RECORD NO. 2799 RECORD 274 001	RECORD NO. 2800 RECORD 274 001

REPLACE RECORDER WITH METERS
RELOCATE RECORDER TO RECORDER BOARD

LEVEL INDICATION

100
50
0
-50
-100

RECORD NO. 2774

RECORD NO. 2775

RECORD NO. 2776

RECORD NO. 2777

RECORD NO. 2778

RECORD NO. 2779

RECORD NO. 2780

RECORD NO. 2781

RECORD NO. 2782

RECORD NO. 2783

RECORD NO. 2784

RECORD NO. 2785

RECORD NO. 2786

RECORD NO. 2787

RECORD NO. 2788

RECORD NO. 2789

RECORD NO. 2790

RECORD NO. 2791

RECORD NO. 2792

RECORD NO. 2793

RECORD NO. 2794

RECORD NO. 2795

RECORD NO. 2796

RECORD NO. 2797

RECORD NO. 2798

RECORD NO. 2799

RECORD NO. 2800

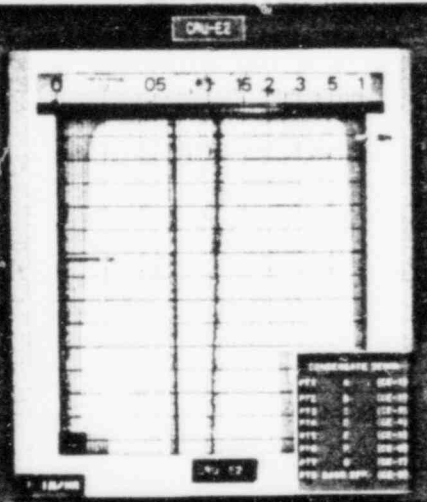
FIGURE 3-50. RECORDERS

904(3-2)

USE DIFFERENT
RECORDER TYPE
REDESIGN CIRCUITRY
RELOCATE TO PANEL C-1,
FEEDWATER AND CONDENSATE

CONDENSATE DEMIN. IN SERVICE

XW-58 724
XW-59 1027
XW-60 028
XW-61 020
XW-62 030
XW-63 031
XW-64 1090



XW-46 025
XW-47 016
XW-48 017
XW-49 020
XW-50 019
XW-51 020
XW-52 020
XHS-273 020
XHS-274 020
XHS-275 020
XHS-276 020
XHS-277 020
XHS-278 020
XHS-279 020

FIGURE 3-51.
CONDENSATE DEMINERALIZER
CONDUCTIVITY RECORDER

904(1-3)

RELOCATE TO
BACK OF PANEL

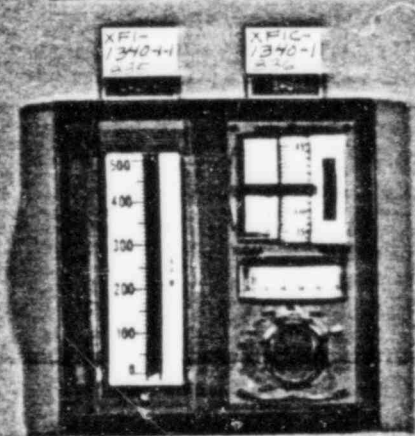
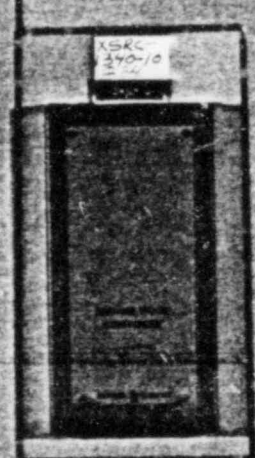
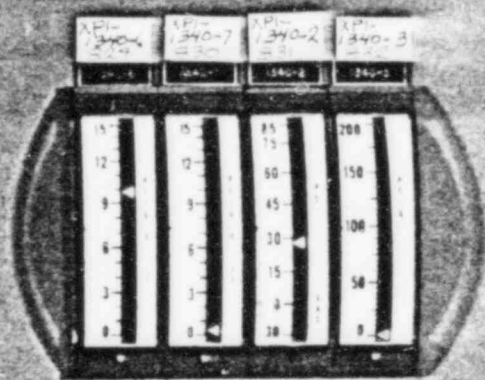


FIGURE 3-52.
SQUARE ROOT EXTRACTOR

904(1-4)

INCORPORATE INTO ARRANGEMENT WITH EQUIPMENT FROM C-7, CONTAINMENT PURGE AND TEST

RELOCATE TO BACK OF PANEL

XAFMI-232

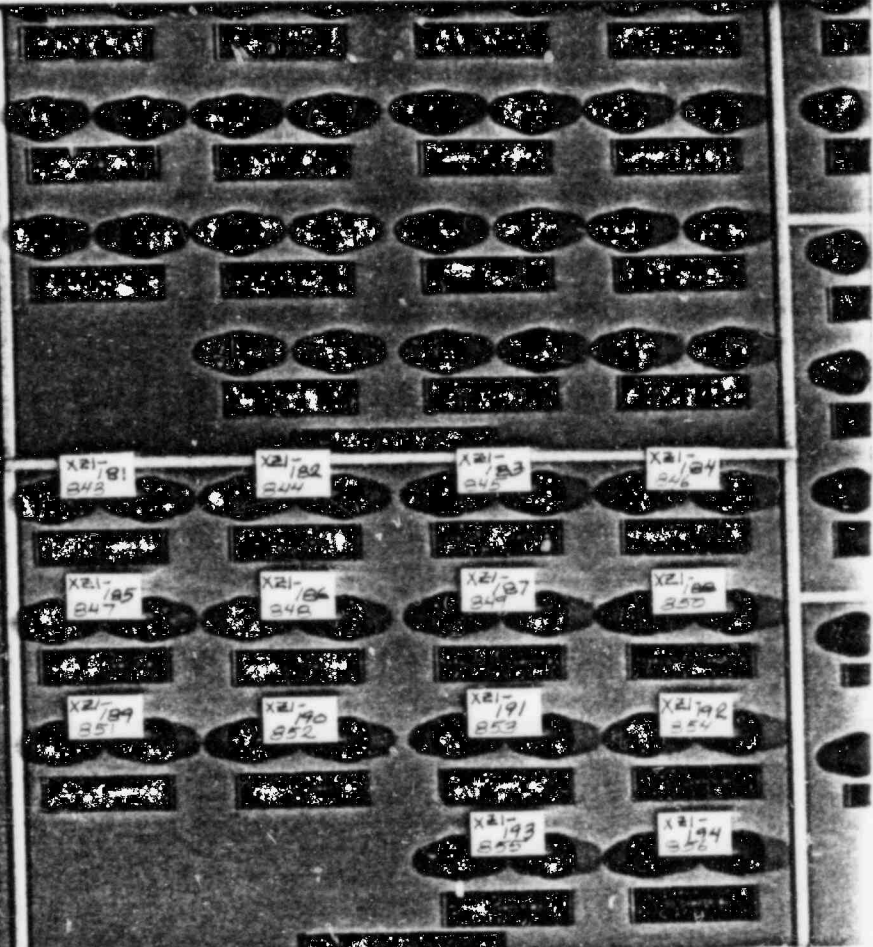


XPWR5-1340



XMS-281

XPT-2



XZ1-181

XZ1-182

XZ1-183

XZ1-184

XZ1-185

XZ1-186

XZ1-187

XZ1-188

XZ1-189

XZ1-190

XZ1-191

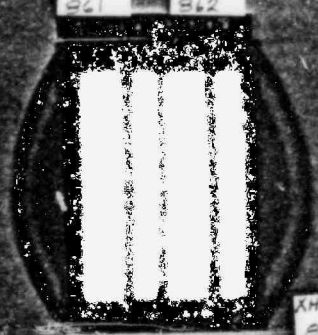
XZ1-192

XZ1-193

XZ1-194

261

262



XZ1-199

XZ1-200

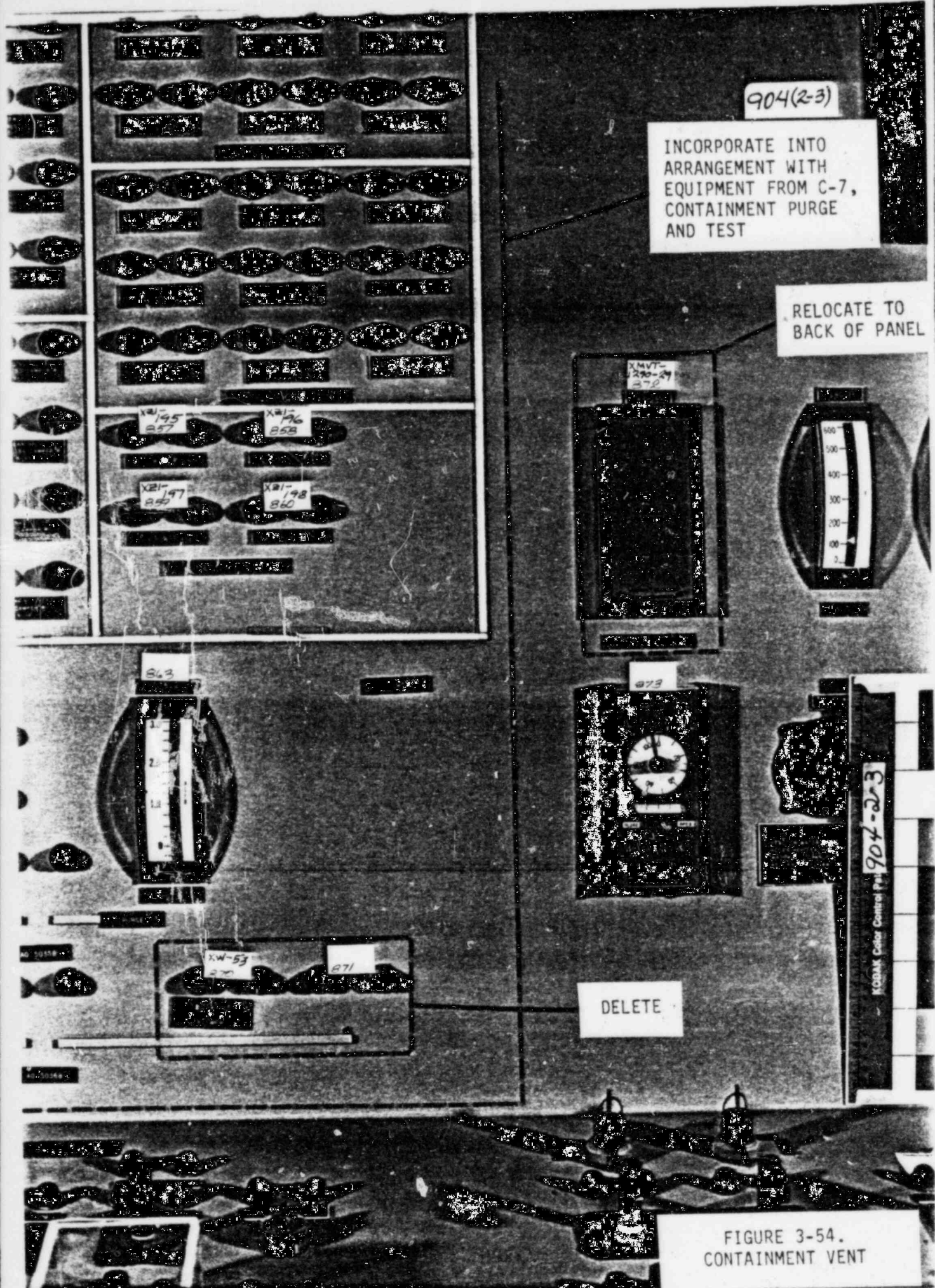
XMS-282

XZ1-201

XMS-283

XZ1-202

FIGURE 3-53. CONTAINMENT VENT



904(2-3)

INCORPORATE INTO
ARRANGEMENT WITH
EQUIPMENT FROM C-7,
CONTAINMENT PURGE
AND TEST

RELOCATE TO
BACK OF PANEL

XMVT-
290-29
272

XMVT-
195
257

XMVT-
196
258

XMVT-
197
259

XMVT-
198
260

263

273

KW-53

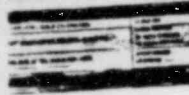
271

KODAK Color Control Panel
904-2r3

DELETE

FIGURE 3-54.
CONTAINMENT VENT

VECTOR LEVEL INDICATOR



APPROX. ELEV. IN INCHES REFERENCED TO TOP OF ACTIVE FUEL

KODAK Color Control Panel 904-3-3

REPLACE WITH METERS,
INTEGRATE INTO SYSTEMS,
RELOCATE RECORDERS
TO RECORDER BOARD

XDP1-260-3A
XFI-260-5A

XFI-263-102 265A
XFI-263-102 266B
XFI-263-157 267A

XTKS-263-105 270

RED - VESSEL SHELL
BLACK - VESSEL FLANGE

XVI-200 207A
XVI-200 208A

XVI-200 209A
XVI-200 210A

XVI-200 211A
XVM-200 212A

XFR-260-7 279

RED-RECIRC FLOW LOOP B
BLACK-RECIRC FLOW LOOP A

XPB-265 280

X3opt 286

XW-264 287

904(3-3)

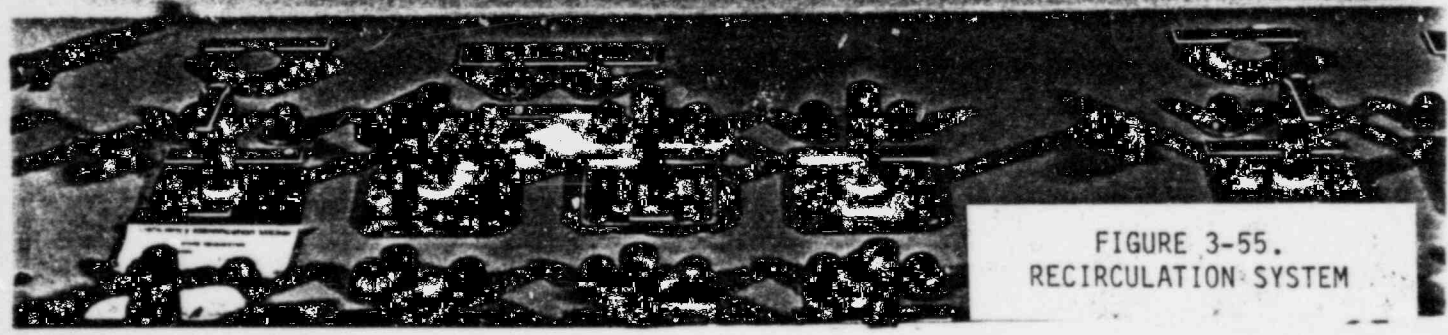


FIGURE 3-55.
RECIRCULATION SYSTEM

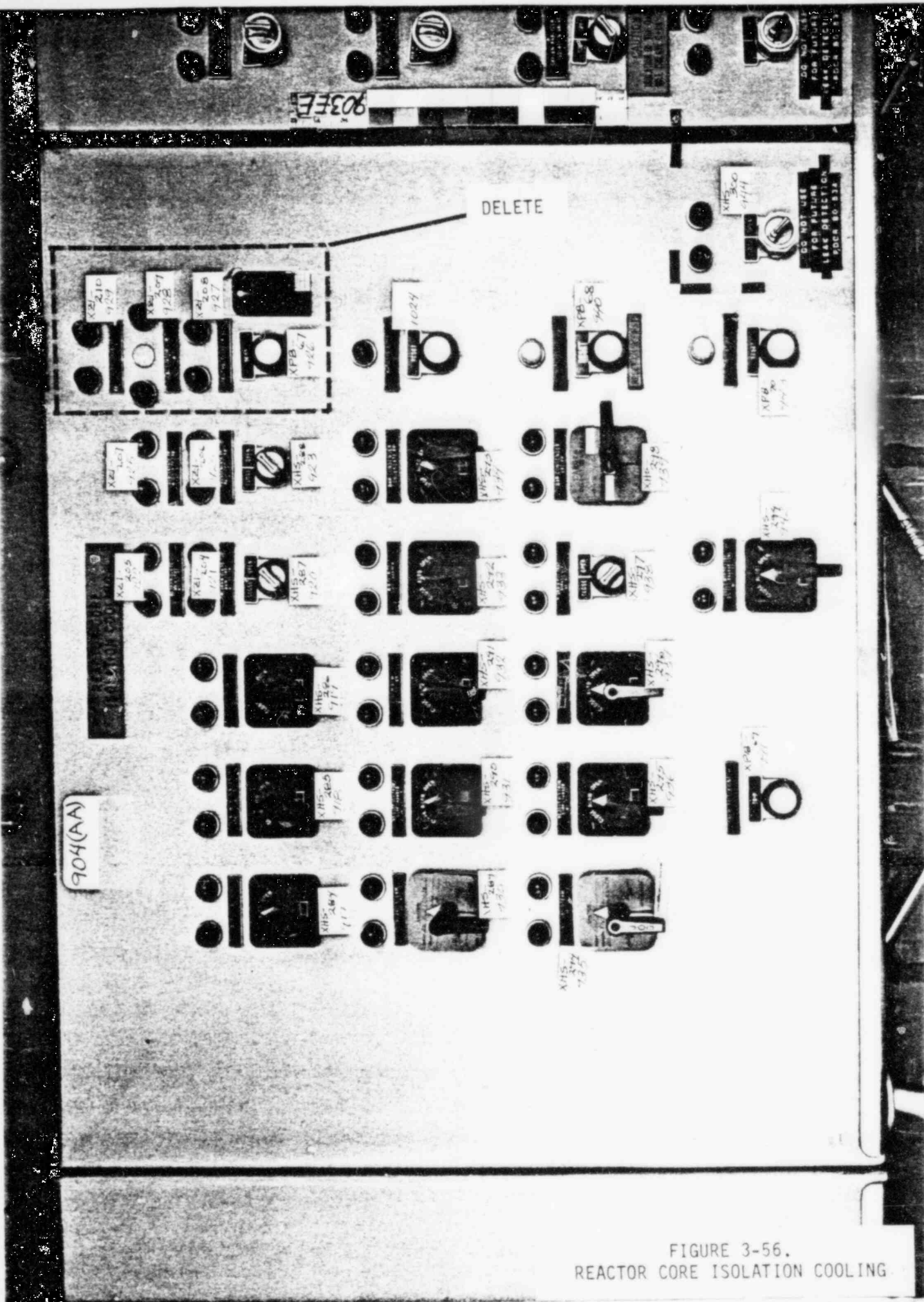
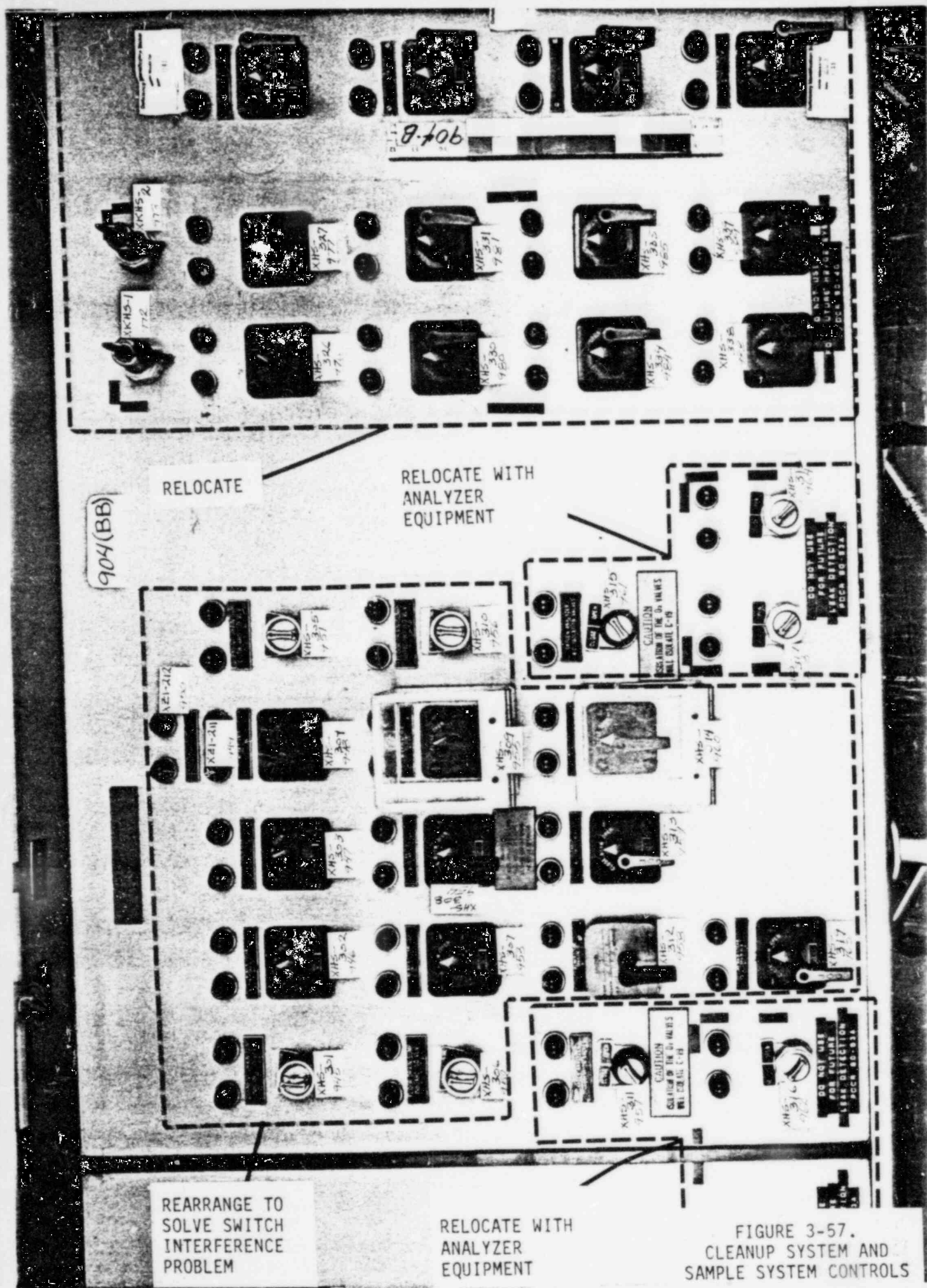


FIGURE 3-56.
REACTOR CORE ISOLATION COOLING.



904(BB)

RELOCATE

RELOCATE WITH ANALYZER EQUIPMENT

REARRANGE TO SOLVE SWITCH INTERFERENCE PROBLEM

RELOCATE WITH ANALYZER EQUIPMENT

FIGURE 3-57. CLEANUP SYSTEM AND SAMPLE SYSTEM CONTROLS

904-D

DELETE

904(DD)

1001
1002
1003
1004
1005
1006
1007
1008
1009
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1013
1014
1015
1016
1017
1018
1019
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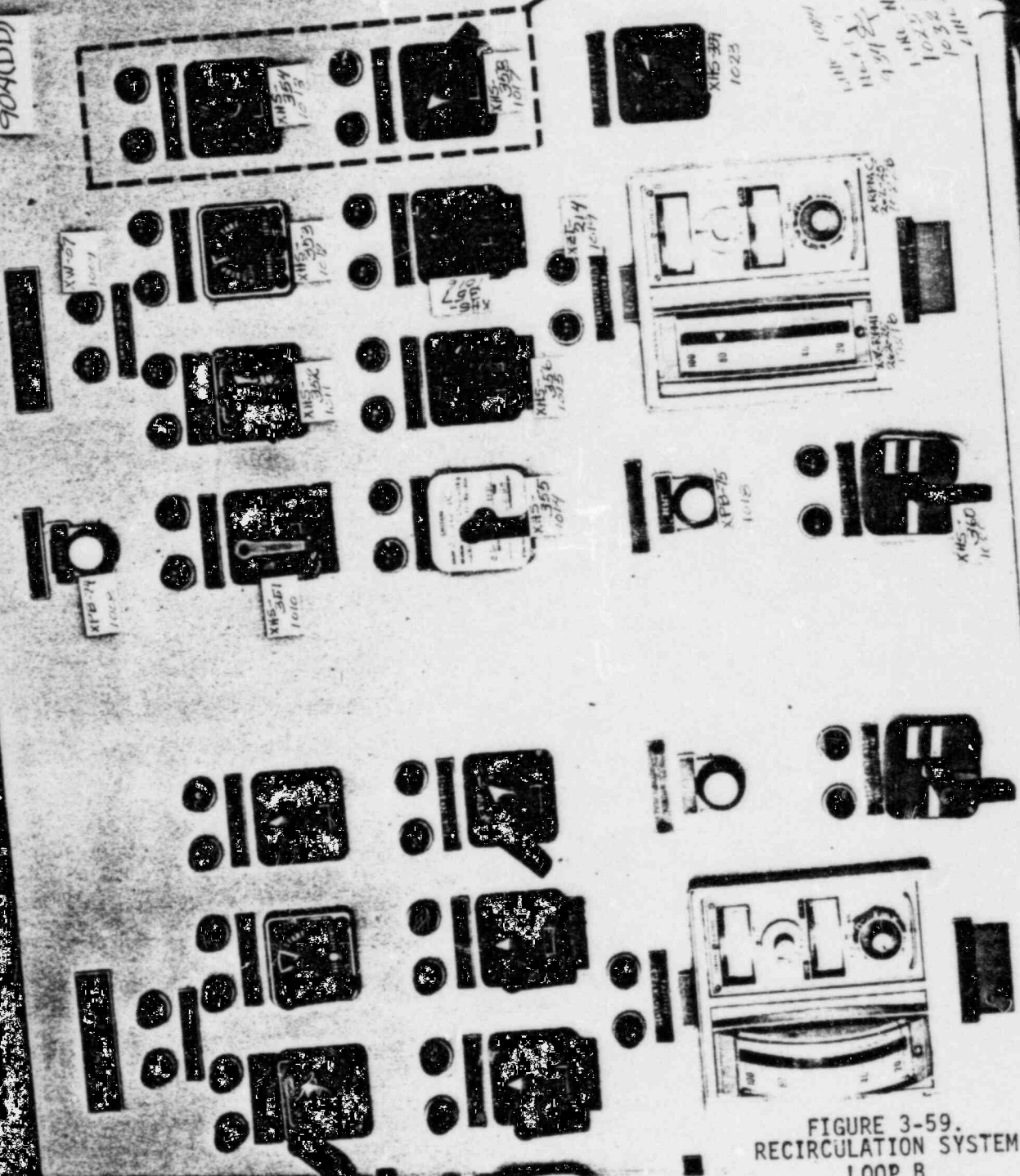
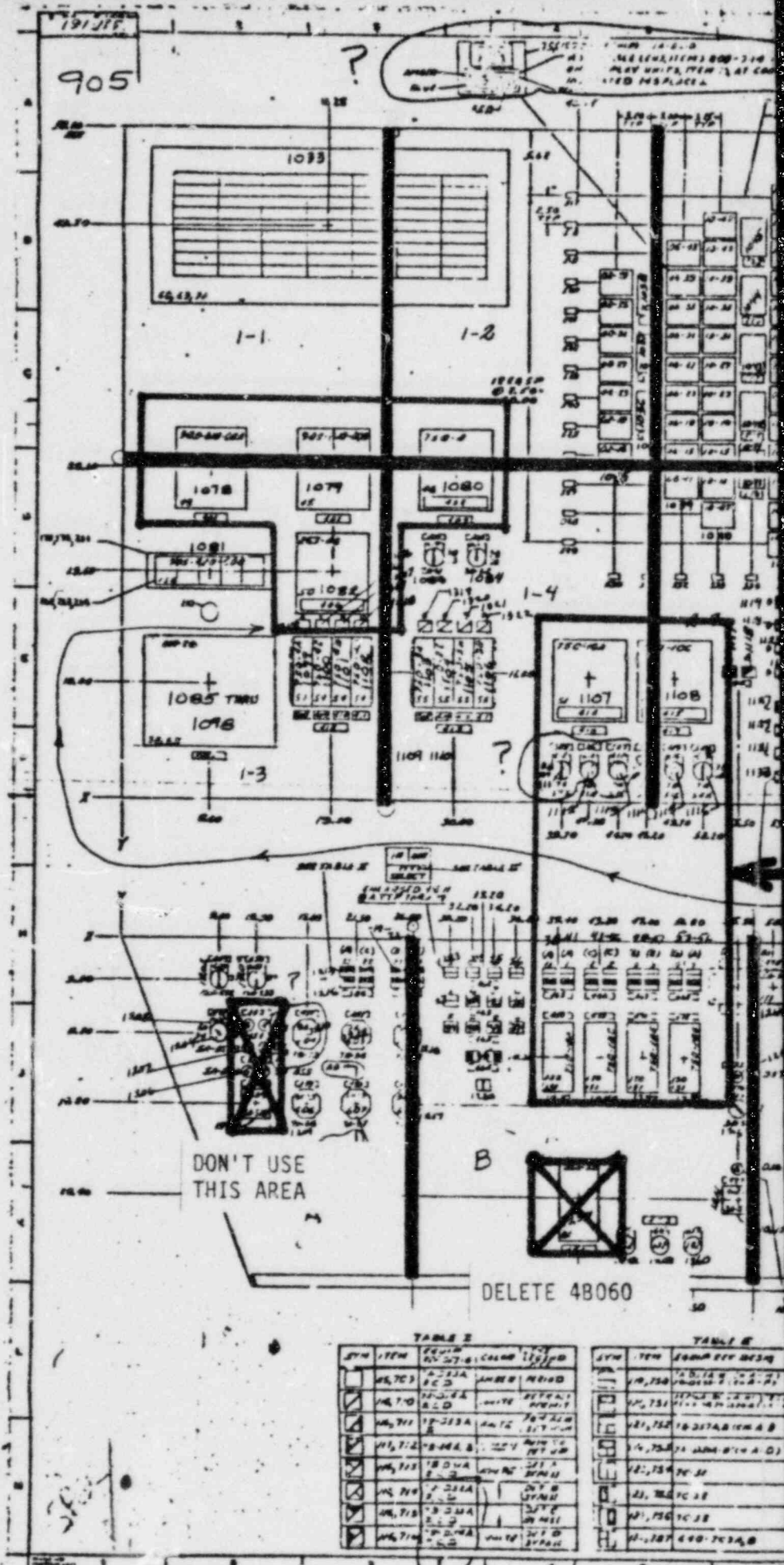


FIGURE 3-59.
RECIRCULATION SYSTEM
LOOP B

Also Available On Aperture Card



TI APERTURE CARD

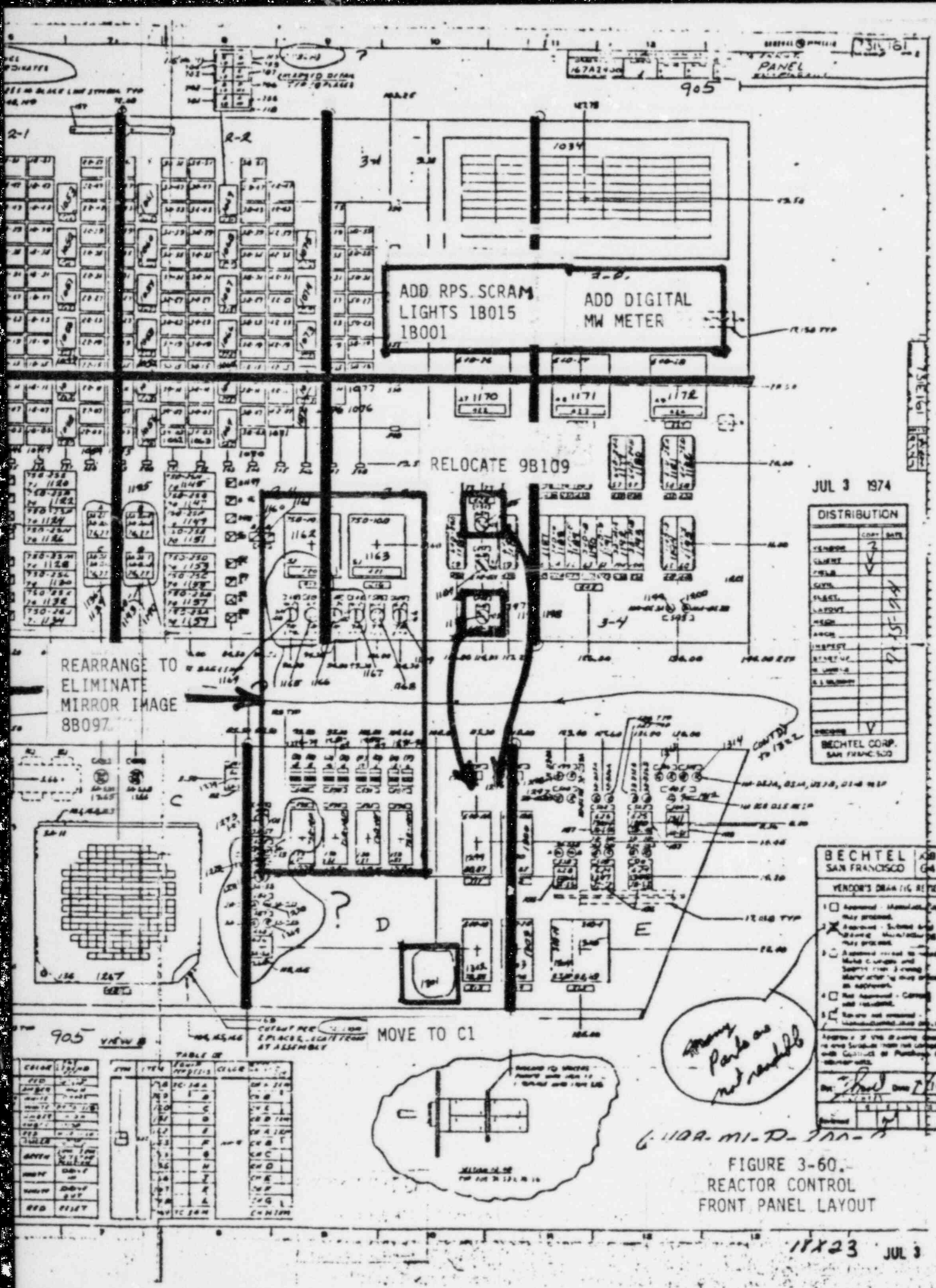
TABLE 3

SYM	ITEM	DESCRIPTION	STATUS
✓	1078	...	...
✓	1079	...	...
✓	1081	...	...
✓	1085 THRU 1086	...	...
✓	1087	...	...
✓	1088	...	...
✓	1089	...	...
✓	1090	...	...
✓	1091	...	...
✓	1092	...	...
✓	1093	...	...
✓	1094	...	...
✓	1095	...	...
✓	1096	...	...
✓	1097	...	...
✓	1098	...	...
✓	1099	...	...
✓	1100	...	...
✓	1101	...	...
✓	1102	...	...
✓	1103	...	...
✓	1104	...	...
✓	1105	...	...
✓	1106	...	...
✓	1107	...	...
✓	1108	...	...
✓	1109	...	...
✓	1110	...	...
✓	1111	...	...
✓	1112	...	...
✓	1113	...	...
✓	1114	...	...
✓	1115	...	...
✓	1116	...	...
✓	1117	...	...
✓	1118	...	...
✓	1119	...	...
✓	1120	...	...
✓	1121	...	...
✓	1122	...	...
✓	1123	...	...
✓	1124	...	...
✓	1125	...	...
✓	1126	...	...
✓	1127	...	...
✓	1128	...	...
✓	1129	...	...
✓	1130	...	...
✓	1131	...	...
✓	1132	...	...
✓	1133	...	...
✓	1134	...	...
✓	1135	...	...
✓	1136	...	...
✓	1137	...	...
✓	1138	...	...
✓	1139	...	...
✓	1140	...	...
✓	1141	...	...
✓	1142	...	...
✓	1143	...	...
✓	1144	...	...
✓	1145	...	...
✓	1146	...	...
✓	1147	...	...
✓	1148	...	...
✓	1149	...	...
✓	1150	...	...

TABLE 4

SYM	ITEM	DESCRIPTION	STATUS
✓	1107	...	...
✓	1108	...	...
✓	1109	...	...
✓	1110	...	...
✓	1111	...	...
✓	1112	...	...
✓	1113	...	...
✓	1114	...	...
✓	1115	...	...
✓	1116	...	...
✓	1117	...	...
✓	1118	...	...
✓	1119	...	...
✓	1120	...	...
✓	1121	...	...
✓	1122	...	...
✓	1123	...	...
✓	1124
✓	1125
✓	1126
✓	1127
✓	1128
✓	1129
✓	1130
✓	1131
✓	1132
✓	1133
✓	1134
✓	1135
✓	1136
✓	1137
✓	1138
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✓	1143
✓	1144
✓	1145
✓	1146
✓	1147
✓	1148
✓	1149
✓	1150

8409285 249-09



JUL 3 1974

DISTRIBUTION	
VERSION	DATE
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BECHTEL SAN FRANCISCO

VENDOR'S DRAWING REVIEW

- Approved - Manufacturing may proceed.
- Approved - Some engineering manufacturing may proceed.
- Approved - Held for Mark Change and Design Review. Marking may proceed as approved.
- Not Approved - Changes will be required.
- Review not completed - Manufacturing may not proceed.

Approval of this drawing does not release Bechtel from its obligations under Contract or Purchase Order agreements.

Dr. [Signature] Date 7/10/74

Many Parts as not readable

6-110A-MI-D-100-15

FIGURE 3-60. REACTOR CONTROL FRONT PANEL LAYOUT

905(2-1)

ENHANCE WITH
DEMARCATON

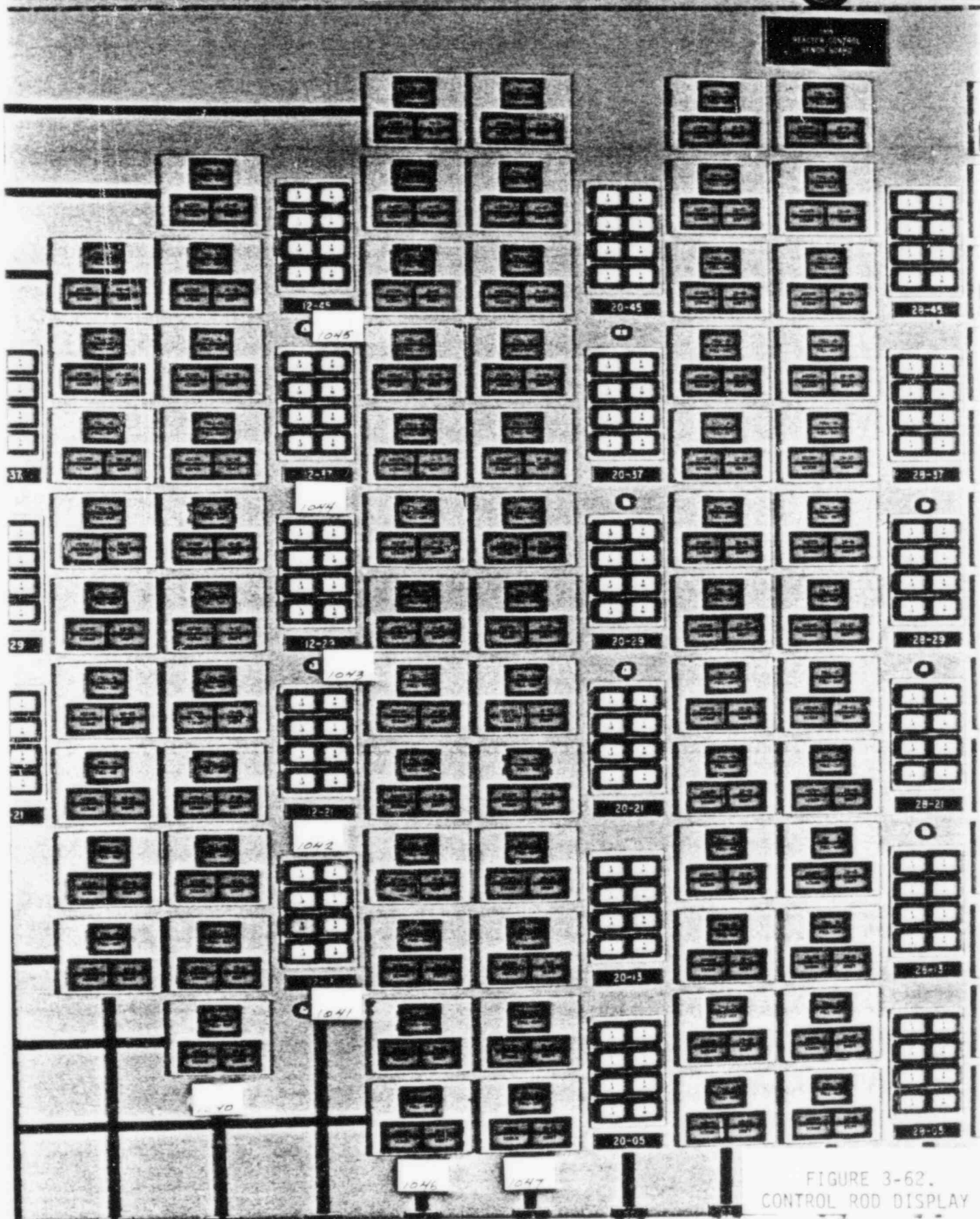


FIGURE 3-62.
CONTROL ROD DISPLAY

ENHANCE WITH
DEMARCATON

905(2-2)

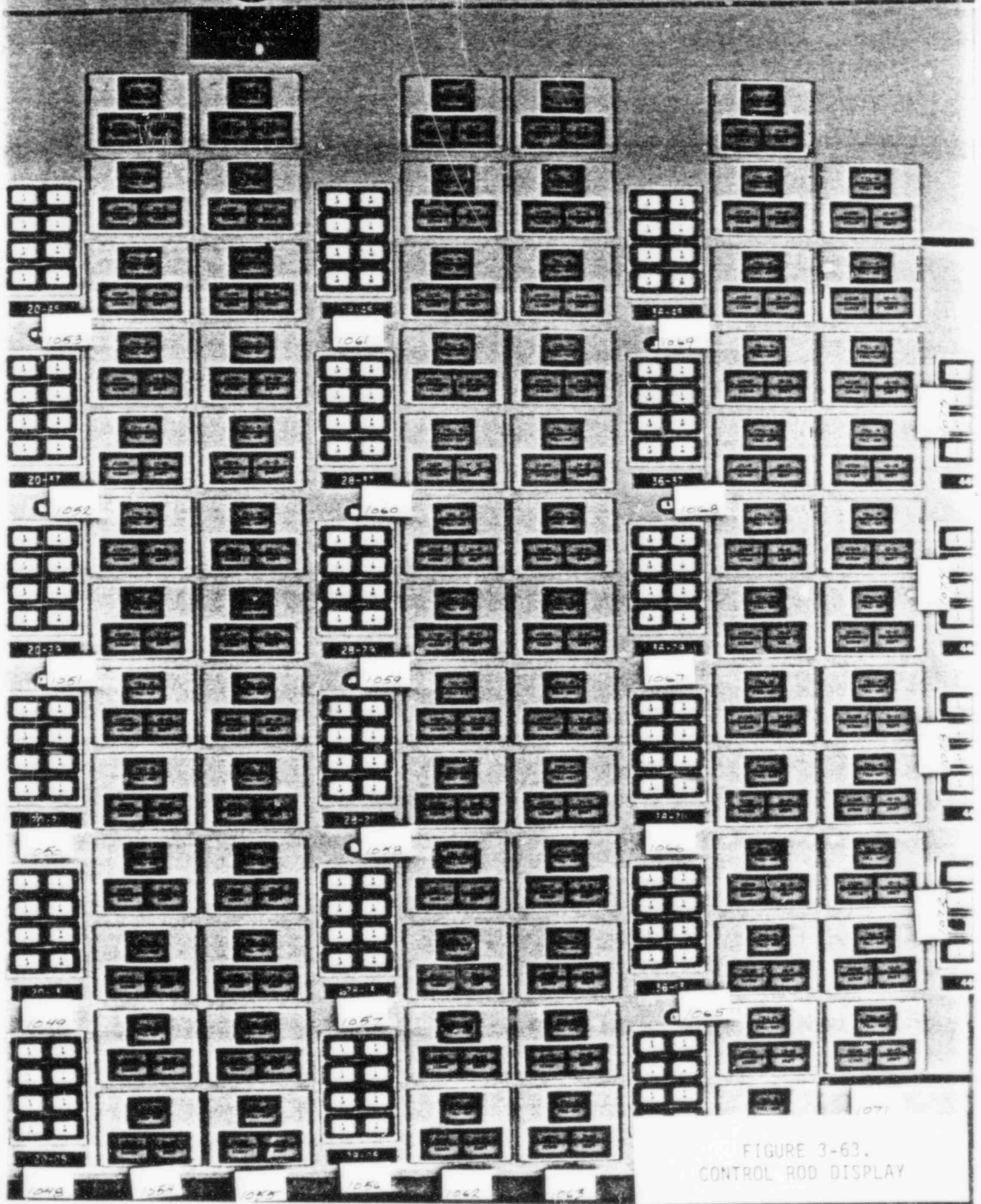
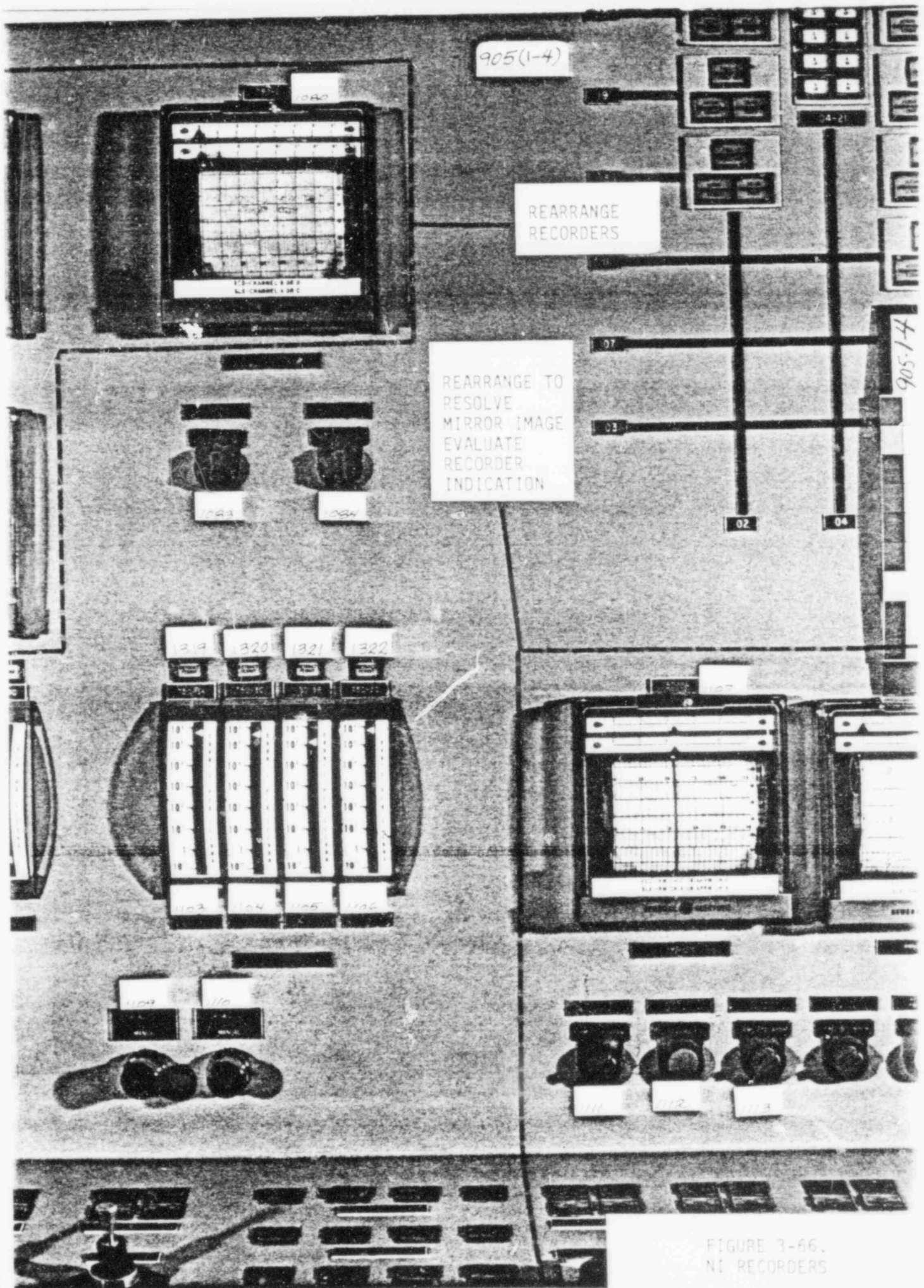
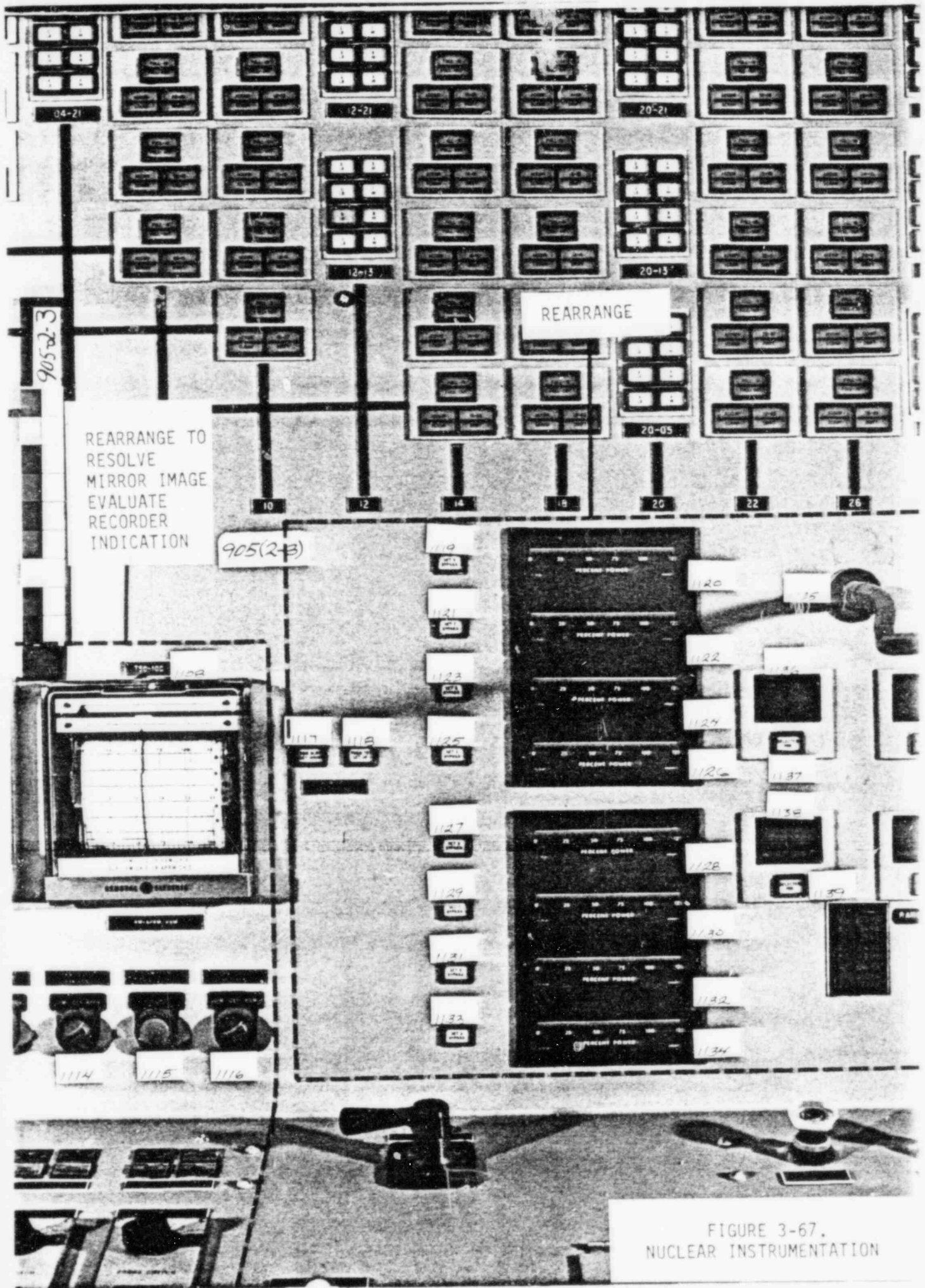


FIGURE 3-63.
CONTROL ROD DISPLAY





REARRANGE TO
RESOLVE
MIRROR IMAGE
EVALUATE
RECORDER
INDICATION

REARRANGE

905(2-B)

905-2-3

FIGURE 3-67.
NUCLEAR INSTRUMENTATION

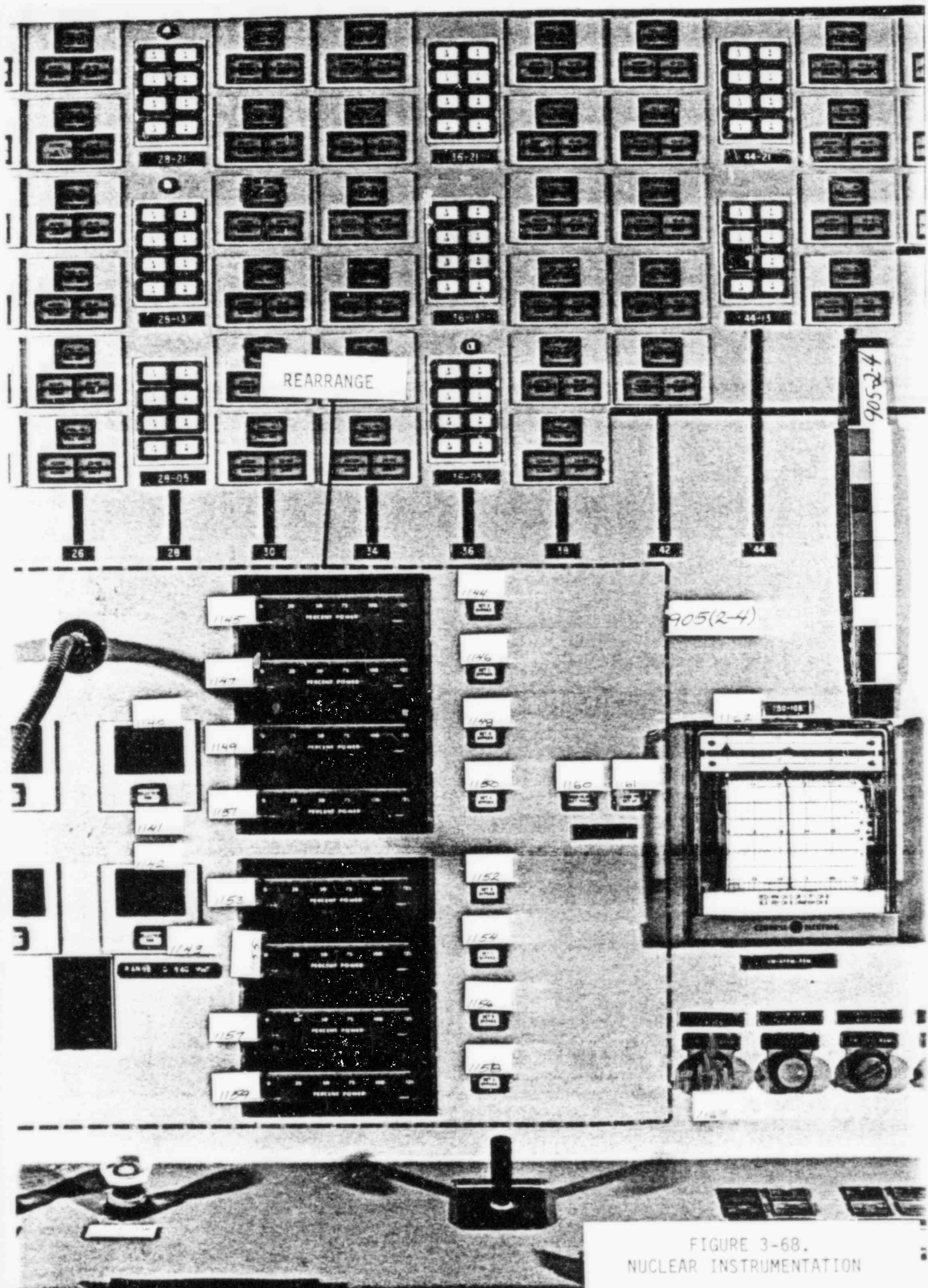
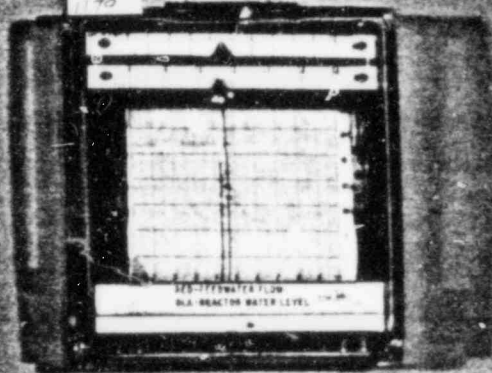


FIGURE 3-68.
NUCLEAR INSTRUMENTATION

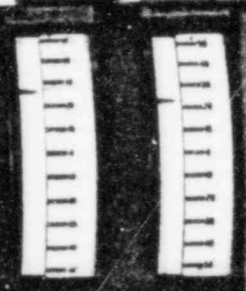
905(3-3)

BOTTOM OF SCALE IS 2" ABOVE ACTIVE FUEL AT RATED POWER AND TEMPERATURE CONDITIONS



FEEDWATER

1173 1174

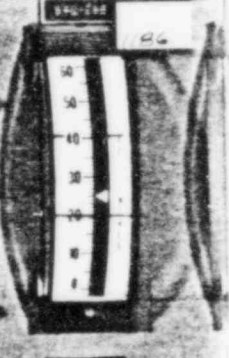
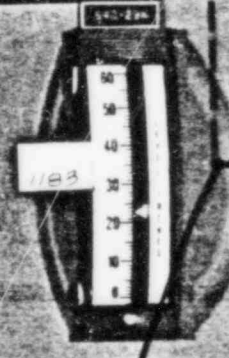


9053-3

REARRANGE TO RESOLVE MIRROR IMAGE EVALUATE RECORDER INDICATION

BOTTOM OF SCALE IS 7" ABOVE ACTIVE FUEL AT RATED POWER AND TEMPERATURE CONDITIONS

BOTTOM OF SCALE IS 7" ABOVE ACTIVE FUEL AT RATED POWER AND TEMPERATURE CONDITIONS



BOTTOM OF SCALE IS 2" ABOVE ACTIVE FUEL AT RATED POWER AND TEMPERATURE CONDITIONS

BOTTOM OF SCALE IS 3" ABOVE ACTIVE FUEL AT RATED POWER AND TEMPERATURE CONDITIONS

RELOCATE

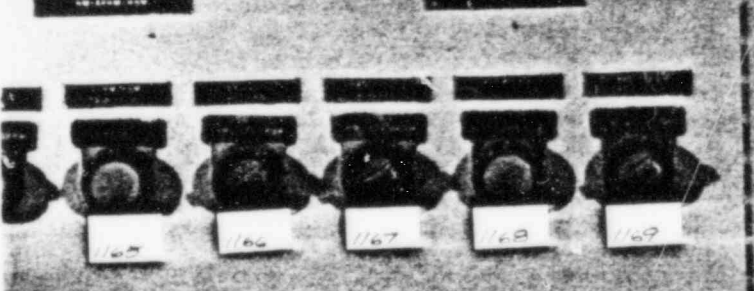
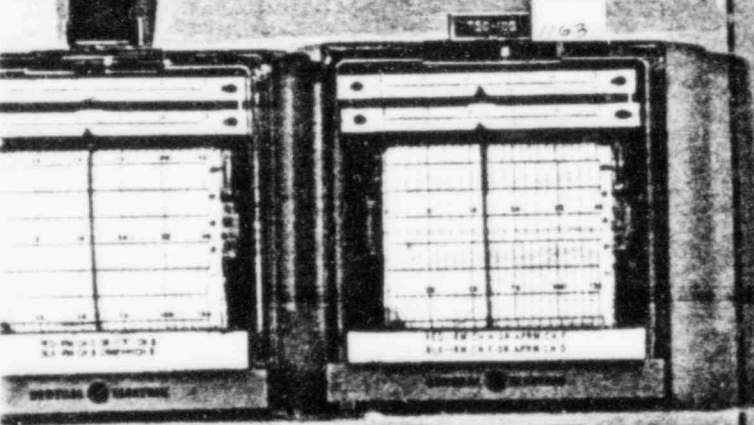
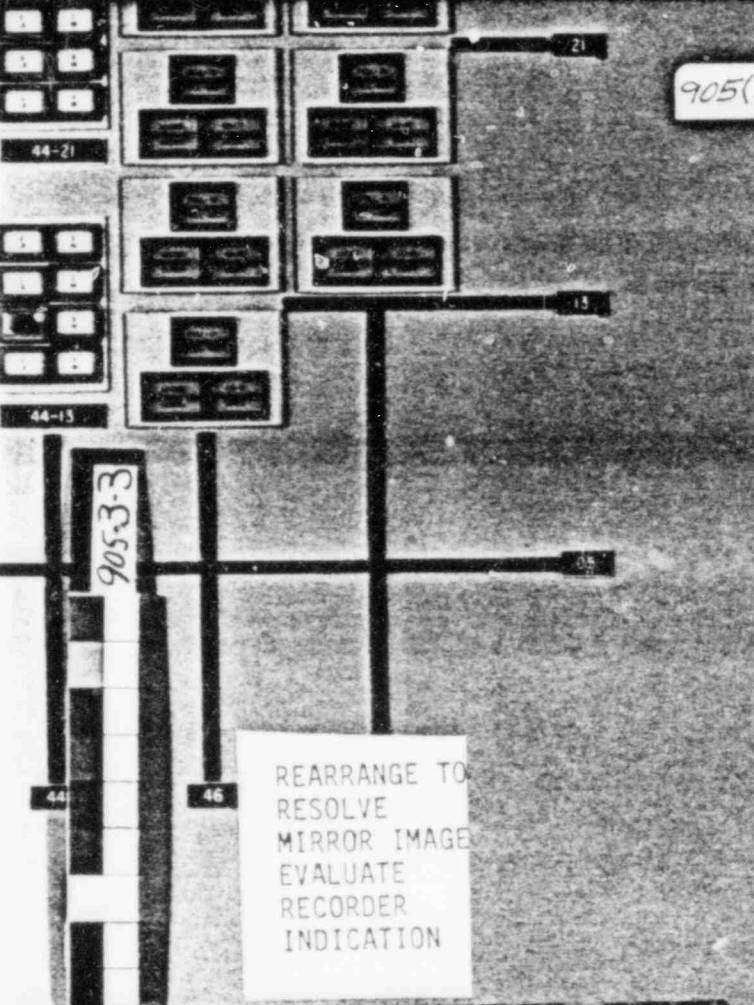


FIGURE 3-69. NUCLEAR INSTRUMENTS AND REACTOR VESSEL LEVEL

905(3-4)

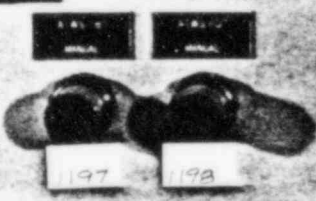
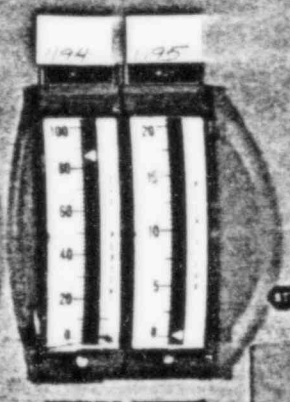
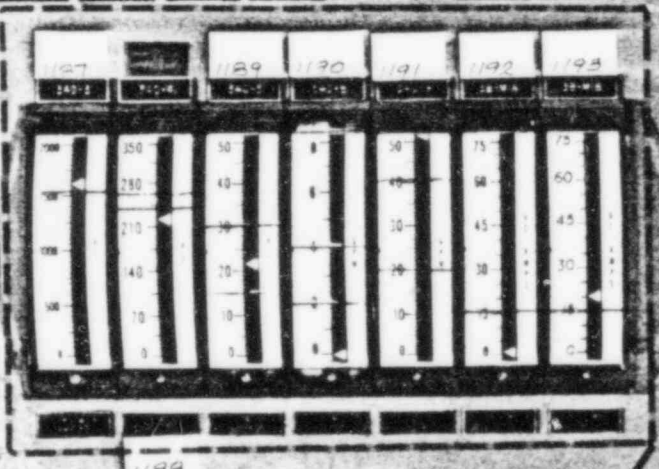
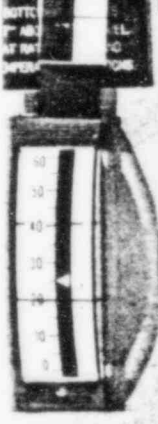
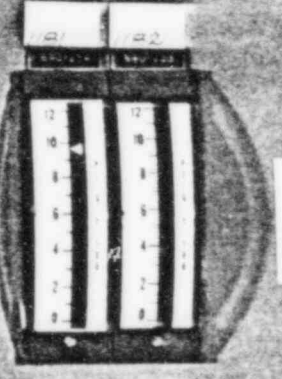
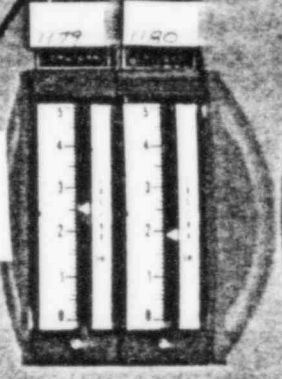
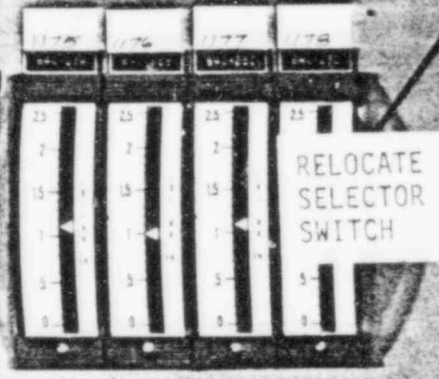
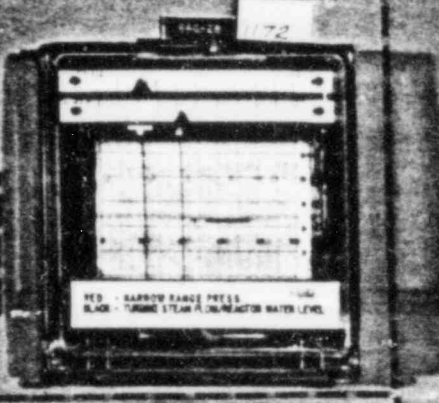
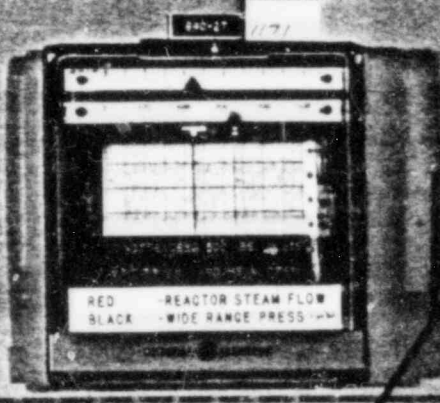
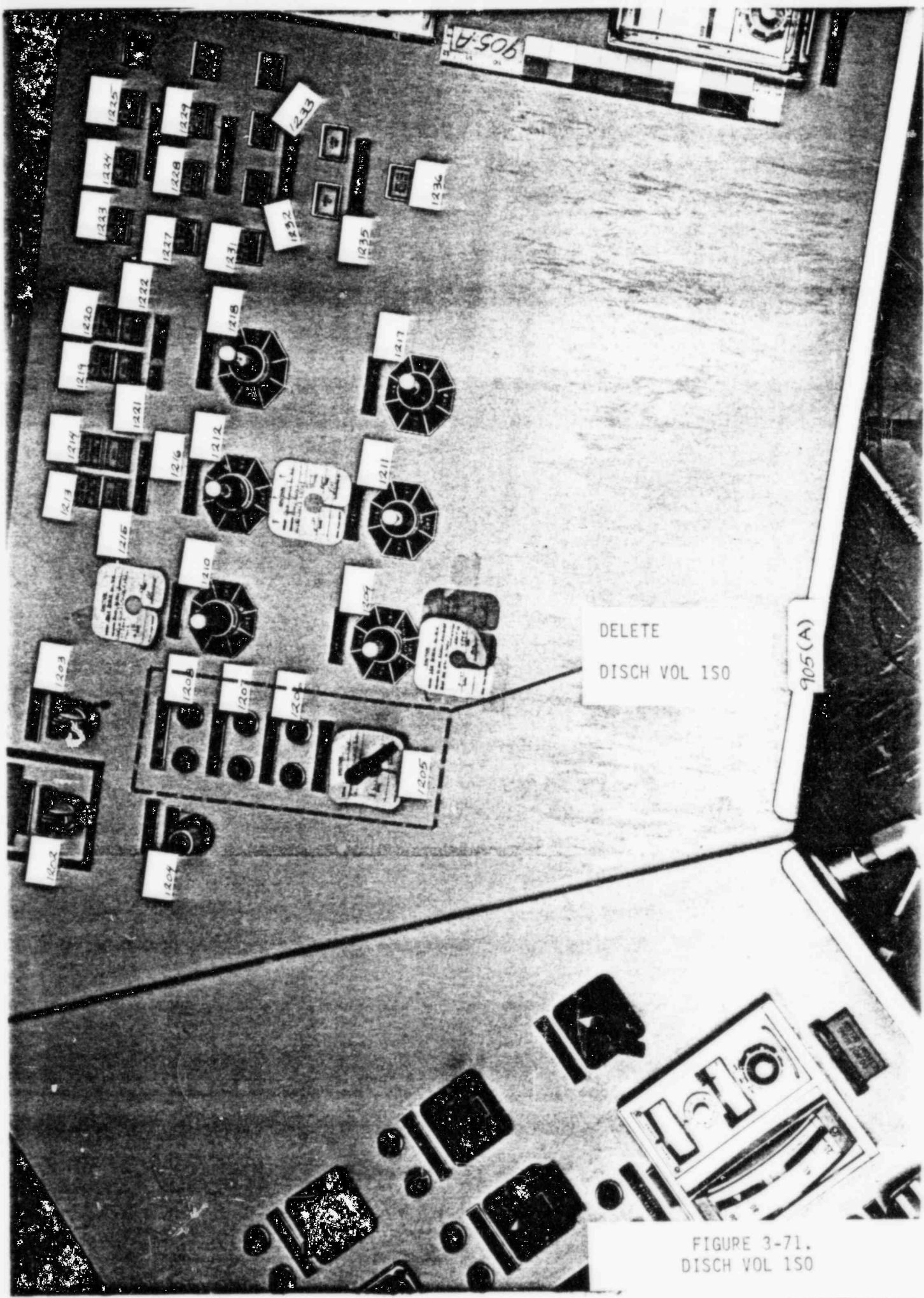


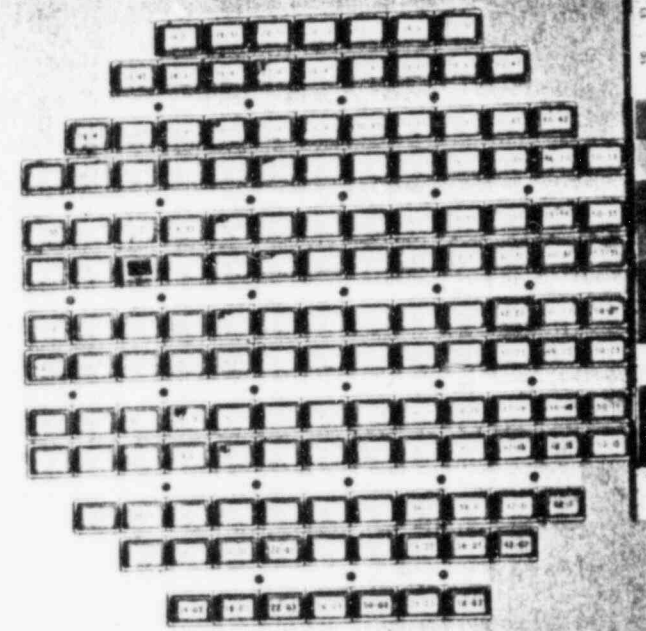
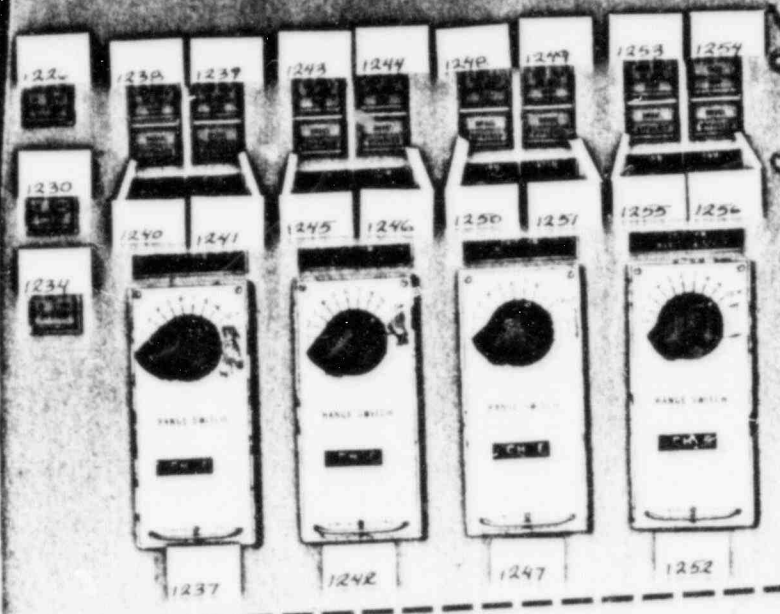
FIGURE 3-70. RECORDERS AND CONTROL ROD DRIVE INDICATORS

DELETE
DISCH VOL 150

905(A)

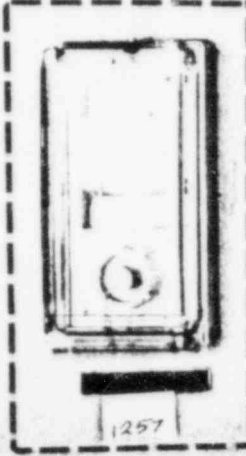
FIGURE 3-71.
DISCH VOL 150





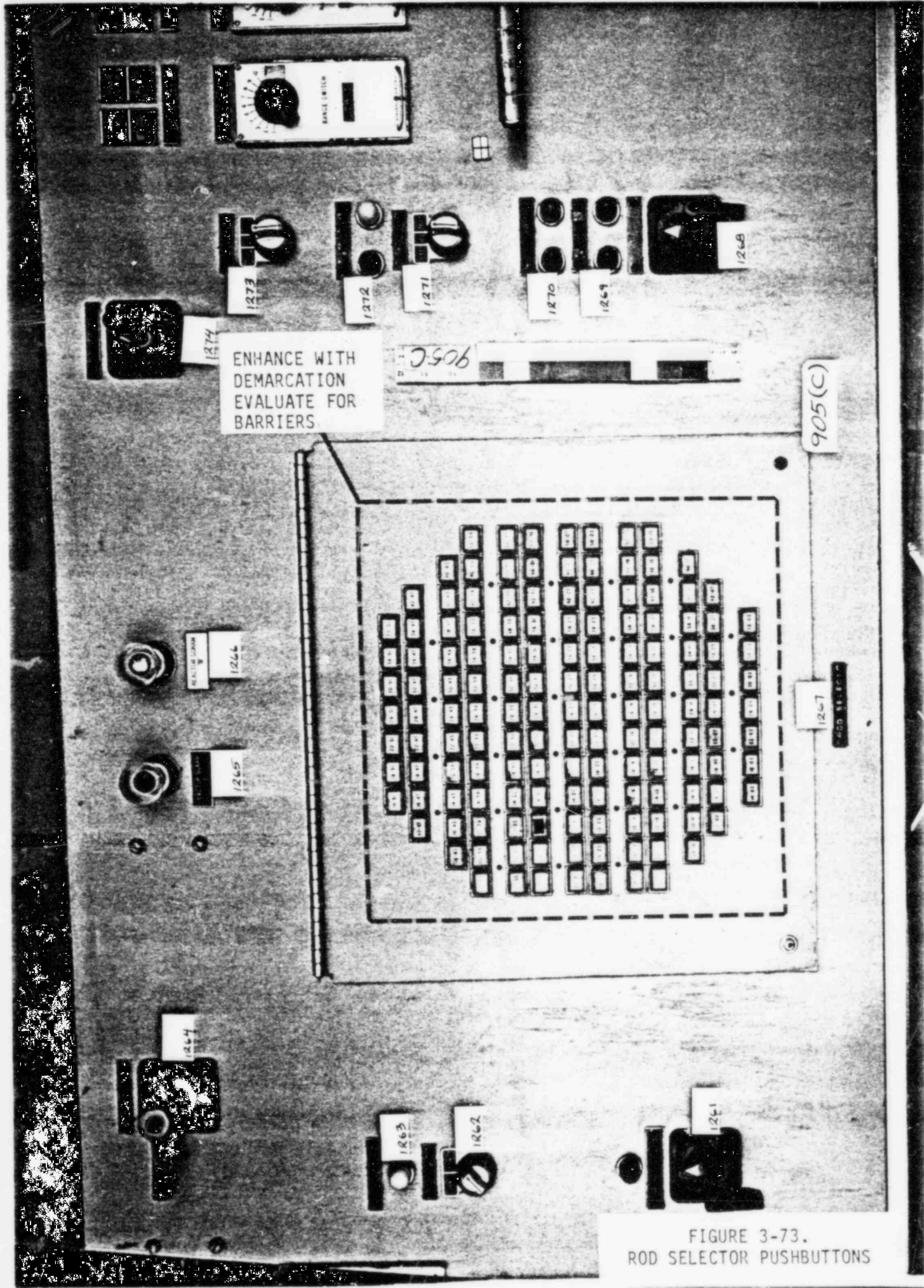
REARRANGE TO
RESOLVE MIRROR
IMAGE

DELETE



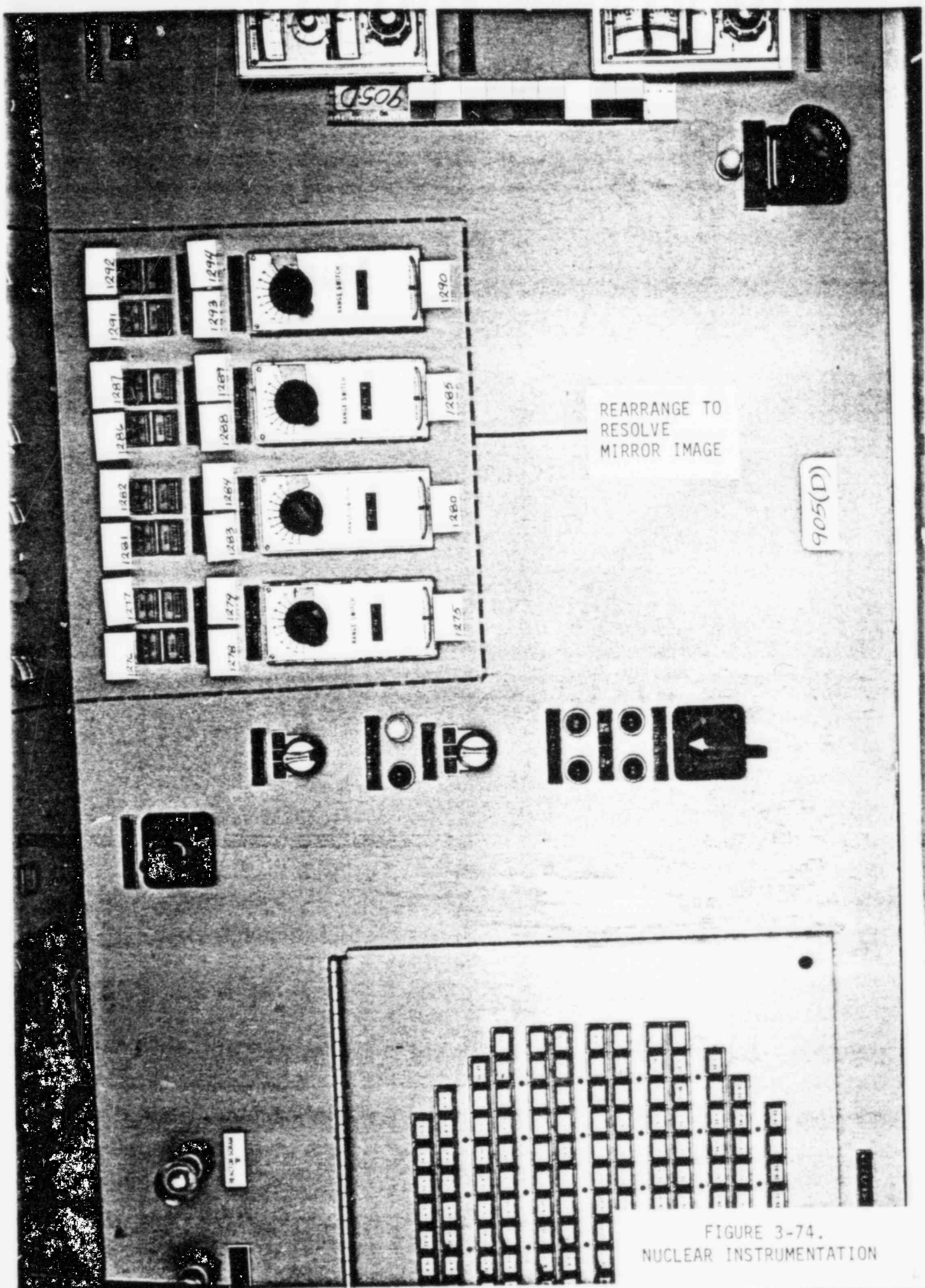
905(B)

FIGURE 3-72.
NUCLEAR INSTRUMENTS



ENHANCE WITH
DEMARCATON
EVALUATE FOR
BARRIERS

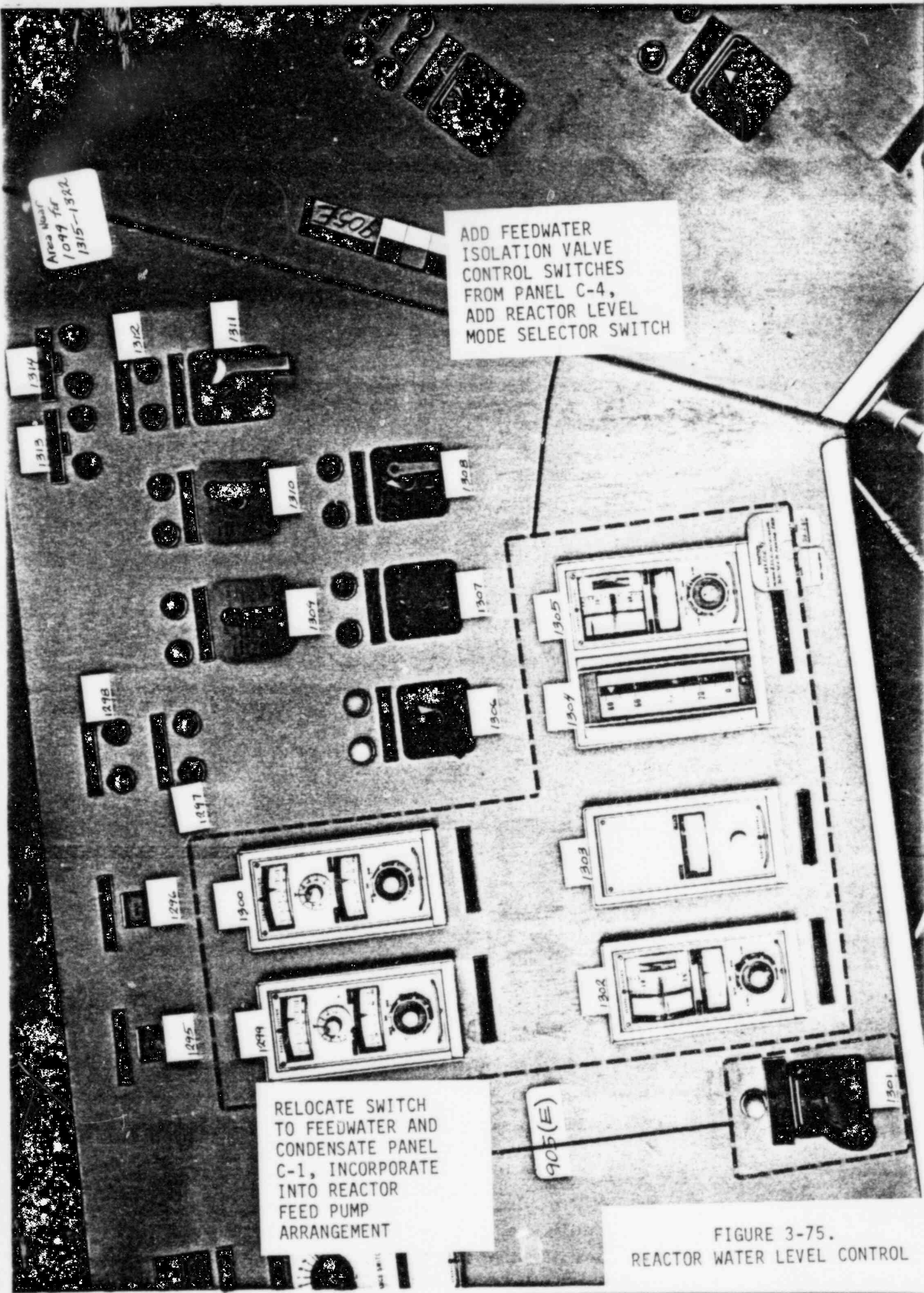
FIGURE 3-73.
ROD SELECTOR PUSHBUTTONS



REARRANGE TO
RESOLVE
MIRROR IMAGE

905(D)

FIGURE 3-74.
NUCLEAR INSTRUMENTATION



ADD FEEDWATER ISOLATION VALVE CONTROL SWITCHES FROM PANEL C-4, ADD REACTOR LEVEL MODE SELECTOR SWITCH

RELOCATE SWITCH TO FEEDWATER AND CONDENSATE PANEL C-1, INCORPORATE INTO REACTOR FEED PUMP ARRANGEMENT

FIGURE 3-75. REACTOR WATER LEVEL CONTROL