SAIC-87\3098

DETAILED CONTROL ROOM DESIGN REVIEW
AUDIT REPORT
FOR
BALTIMORE GAS AND ELECTRIC COMPANY'S
CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2
OCTOBER 6, 1987

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SAIC

Science Applications International Corporation

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1.0 INTRODUCTION

The Baltimore Gas and Electric Company submitted a Detailed Control Room Design Review (DCRDR) Program Plan to the Nuclear Regulatory Commission (NRC) on September 1, 1983 (Reference 1) in order to satisfy the Program Plan requirements of NUREG-0737, Supplement 1 (Reference 2) for the Calvert Cliffs Nuclear Power Plant, Units 1 and 2. The NRC staff reviewed the submittal with reference to the nine DCRDR requirements of NUREG-0737, Supplement 1, and the guidance provided in NUREG-0700 (Reference 3) and NUREG-0800 (Reference 4).

NUREG-0737, Supplement 1 requires that a Program Plan be submitted within two months of the start of the DCRDR. Consistent with the requirements of NUREG-0737, Supplement 1, the Program Plan should describe how the following elements of the DCRDR will be accomplished:

1. Establishment of a qualified multidisciplinary review team.

2. Function and task analyses to identify control room operator tasks and information and control requirements during emergency operations.

3. A comparison of display and control requirements with a control room inventory.

4. A control room survey to identify deviations from accepted human factors principles.

5. Assessment of human engineering discrepancies (HEDs) to determine which HEDs are significant and should be corrected.

6. Selection of design improvements.

7. Verification that selected design improvements will provide the necessary correction.

8. Verification that improvements will not introduce new HEDs.

9. Coordination of control room improvements with changes from other programs such as Safety Parameter Display System (SPDS), operator training, Regulatory Guide 1.97 instrumentation, and upgraded emergency operating procedures.

The staffs' comments on Calvert Cliffs Nuclear Power Plant's DCRDR Program Plan review were forwarded to Baltimore Gas and Electric by letter dated December 30, 1983 (Reference 5).

NUREG-0737, Supplement 1 requires that a Summary Report be submitted at the end of the DCRDR. As a minimum, it shall:

1. Outline proposed control room changes.

2. Outline proposed schedules for implementation.

3. Provide summary justification for HEDs with safety significance to be left uncorrected or partially corrected.

Baltimore Gas and Electric submitted a Summary Report, with a commitment to provide a supplemental report, for the Calvert Cliffs Nuclear Power Plant to the NRC on December 31, 1984 (Reference 6).

In a letter dated September 20, 1985 (Reference 7), Baltimore Gas and Electric Company responded to the NRC's comments to include a functional task analysis and new control room survey in the DCRDR. Baltimore Gas and Electric Company submitted the DCRDR Supplemental Program Plan to the NRC on November 1, 1985 (Reference 8). On May 29, 1987, Baltimore Gas and Electric Company requested an extension in the schedule for meeting the DCRDR requirements (Reference 9).

An on-site meeting was conducted on October 6, 1987 to review the implementation of the supplemental DCRDR and to assess the need for further extension of the proposed schedule. This on-site meeting report reflects the consolidated observations, findings and conclusions of the review team members. A list of meeting attendees is provided in Attachment 1, the meeting agenda is provided in Attachment 2, and Attachment 3 contains the licensee's presentation material.

2.0 EVALUATION

The purpose of this evaluation was to determine the status of the nine DCRDR requirements in NUREG-0737, Supplement 1. The evaluation was performed by comparing the information provided by Baltimore Gas and Electric with the criteria in NUREG-0800, Section 18.1, Rev. 0, Appendix A of the Standard Review Plan. The reviewers' evaluation of the DCRDR for the Calvert Cliffs Nuclear Power Plant, Units 1 and 2 is provided below.

2.1 Establishment of a Qualified Multidisciplinary Review Team

The DCRDR review team at Calvert Cliffs consisted of specialists in human factors, operations, training, instrumentation and control maintenance, and quality assurance. Support to staff management was provided by an oversight committee made up of specialists in design engineering, operations, nuclear training, and maintenance. The DCRDR team functioned well with one exception, as discussed below.

During the assessment process, the DCRDR team's role is to categorize HEDs and to propose modifications. The HEDs and proposed modifications are then sent to the oversight committee for review. Following review by the oversight committee, it is not clear how, or who, finally approves or disapproves the proposed changes.

It is the review team's judgment that Baltimore Gas and Electric Company has not met the requirement for the establishment of a qualified multidisciplinary review team because of the undefined role of the oversight committee in the selection of design improvements and approval process.

2.2 System Function and Task Analysis

The licensee performed a system function and task analysis based on the Combustion Engineering Emergency Procedures Guidelines (CEN-152, Revision 02) in order to identify operator tasks and needs. Approximately five hundred tasks were identified along with their associated instrumentation and control requirements and characteristics. Information obtained from the task analysis was stored in a database and later became part of the coordinated effort in conjunction with other programs such as SPDS, Regulatory Guide 1.97 Instrumentation, and the identification of deviations from Emergency Procedure Guidelines.

It is the review team's judgment that Baltimore Gas and Electric has met the NUREG-0737, Supplement 1 requirement for a function and task analysis to identify control room operator tasks and information and control requirements during emergency operations.

2.3 Comparison of Display and Control Requirements with a Control Room Inventory

The licensee conducted a comparison of display and control requirements using the task analysis data. Verification of the availability and suitability of controls and displays was done by comparing the display and control requirements to the actual displays and controls in the control room. The verification procedure resulted in identification of 70 HEDs.

Validation of control room functions was conducted using the control room simulator. An actual control room team consisting of two reactor operators, a shift supervisor, and a shift technical advisor walked through the upgraded Emergency Operating Procedures (EOPs) while the review team validated control room functions. The validation of control room functions resulted in identification of 68 human engineering discrepancies. The following EOPs were used in conducting the validation:

EOP-0	Standard Post Trip Action
EOP-1	Reactor Trip
EOP-2	Loss of Offsite Power
EOP-3	Loss of Feedwater

EOP-4 Excess Steam Demand
EOP-5 Loss of Coolant Accident
EOP-6 Steam Generator Tube Rupture
EOP-7 Station Blackout (still in progress)
EOP-8 Functional Recovery Guidelines (still in progress)

In addition to the EOPs, the following operating procedures were validated:

OP-1 Startup from Cold Shutdown
OP-2 Startup from Hot Standby

Finally, a checklist was used to evaluate the human factors implications in the EOPs and DCRDR. EOP concerns from the DCRDR were passed on to the EOP team and corrections were made.

It is the review team's judgment that the Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for a comparison of display and control requirements with the control room inventory.

2.4 Control Room Survey to Identify Deviations from Accepted Human Factors Principles

The licensee conducted a control room survey using the guidelines provided in Section 6 of NUREG-0700. Documentation was provided for each guideline and HEDs were written for those guidelines which were not met. In addition, fifteen operators were interviewed. Comments and HEDs resulting from the interviews were documented as well.

It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for a control room survey to identify deviations from accepted human factors principles.

2.5 Assessment of Human Engineering Discrepancies

The assessment of HEDs resulting from Calvert Cliffs DCRDR was still in progress at the time of this review. Forty-four percent of the HEDs had been assessed by the DCRDR review team. The assessed HEDs and proposed modifications had been sent to the oversight committee. The review team raised several concerns regarding the assessment process.

First, the oversight committee's process is unclear. Once an HED has been reviewed by the DCRDR review team and a proposed modification is made, it is sent to the oversight committee for review. The process for review by the committee and their method of assessment and prioritization of an HED are not defined or documented.

A second concern which follows is the uncertainty of the schedule for handling approved and unapproved modifications. The iterative process of finalizing and implementing modifications is not clearly defined.

The review team also raised a concern regarding the ranking of safety-significant HEDs. The team's review of safety-significant Category 1 and 2 HEDs raised questions regarding the licensee's definition of safety-significant. For example, discrepancies relating to such problems as handwritten labels or labeling with dymotape were categorized as safety-significant. The concern is that non-safety-significant HEDs are being assessed safety-significant, diminishing the attention that should be given to more important discrepancies.

It is the review team's judgment that Baltimore Gas and Electric Company has not met the NUREG-0737, Supplement 1 requirement for an assessment of HEDs to determine which are significant and should be corrected.

2.6 Selection of Design Improvements

The assessment process is still underway at Calvert Cliffs and the selection of design improvements is just beginning. The licensee expects to complete the assessment and develop HED corrections and to submit their final DCRDR Summary Report in March, 1988.

According to the licensee, the assessment is taking longer than expected, which is the reason for requesting a deadline extension for submittal of the final DCRDR Summary Report. The licensee's schedule for correcting the HEDs is provided in Table 1.

It is the review team's judgment that the licensee has not met the NUREG-0737, Supplement 1 requirement for selection of design improvements.

2.7 Verification that Selected Design Improvements will Provide the Necessary Correction

As described by the licensee, the process for verifying that the modification corrects the HED will include an HED close-out document for all modifications. All modifications will be subjected to a human factors engineering review by the modifications initiator and DCRDR project manager. Both the modification initiator and DCRDR project leader will be responsible for reviewing and signing the HED close-out document.

Based on the licensee's description of the process for verifying that the modifications will correct the HEDs, the review team concluded that the licensee should meet the NUREG-0737, Supplement 1 requirement, but the licensee should document this process in their Summary Report.

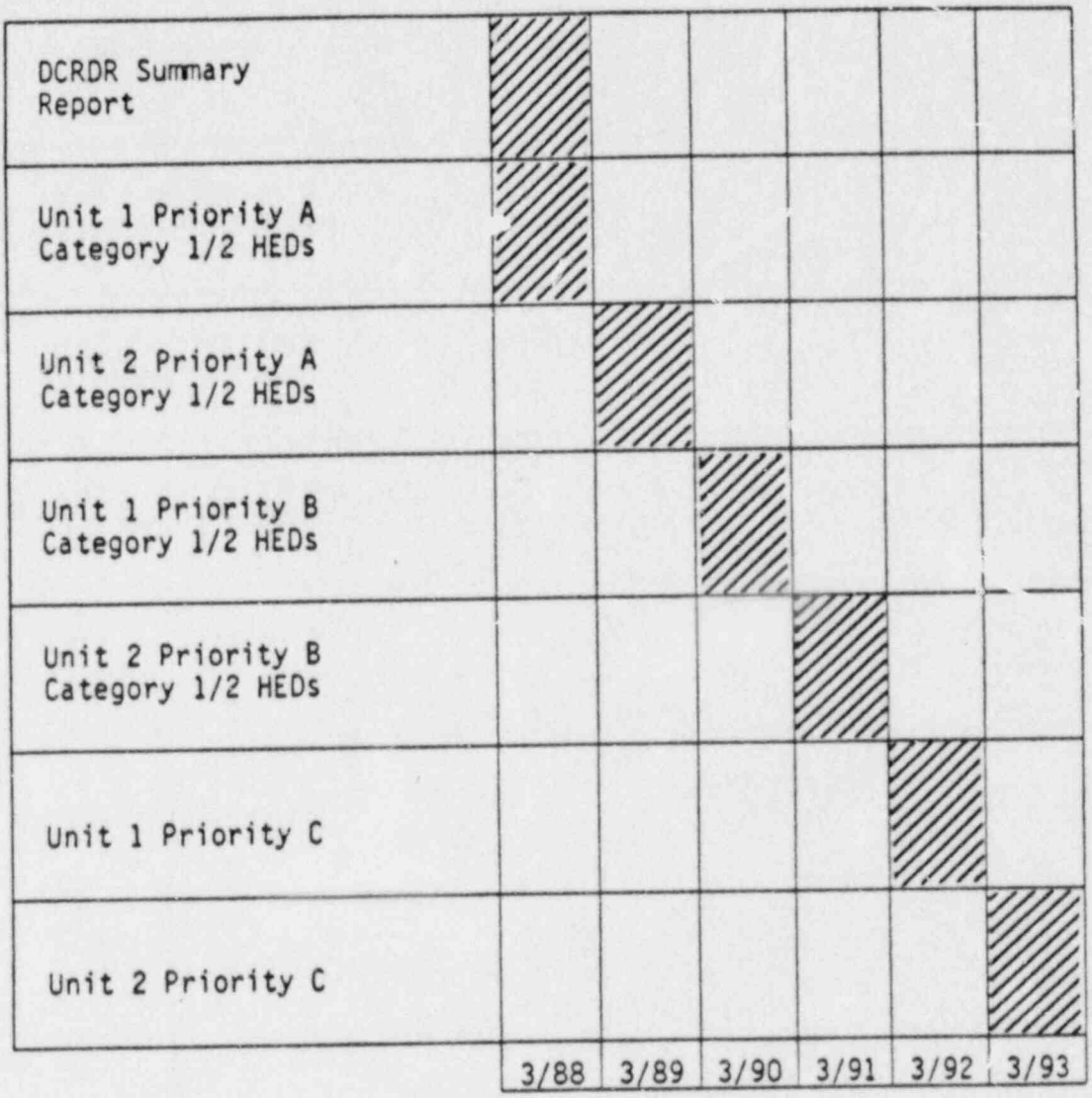
2.8 Verification that Selected Design Improvements will not Introduce New HEDs

As discussed in Section 2.7, based on the licensee's description of the process for verifying that the modifications will not introduce new HEDs, the team concluded that the licensee should meet the NUREG-0737, Supplement 1 requirement.

TABLE 1

CALVERT CLIFFS

SCHEDULE FOR HED CORRECTIONS



2.9 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

Coordination of the DCRDR with SPDS was accomplished through the use of the task analysis database derived from the CEN-152, which was also used as the basis for the Calvert Cliffs critical safety functions. It is the review team's judgment that the licensee is coordinating the DCRDR with the SPDS.

The results of the DCRDR task analysis were given to the training department for use in conducting a task analysis for operator training. The training task analysis was conducted to identify the knowledge, skills, abilities, and other characteristics necessary to complete operator tasks.

The coordination with Regulatory Guide 1.97 has been an ongoing modification review process. In conducting the DCRDR task analysis, reference was made to Regulatory Guide 1.97 in the database so that it could be used as a sortable field. Thus, when a modification is made to any instrumentation, the reference to Regulatory Guide 1.97 can be tracked to ensure that the requirement has been met.

Finally, much of the revision and rewrite of the upgraded emergency operating procedures was done during the validation and task analysis. As the validation team found concerns, they were immediately passed on to the procedures team and corrected. Procedures, tasks, and control and display requirements also can be tracked through use of the task analysis database.

It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for coordination of control room improvements with changes from other programs such as SPDS, Operator Training, Regulatory Guide 1.97 Instrumentation, and Upgraded Emergency Procedures.

3.0 CONCLUSIONS

Baltimore Gas and Electric Company submitted the Detailed Control Room Design Review (DCRDR) Summary Report for Calvert Cliffs Nuclear Power Plant, Units 1 and 2, on December 31, 1984. The NRC reviewed the report and requested that additional analysis be conducted. On November 1, 1985, Baltimore Gas and Electric Company submitted to the NRC, a Supplemental Program Plan to include a functional task analysis and control room survey. By letter dated May 29, 1987, Baltimore Gas and Electric Company requested that the schedule for meeting the DCRDR requirements be changed. In order to resolve concerns regarding the change in schedule and to evaluate more completely the Calvert Cliffs DCRDR, an on-site meeting was conducted on October 6, 1987. During the meeting, the NRC staff, accompanied by representatives from Science Applications International Corporation (SAIC) performed a detailed evaluation of Baltimore Gas and Electric Company's DCRDR. The evaluation included examination of Baltimore Gas and Electric Company's DCRDR documentation, discussions with the licensee's DCRDR team, inspection of the existing control room, and inspection of HEDs and proposed corrective action modifications. This report reflects the consolidated findings and conclusions of the NRC review team. The conclusions are provided below, organized by the nine NUREG-0737, Supplement 1 DCRDR requirements.

1. It is the review team's judgment that Baltimore Gas and Electric Company has not met the NUREG-0737, Supplement 1 requirement for establishment of a qualified multidisciplinary review team because of the undefined and undocumented role of the oversight committee in the assessment and design improvement selection processes.

2. It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for a function and task analysis to identify control room operator tasks and information and control requirements during emergency operations.

3. It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for a comparison of display and control requirements with the control room inventory.

4. It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for a control room survey to identify deviations from accepted human factors principles.

5. It is the review team's judgment that Baltimore Gas and Electric Company has not met the NUREG-0737, Supplement 1 requirement for an assessment of HEDs to determine which are significant and should be corrected because of the concerns listed below.

   - The oversight committee process and its role in the assessment of HEDs is unclear. The committee's process for review and approval/disapproval of proposed modifications to HEDs, its role in relation to the review team and the final assessment of HEDs needs to be more clearly defined.

   - The schedule for implementing proposed modifications is unclear.

   - Non-safety-significant HEDs are being assessed as Category 1 (safety-significant).

6. It is the review team's judgment that, based on the process described, Baltimore Gas and Electric Company has not met the NUREG-0737, Supplement 1 requirement for selection of design improvements since the selection process is still in progress.

7. It is the review team's judgment that, based on the process described, Baltimore Gas and Electric Company should meet the NUREG-0737, Supplement 1 requirement for verification that selected improvements will produce the necessary corrections. However, it will be necessary for the licensee to document this process in their final Summary Report.

8. It is the review team's judgment that Baltimore Gas and Electric Company should meet the NUREG-0737, Supplement 1 requirement for verification that the selected improvements do not introduce new HEDs. However, it will be necessary for the licensee to document this process in their Summary Report.

9. It is the review team's judgment that Baltimore Gas and Electric Company has met the NUREG-0737, Supplement 1 requirement for coordination of the DCRDR with other Supplement 1 improvement programs such as SPDS, Operator Training, Regulatory Guide 1.97 Instrumentation, and Upgraded EOPs.

REFERENCES

1. "Program Plan for the Calvert Cliffs Unit 1 and 2 Control Room Design Review," Attached to Letter from A.E. Lundvall, Jr. (BG&E) to R.A. Clark (NRC), dated September 1, 1983.

2. Supplement 1 to NUREG-0737, "Requirements for Emergency Response Capability" (Generic Letter No. 82-33), December 17, 1982.

3. NUREG-0700, "Guidelines for Control Room Design Reviews," September 1981.

4. NUREG-0800, "Standard Review Plan," Section 18.1, "Control Room," and Appendix A, "Evaluation Criteria for Detailed Control Room Design Reviews (DCRDR)," September 1984.

5. "Review of the Calvert Cliffs Detailed Control Room Design Review Program Plan," U.S. Nuclear Regulatory Commission, December 30, 1983.

6. "Control Room Design Review Summary Report for the Calvert Cliffs Nuclear Power Plant Units 1 and 2," Baltimore Gas and Electric Company, December 31, 1984.

7. Letter from A.E. Lundvall, Jr. (BG&E) to E.J. Butcher, Jr. (NRC) dated September 20, 1985.

8. Letter from A.E. Lundvall, Jr. (BG&E) to E.J. Butcher, Jr. (NRC) "Detailed Control Room Design Review, Supplemental Program Plan" dated November 1, 1985.

9. Letter from J.A. Tiernan (BG&E) to USNRC dated May 29, 1987.

ATTACHMENT 1

MEETING ATTENDEES

MEETING ATTENDEES

10/6/87

Name	Affiliation
Richard J. Eckenrode	NRC/HFAB
Garmon West, Jr.	NRC/HFAB
Joseph DeBor	NRC/SAIC
Barbara Glickstein	NRC/SAIC
William McCaughey	BG&E/Licensing
Malcolm D. Patterson	BG&E/I&C
Joseph B. Winter, Jr.	Workscience
Bruce B. Meowea	BG&E/I&C
Ken Shaffer	BG&E/Bechtel
Jeff Jozwiak	NUS Corporation
Richard L. Szoch	BG&E/I&C Engineer
Richard B. Mervine	BG&E/ISD
Guy R. Knierien	BG&E/MPEU
John Lohr	BG&E/Operations
Kevin Melmann	BG&E/Training
Robert F. Ash	BG&E/Design Engineer
Jim Lippold	Manager Nuclear Engineer Service Department

ATTACHMENT 2

TENTATIVE AGENDA

BG&E/NRC Meeting
October 6, 1987

A.)	BG&E Opening Remarks	8:30 a.m.
	1.) Background 2.) Schedule 3.) Review of Meeting Agenda and Expected Results	
B.)	NRC Opening Remarks	9:00 a.m.
C.)	Management and Staffing	9:15 a.m.
	1.) Review Team 2.) Oversight Committee	
D.)	Data Collection	9:30 a.m.
	1.) Inventory 2.) Task Analysis and Data Base Demonstration 3.) Display and Control Requirements Compared with Control Room Inventory (BG&E: Verification)	
	BREAK	10:30 a.m.
	4.) Operator Survey 5.) Control Room Checklist Survey (NUREG-0700) 6.) Validation of Control Room Function 7.) HED Data Base Demonstration	10:45 a.m.
E.)	HED Assessment and Design Improvements	12:00 noon
	1.) Assessment Team 2.) Process 3.) Implementation	
F.)	Verification of Design Improvements (BG&E: Validation of HED Corrections)	12:45 p.m.
	LUNCH	1:00 p.m.
G.)	SPDS Background	1:30 p.m.
H.)	Plant Tour	2:00 p.m.
	1.) SPDS Demonstration 2.) Control Room	
I.)	SPDS Question and Answer	3:30 p.m.
J.)	Coordination with Other Programs (SPDS, RG 1.97, EOPs, Operator Training)	4:00 p.m.
K.)	NRC Closing Remarks	4:15 p.m.
	1.) Strengths/Weaknesses 2.) Suggested Improvements	
L.)	BG&E Closing Remarks	4:45 p.m.

ATTACHMENT 3

LICENSEE PRESENTATION MATERIAL

DETAILED CONTROL ROOM DESIGN REVIEW

CCNPP EQUIPMENT DATA BASE - REQUIRED MODIFICATIONS

INFORM DATA SET

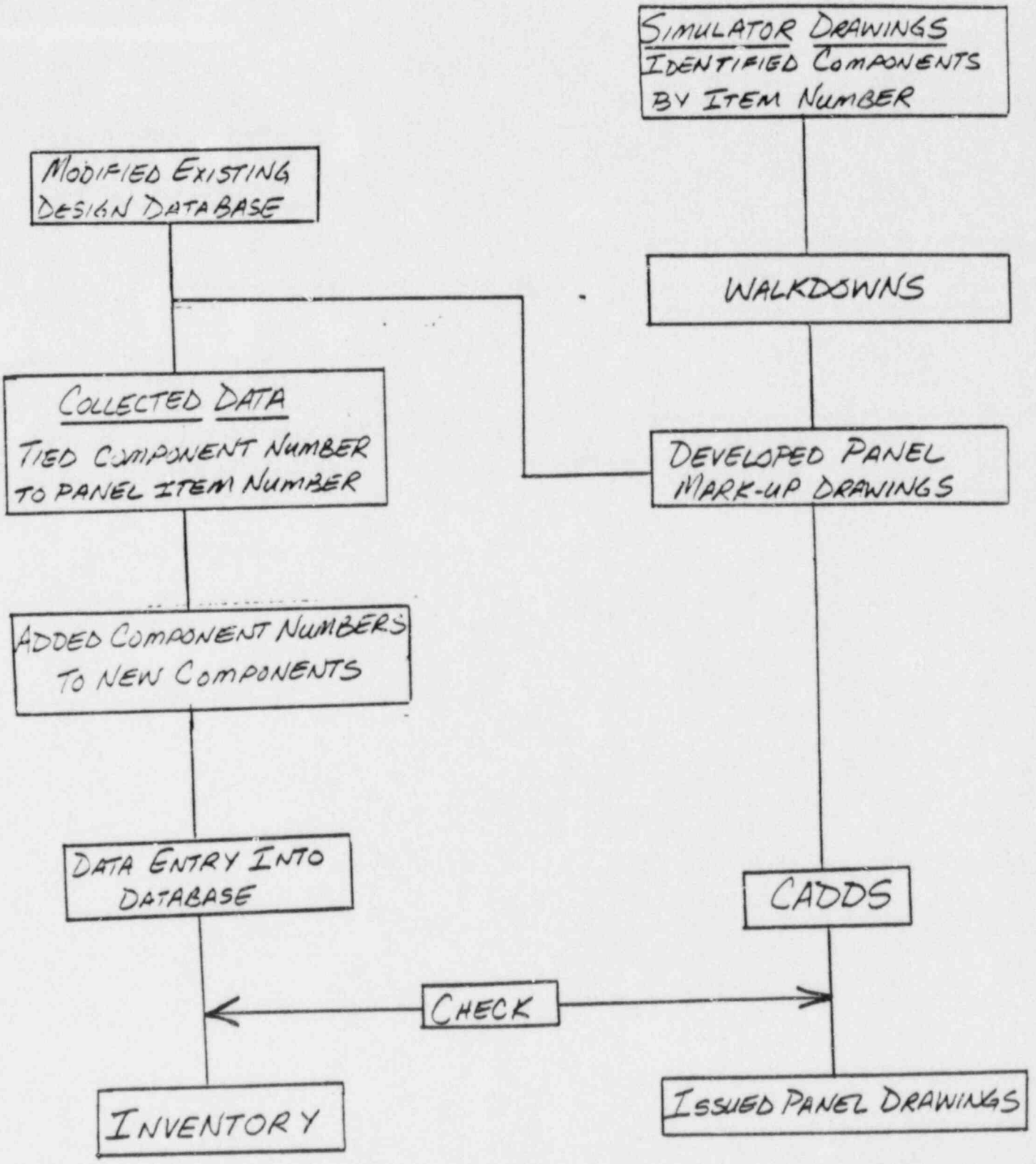
SYSND	(4)	START UP SYSTEM NUMBER
SERV-DESC	(30)	SERVICE DESCRIPTION
COMP	(30)	COMPONENT DESCRIPTIVE DETAILS
*HF-TYPE	(30)	HUMAN FACTORS DESIGNATION OF COMPONENT TYPE
COMPNO	(14)	COMPONENT NUMBER
PNLLOC	(10)	COMPONENT PANEL LOCATION - PANEL NUMBER
PNL-ITEM#	(4)	INSTRUMENT PANEL ITEM NUMBER
*PNL-PLANE	(2)	PANEL PLANE AS INDICATED PANEL DRAWINGS - A, B, C OR NA

PANEL - CODE DATA SET

COMPNO	(14)	COMPONENT NUMBER
*PNL-CODE	(20)	HUMAN FACTORS CODING USED ON CONTROL ROOM PANELS

NOTE: '*' INDICATES NEW DATA ELEMENT

METHOD


SIMULATOR DRAWINGS
IDENTIFIED COMPONENTS
BY ITEM NUMBER
MODIFIED EXISTING
DESIGN DATABASE
WALKDOWNS
COLLECTED DATA
TIED COMPONENT NUMBER
TO PANEL ITEM NUMBER
DEVELOPED PANEL
MARK-UP DRAWINGS
ADDED COMPONENT NUMBERS
TO NEW COMPONENTS
DATA ENTRY INTO
DATABASE
CADDS
CHECK
INVENTORY
ISSUED PANEL DRAWINGS

DCRDR INPUT DATA SHEET
DCRDR INVENTORY

__ ADDITION ✓ CHANGE __ DELETION

COMPNO : 0FI2192 PNLLOC : 1C33 PNL-PLANE : N/A SYSNO : 69

PNL-ITEM# : 3 SERV-DESC : WASTE GAS DISCHARGE FLOW

PNL-CODING : — COMP : ~~FLOW INDICATOR~~ 2

HF-TYPE : 40 SR-FUNCTION : _____

HANDSWITCH

ACTION : _____ CNTRL-COMP : _____

POSITIONS :

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

DISPLAY

MEASURED1 : 10 MEASURED2 : _____

UNITS1 : 50 UNITS2 : _____

RANGE1 : 0-50 RANGE2 : _____

DIV1 : 1 DIV2 : _____

ACCURACY1 : _____ ACCURACY2 : _____

ANNUNCIATOR TEXT

1. _____
2. _____
3. _____
4. _____

INITIATED: MSB DATE : 3-7-86

AS-BUILT APPROVAL: RM DATE : 8/8/86

AS-BUILT COMPUTER INPUT: _____ DATE : 8/21/86

CALVERT CLIFFS NUCLEAR POWER PLANT
HUMAN FACTORS ENGINEERING
COMPONENT LIST

ITEM#	PLANE	COMPONENT	SERVICE DESCRIPTION	HI
0051	C	1TI122H	LOOP 12 HOT LEG TEMP	DISPLAY
			HF-TYPE: METER - EDGEWISE, VERTICAL	
			PARAMETER: TEMPERATURE	
			UNITS: DEGREES FAHRENHEIT	
			RANGE: 515-665	
			DIVISIONS: 5	
			PANEL CODING: ** NONE **	
0052	C	1HS103	REACTOR VESSEL VENT VALVE	HANDSWITC
			HF-TYPE: SELECTOR UNLIGHTED/KEY	
			HS-ACTION: MAINTAINED	
			CONTROL-COMP: NON - THROTTABLE VALVE	
			POSITIONS: 2 OPEN	
			1 CLOSE	
			PANEL CODING: OPEN	
			CLOSE	
0053	C	1HS105	PRSR VESSEL VENT VALVE CONTROL	HANDSWITC
			HF-TYPE: SELECTOR UNLIGHTED/KEY	
			HS-ACTION: MAINTAINED	
			CONTROL-COMP: NON - THROTTABLE VALVE	
			1 CLOSE	
			2 OPEN	
			PANEL CODING: OPEN	
			CLOSE	
0054	C	1HS104	REACTOR VESSEL VENT VALVE	HANDSWITC
			HF-TYPE: SELECTOR UNLIGHTED/KEY	
			HS-ACTION: MAINTAINED	
			CONTROL-COMP: NON - THROTTABLE VALVE	
			2 OPEN	
			1 CLOSE	
			PANEL CODING: OPEN	
			CLOSE	

GUIDELINE

COMPLIANCE CHECKLIST

N/A	Yes	No	Reference/Comment

6.4.3.3 LEGEND PUSHBUTTONS

Legend pushbuttons are rectangular self-illuminated pushbuttons which display a written legend, usually as one or more small illuminated tiles. Legend pushbuttons serve both as a control (switch) and as a display (legend light). Depending on system design, a legend may be lighted either when the operator activates the pushbutton, or when a change occurs in system condition. Legend pushbuttons may have more than one display area.

a.	DISCRIMINABILITY – Legend pushbuttons should be readily distinguishable from legend lights. This may be achieved by distinctive shape, labeling, location, or other techniques. (See also Guideline 6.5.3.3.)		✓	RK 3/3
b.	LEGEND			
	(1) The legend should be readable under ambient light conditions, with or without internal illumination.		✓	RK 3/3
	(2) The illuminated condition should be clearly recognizable under the highest predicted ambient light condition and should be at least 10% brighter than the surrounding panel.		✓	RK 3/3
	(3) Legend lettering and contrast should conform to recommendations for legend lights (Guideline 6.5.3.3).		✓	JC 5/6
	(4) The legend message should be specific, unambiguous, and concise.		✓	RK 3/3
	(5) The legend message should contain no more than three lines of lettering.		✓	RK 3/3
c.	PROVISION FOR LAMP FAILURE			
	(1) A lamp test or dual lamp/dual filament capability should be provided.		✓	RK 3/3 HFE 191
	(2) Lamps within the pushbutton should be replaceable from the front of the panel.		✓	RK 3/3

HED NO.	DISCREPANCY
51	CONTROLS ARE POSITIONED MORE THAN 25 INCHES FROM THE FRONT EDGE OF CONSOLE
259	MORE THAN NINE GRADUATIONS SEPARATE NUMBERS ON CITED METER DISPLAYS
271	CITED METERS ARE TOO HIGH TO BE READ EASILY
92	THIS PANEL IS LESS THAN 50" FROM THE BACK WALL/CABINET
618	THE CONTROL ROOM TEMPERATURE REACHES BOTH HOT AND COLD EXTREMES
584	ILLUMINATION AT THE PANEL IS GREATER THAN 50 FOOTCANDLES

CHECKLIST HED BREAKDOWN

NUMBER OF HEDS	SECTION	TOPIC AREA
169	6.1	CONTROL ROOM WORKSPACE
7	6.2	COMMUNICATIONS
67	6.3	ANNUNCIATOR WARNING SYSTEM
49	6.4	CONTROLS
116	6.5	VISUAL DISPLAYS
129	6.6	LABELS AND LOCATION AIDS
30	6.7	PROCESS COMPUTERS
57	6.8	PANEL LAYOUT
67	6.9	CONTROL-DISPLAY INTEGRATION

VALIDATED PROCEDURES

EOP-0	STANDARD POST TRIP ACTIONS
EOP-1	REACTOR TRIP
EOP-2	LOSS OF OFFSITE POWER
EOP-3	LOSS OF FEEDWATER
EOP-4	EXCESS STEAM DEMAND
EOP-5	LOSS OF COOLANT ACCIDENT
EOP-6	STEAM GENERATOR TUBE RUPTURE
OP-1	UNIT ONE PLANT START-UP FROM COLD SHUTDOWN
OP-2	PLANT START-UP FROM HOT STANDBY TO MIN LOAD (U1)

ANTICIPATED TRANSIENT W/O SCRAM (following a loss of offsite power)

TASK ANALYSIS CHECKLIST

(Rev. 1)

PROCEDURE _____ SECTION _____

	N/A	YES	NO
1) EOP/TASK ANALYSIS CROSS-REFERENCE MISMATCH.....	____	____	___
A. TASK (OTHER THAN ALTERNATE ACTION NOT PERFORMED) _____ TASK #'s _____, _____ _____, _____ _____, _____			
B. ADDITIONAL TASK(s) PERFORMED BUT NOT REFERENCED _____			
2) TASK ELEMENT NOT IN SEQUENCE PERFORMED.....	____	____	___
3) COMPONENTS REFERENCED ARE INAPPROPRIATE.....	____	____	___
A. COMPNO_____ INCLUDE____ DELETE____			
B. COMPNO_____ INCLUDE____ DELETE____			
C. COMPNO_____ INCLUDE____ DELETE____			
D. COMPNO_____ INCLUDE____ DELETE____			
4) INDIVIDUAL WORKLOAD TOO COMPLEX.....	____	____	___
A. PANEL TO PANEL MOVEMENT EXCESSIVE ____			
B. OPERATOR INTERFERENCE WITH ONE ANOTHER ____			
C. COMPLETION TIME UNUSUALLY HIGH ____			

COMMENTS:

REVIEWER _____ DATE _____

(Rev. 1)

PROCEDURE _____ SECTION _____

	N/A	YES	NO
1) REQUIRED DISPLAYS/CONTROLS NOT AVAILABLE.....	____	____	___
2) INADEQUATE DISPLAY CHARACTERISTICS.....	____	____	___

COMPNO	A	B	C
RANGE			
UNITS			
DIVSIONS			
RESPONSE			
ACCURACY			

	N/A	YES	NO
3) INADEQUATE CONTROL CHARACTERISTICS.....	____	____	___

COMPNO	A	B	C
DISP/CONT RELATION			
INCR CNTL: THROTTLE			
CONTROLLER			
RESPONSE			

	N/A	YES	NO
4) INADEQUATE CONTROL BOARD FORMAT.....	____	____	___

A. MIMICS ____
B. DEMARCATION ____
C. ORIENTATION ____
D. GROUPING ____

	N/A	YES	NO
5) ADVERSE EFFECT OF DISPATCHING OPERATOR.....	____	____	___

A. RESPONSE TIME ____
B. HARSH ENVIRONMENT ____

	N/A	YES	NO
6) DIFFICULTIES IN DETERMINING SYSTEM FUNCTION STATUS	____	____	___

A. TOO MANY PARAMETERS ____
B. CONFUSING PARAMTERS ____

COMMENTS:

REVIEWER _____ DATE _____

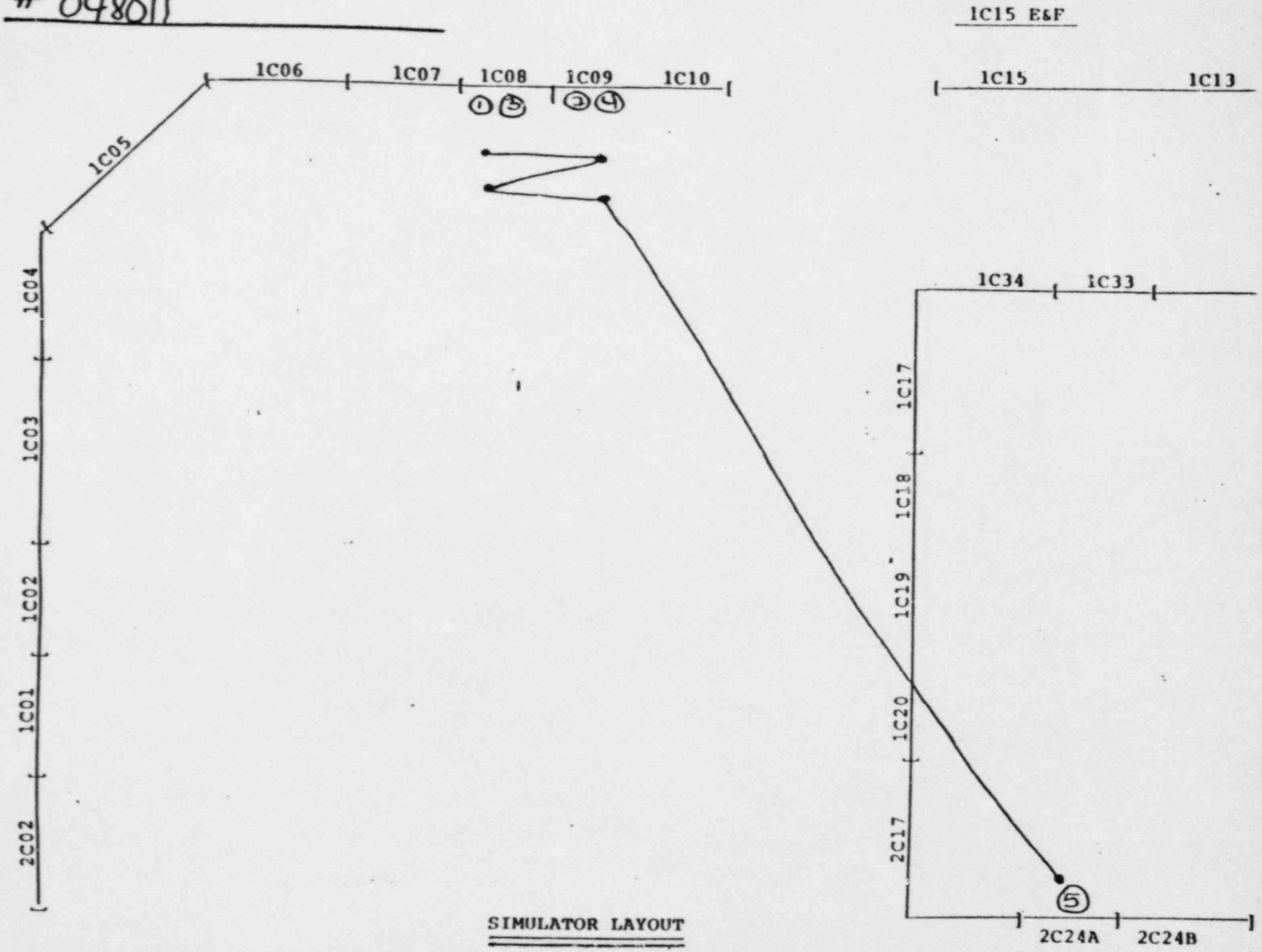
PROCEDURE _____ SECTION _____

		N/A	YES	NO
1)	NOT CLEARLY UNDERSTOOD.....	____	____	___
	A. FUNCTION AND/OR SUBFUNCTION UNCLEAR ____			
	B. DIRECTED ACTION UNCLEAR ____			
	C. INFORMATION NOT IN PROPER FORMAT ____			
2)	ADVERSE EFFECT OF CROSS-REFERENCE.....	____	____	___
	A. FIGURE, CHART, TABLE NOT READILY ACCESSABLE ____			
	B. INFORMATION NOT IN PROPER FORMAT ____			
	C. PROCEDURE CROSS REFERENCE ____			
3)	INDIVIDUAL WORKLOAD TOO COMPLEX.....	____	____	___
	A. PANEL TO PANEL MOVEMENT EXCESSIVE ____			
	B. OPERATOR INTERFERENCE WITH ONE ANOTHER ____			
	C. COMPLETION TIME UNUSUALLY HIGH ____			
4)	COMMUNICATION DIFFICULTIES.....	____	____	___

COMMENTS:

REVIEWER _____ DATE _____

048011



SIMULATOR LAYOUT

VALIDATION HEDS

HED NUMBER	DISCREPANCY
1036	Annunciators should flash prior to acknowledgment. Difficult to discern recently activated windows from previously acknowledged windows.
1042	There is no 14 FW heater status indication in the control room.
1053	Letdown flow controller is located on 1C06. Letdown flow indication is on 1C07. Two operators are required to perform this basic task.
1054	Low suction pressure on AFW pumps is an entry requirement of EOP-3. There is no pressure meter in the control room. A mini-annunciator is the only form of indication.
1056	Cited indicators were at full scale during event. Therefore, actual flow could not be determined.

CHECKLIST	691
VERIFICATION	70
VALIDATION	68
OPERATOR SURVEY	197
1580 TRANSFERS	59

HUMAN ENGINEERING DISCREPANCY RECORD

REVIEWER: DLW UNIT:3 DATE: 02/28/86 SOURCE: CL NUMBER: 67

PANEL	ITEM NO.	PANEL	ITEM NO.	PANEL	ITEM NO.
1C20	141	-----	----	-----	----
1C20	165	-----	----	-----	----
1C20	166	-----	----	-----	----
1C20	168	-----	----	-----	----
1C20	169	-----	----	-----	----
1C20	173	-----	----	-----	----
-----	----	-----	----	-----	----

DESCRIPTION OF DISCREPANCY

CONTROLS ARE NOT SET BACK 3 INCHES FROM FRONT EDGE OF CONSOLE.
(69-73; 664)

GUIDELINE: 6.1.2.2.D.1

CATEGORY: 1 PRIORITY: B STATUS: FCR

PHOTO NO. 0 PHOTO INSTRUCTIONS:

PHOTO CAPTION:

FCR: MR:

RESOLUTION:GUARDRAILS SHOULD BE INSTALLED. THERE IS NO KNOWN HISTORY OF ACCIDENTAL ACTIVATION AT CONFF INVOLVING 'BUMPS' OR CONTROL SWITCHES CATCHING ON CLOTHING, ALTHOUGH THE POSSIBILITY DOES EXIST.

SEE HEDS 70,71,72,73,664,952 AND 974

CLOSEOUT DATE: / /

HEDs AND TASK(S) ASSOCIATED WITH PANEL 1C03 ITEM 98 OF HED NO. 341 DATE:10/02/87

HED NO.	*STATUS*	*DESCRIPTION*
85	RP-29	CONTROLLE DISPLAY AN INDICATION OF DEMAND STATUS THAT IS NOT LABELED. (81-85)
210	RP-36	DIRECTION OF MOTION IS NOT IDENTIFIED FOR CONTINUOUS MOTION ROTARY CONTROLS MOUNTED ON CONTROLLERS. (210-214, 290-291) THIS SUPERSEDES 1580 HED NO. 37-CL
221	RP-44	THE DIRECTION OF MOVEMENT OF THE VALUVE POSITION DEMAND ROTARY CONTROL KNOB AND DEMAND DISPLAY BELOW IT IS NOT EVIDENT.
230	RP-45	FOR CONTROLLERS, THE VALVE DEMAND POSITION ROTARY CONTROL KNOB IS NOT MARKED TO INDICATE THE LIMITS OR RATE OF MOVEMENT WITH RELATION TO THE ADJACENT DISPLAY.THIS SUPERSEDES 1580 HED NO 81-CL
282	RP-43	CONTROLLERS REPRESENT A SINGLE CONTROL-DISPLAY PAIR. THE VALVE DEMAND POSITION INDICATION IS OBSCURED DURING MANIPULATION OF THE ROTARY CONTROL KNOB LOCATED ABOVE THE METER. THIS ALONG WITH HEDS 282,283,284,285,286 AND 287 SUPERSEDE 1580 HED NO. 278
341	RP-26	CONTROL-DISPLAY PAIRS ARE NOT ARRANGED WITH THE CONTROL BELOW THE DISPLAY. CONTROLLERS ARE A CONTROL DISPLAY PAIR WITH THE VALVE DEMAND POSITION CONTROL KNOB ABOVE THE ASSOCIATED DISPLAY.
573	--------	CONTS & DISPS ARE GROUPED BY SYS AND TASK, BUT WITHIN THOSE GROUPINGS COMPONENTS ARE NOT ORDERED BY FREQUENCY OF USE OR IMPORTANCE.1C03 FEED SYS HAS THIS PROBLEM AT LOW POWER IN MAN MODE.AN OPERATOR HAS TO WORK WITH CONTROLLERS 2-3 FT APART AT THE SAME TIME.
604	TRANSF	CONTROLLERS ARE MOUNTED TOO CLOSE TO THE EDGE OF THE PANEL. THEY ARE 2 1/2 INCHES FROM THE EDGE INSTEAD OF THE SPECIFIED 3 INCHES. (SEE HED'S 69-72) THIS SUPERCEDES 1580 HED NO. 8-OR
747	---- ----	Failure of the demand signal is demonstrated on controllers with a manual capability, by zero being read on the demand output meter. This is not necessarily consistent with the failure of the plant component ie. FAIL OPEN/FAIL CLOSE/ FAIL AS IS. The operator may be misled. See HED #754.

TASK(S)

045014	1HIC4516	START MFW pumps
045015	1HIC4516	ENSURE Main Feedwater is operating
045020	1HIC4516	MODULATE MFW in manual to control SG level

HED NO.	STATUS	CAT/PRI	GUIDELINE	DESCRIPTION
40	RP-4	/	6.3.3.3.C.2	THE COORDINATES USED TO IDENTIFY ANNUNCIATOR TILES ARE SHOWN AT THE BOTTO OF EACH COLUMN OF TILES. A COORDINATE SYSTEM AT THE TOP AND LEFT SIDE OF THE ANNUNCIATOR PANELS IS PREFERRED. (J1-40)
617	RP-4	/	6.3.3.3.C.3	LETTER HEIGHT FOR ANNUNCIATOR PANEL COORDINATE DESIGNATION IS 0.18" FOR ION DESIGNATORS AND 0.1" FOR INDIVIDUAL TILE DESIGNATION.
41	RP-5	/	6.3.3.3.D.1	THE NUMBER OF ALARM TILES OF THE CITED ANNUNCIATOR ALARM BOXES EXCEEDS 50. BOX H ON THESE PANELS HAS 56 TILES.
42	RP-5	/	6.3.3.3.D.1	THE NUMBER OF ALARM TILES OF THE CITED ANNUNCIATOR ALARM BOXES EXCEEDS 50 BOX E ON THESE PANELS HAS 64 TILES.
77	RP-5	/	6.3.3.4.A.	THE CITED ANNUNCIATOR DOES NOT ACCURATELY DESCRIBE THE ALARM CONDITION. ("LETDOWN ISOLATED 1CV2085" MEANS INSTRUMENT AIR INSIDE THE CONTAINMENT HAS BEEN LOST.)
44	RP-5	/	6.3.3.4.C.	ANNUNCIATOR TILE LEGENDS ADDRESS MORE THAN ONE PARAMETER. 1&2ANNUN-E1,51,55,59,63
625	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT ON ANNUNCIATOR PANEL FAILS TO SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES FOR ALL EXISTING LETTER SIZES ON PANEL.
626	RP-18	/	6.3.3.5.A.1	SMALL, MEDIUM AND LARGE LETTER HEIGHTS ON ANNUNCIATOR PANEL FAIL TO SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES.
627	RP-18	/	6.3.3.5.A.1	LARGE AND SMALL LETTER HEIGHTS ON ANNUNCIATOR PANEL FAIL TO SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES.
628	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT ON ANNUNCIATOR PANEL FAILS TO SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES.
629	RP-18	/	6.3.3.5.A.1	MEDIUM AND SMALL LETTER HEIGHTS ON ANNUNCIATOR PANELS FAIL TO SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES.
630	RP-18	/	6.3.3.5.A.1	LETTER HEIGHTS ON ANNUNCIATOR PANEL DO NOT SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES.
631	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT DOES NOT SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES FOR ANY EXISTING SIZE OF LETTER HEIGHT.
632	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT DOES NOT SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES FOR ANY EXISTING SIZE OF LETTER HEIGHT.
633	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT DOES NOT SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES FOR ANY EXISTING SIZE OF LETTER HEIGHT.
635	RP-18	/	6.3.3.5.A.1	LETTER HEIGHT DOES NOT SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES FOR ANY EXISTING SIZE OF LETTER HEIGHT.

BALTIMORE GAS & ELECTRIC HUMAN ENGINEERING DISCREPANCY REPORT DATE:10/02/87

ALL HEDS WITH THE STATUS:RP-5 SORTED BY HED NO.

HED NO.	STATUS	CAT/PRI	GUIDELINE	DESCRIPTION
22	RP-5	/	6.3.1.2.D.1	ALARMS FOR SHARED PLANT SYSTEMS (VENTILATION SYSTEMS) ARE LOCATED ONLY IN UNIT 1 CONTROL ROOM. THIS IS A SHARED CONTROL ROOM SO THESE PANELS ARE ACCESSIBLE TO BOTH UNITS.
26	RP-5	/	6.3.1.5.A.	NOT ALL CLEARED ALARMS HAVE AN AUDIBLE SIGNAL TO INDICATE THAT THE ALARM HAS CLEARED. AUDIBLE SIGNAL FOR ALL CLEARED ALARMS IS GIVEN IN SIMULATOR. AUDIBLE SIGNAL MUST BE ACKNOWLEDGED TO SILENCE. THIS APPLIES TO ALL ANNUNCIATORS.(DID WORK LIKE THIS BUT FOR DELETED)
27	RP-5	/	6.3.2.1.F.	ANNUNCIATOR AUDITORY ALERT SIGNAL IS COMMON FOR ALL WORK STATIONS WITHIN EACH UNIT. ALTHOUGH THERE ARE SEPARATE AUDITORY SIGNALS FOR EACH UNIT, THERE IS NOT A SEPARATE SIGNAL FOR EACH INDIVIDUAL PANEL/WORK STATION.
28	RP-5	/	6.3.3.1.B.1	EACH ANNUNCIATOR PANEL DOES NOT HAVE AN INDIVIDUAL LABEL. THERE CITED PANELS ARE IDENTIFIED ONLY BY THE CONTROL PANEL IDENTIFICATION LABEL AT THE TOP OF THE PANEL. (28-30)
29	RP-5	/	6.3.3.1.B.1	EACH ANNUNCIATOR PANEL DOES NOT HAVE AN INDIVIDUAL LABEL. THESE CITED PANELS ARE IDENTIFIED ONLY BY THE CONTROL PANEL IDENTIFICATION LABEL AT THE TOP OF THE PANEL. (28-30)
30	RP-5	/	6.3.3.1.B.1	EACH ANNUNCIATOR PANEL DOES NOT HAVE AN INDIVIDUAL LABEL. THESE CITED PANELS ARE IDENTIFIED ONLY BY THE CONTROL PANEL IDENTIFICATION LABEL AT THE TOP OF THE PANEL. (28-30)
41	RP-5	/	6.3.3.3.D.1	THE NUMBER OF ALARM TILES OF THE CITED ANNUNCIATOR ALARM BOXES EXCEEDS 50. BOX H ON THESE PANELS HAS 56 TILES.
42	RP-5	/	6.3.3.3.D.1	THE NUMBER OF ALARM TILES OF THE CITED ANNUNCIATOR ALARM BOXES EXCEEDS 50. BOX E ON THESE PANELS HAS 64 TILES.
44	RP-5	/	6.3.3.4.C.	ANNUNCIATOR TILE LEGENDS ADDRESS MORE THAN ONE PARAMETER. 1&2ANNUN-E1,51,55,59,63
46	RP-5	/	6.3.4.1.B.2	ANNUNCIATOR ALARMS FOR EACH UNIT CAN BE ACKNOWLEDGED FROM ANY ANNUNCIATOR "ACKNOWLEDGE" BUTTON FOR THAT UNIT. THE OPERATOR DOES NOT HAVE TO ACKNOWLEDGE THE ALARM FROM THE PANEL WHERE IT ORIGINATED.
47	RP-5	/	6.3.4.2.B.	ANNUNCIATOR RESPONSE CONTROLS ARE NOT CODED FOR EASY RECOGNITION. THERE IS NO COLOR CODING, BACKGROUND SHADING, DEMARCATION OR SHAPE CODING TO HIGHLIGHT THE GROUPS OF ANNUNCIATOR RESPONSE CONTROLS. (47-50)
48	RP-5	/	6.3.4.2.B.	Annunciator response controls are not coded for easy recognition. There is no color coding, background shading, demarcation or shape coding to highlight the groups of annunciator response controls.
49	RP-5	/	6.3.4.2.B.	ANNUNCIATOR RESPONSE CONTROLS ARE NOT CODED FOR EASY RECOGNITION. THERE IS NO COLOR CODING, BACKGROUND SHADING, DEMARCATION OR SHAPE CODING TO HIGHLIGHT THE GROUPS OF ANNUNCIATOR RESPONSE CONTROLS. THIS SUPERSEDES 1580 HED R.. 601-02.

HUMAN ENGINEERING DISCREPANCY RECORD

REVIEWER: LC UNIT:1 DATE: 03/07/86 SOURCE: CL NUMBER: 354

PANEL	ITEM NO.	PANEL	ITEM NO.	PANEL	ITEM NO.
1C03	84	-----	----	-----	----
1C03	85	-----	----	-----	----
-----	----	-----	----	-----	----
-----	----	-----	----	-----	----
-----	----	-----	----	-----	----
-----	----	-----	----	-----	----
-----	----	-----	----	-----	----

DESCRIPTION OF DISCREPANCY

A LABEL ON THE GLASS COVER OF THE RECORDER IS WORN AND IS COMING OFF.

GUIDELINE: 6.5.1.4.A.

CATEGORY: PRIORITY: STATUS: RP-30

PHOTO NO. 0 PHOTO INSTRUCTIONS:

PHOTO CAPTION:

FCR: MR:

RESOLUTION:

HF EVALUATION:

CLOSEOUT DATE: / /

HEDs AND TASK(S) ASSOCIATED WITH PANEL 1C03 ITEM 84 OF HED NO. 354 DATE:05/07/87

HED NO.	*STATUS*	*DESCRIPTION*
354	RP-30	A LABEL ON THE GLASS COVER OF THE RECORDER IS WORN AND IS COMING OFF.

TASK(S)

0J6050	1LR1111	TERMINATE aux feedwater flow into SG 11 from Fire Main Water via AFW pp 13
063003	1LR1111	DETERMINE Steam Generator 11 level
063009	1LR1111	DETERMINE if a SG is available for use as a heat sink
0J6053	1LR1111	START and modulate aux feedwater flow to achieve desired level in SG 11 from Fire Main Water via AFW pp 23

HUMAN ENGINEERING DISCREPANCY RECORD

REVIEWER: DLW UNIT:3 DATE: 02/28/86 SOURCE: CL NUMBER: 67

PANEL	ITEM NO.	PANEL	ITEM NO.	PANEL	ITEM NO.
1C20	141	-----	----	-----	----
1C20	165	-----	----	-----	----
1C20	166	-----	----	-----	----
1C20	168	-----	----	-----	----
1C20	169	-----	----	-----	----
1C20	173	-----	----	-----	----
-----	----	-----	----	-----	----

DESCRIPTION OF DISCREPANCY

CONTROLS ARE NOT SET BACK 3 INCHES FROM FRONT EDGE OF CONSOLE.
(69-73; 664)

GUIDELINE: 6.1.2.2.D.1

HF EVALUATOR: _____ DATE: _____

DCRDR PROJECT LEADER: _____ DATE _____

ATTACHMENT ONE

DCRDR ASSESSMENT STATUS REPORT DATE:10/02/87

* ASSESSMENT OVERVIEW *

PERCENT OF ASSESSMENT COMPLETE.....44

TOTAL NUMBER OF HEDS TO ASSESS.....1095

TOTAL NUMBER OF HEDS ASSESSED.....479

** BREAKDOWN OF ASSESSMENT RESULTS **

STATUS	TOTAL COUNT	% OF ASSESSED HEDS (approx)
FCR	31	6
MR	2	0
REVIEW	2	0
TRANSFERRED	~~210~~	44
CORRECTED	12	3
RESOLVED	13	3
NO ACTION	209	44

DCRDR PROJECT TEAM MEMBERS

BRUCE MROWCA ------ I&C ENGINEERING ------ PROJECT LEADER

J. B. WINTER --- INDUSTRIAL PSYCHOLOGIST -- HF SPECIALIST

JEFF HUNT ---------- OPERATIONS/ENGINEERING/SRO

JEFF JOZWIAK ------- ELECTRICAL ENGINEERING

PAUL PIERINGER ----- OPERATIONS/ENGINEERING/QA/(RO-EXPIRED)

KEN SHAFFER -------- ENGINEERING TECHNICIAN

JIM YOE ----------- OPERATIONS/TRAINING/SRO

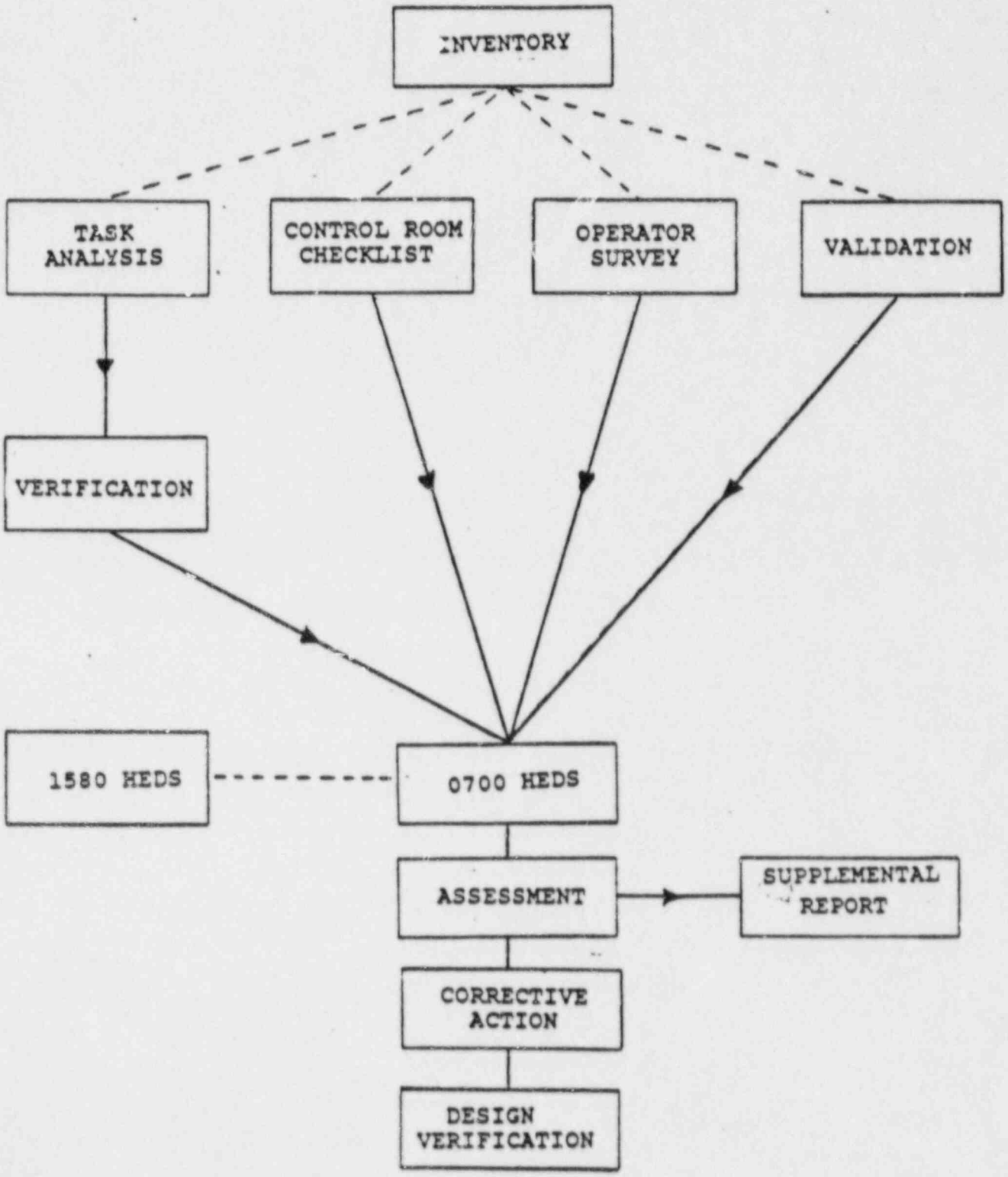
OVERSIGHT COMMITTEE

R. F. ASH	GENERAL SUPERVISOR, DESIGN ENGINEERING
R. P. HEIBEL	GENERAL SUPERVISOR, OPERATIONS
K. J. NIETMANN	GENERAL SUPERVISOR, NUCLEAR TRAINING
R. L. WENDERLICH	GENERAL SUPERVISOR, E & C MAINTENANCE

1. AN INVENTORY OF THE CONTROL ROOM TO IDENTIFY AND DESCRIBE THE PERFORMANCE FEATURES OF THE EXISTING INSTRUMENTATION AND EQUIPMENT.

2. A REVIEW AND ANALYSIS OF SYSTEM FUNCTIONS AND CONTROL ROOM OPERATOR TASKS, TO ESTABLISH THE INSTRUMENTATION AND EQUIPMENT REQUIREMENTS AND THE PREFORMANCE CRITERIA FOR THE TASKS OPERATORS ARE EXPECTED TO ACCOMPLISH.

3. VERIFICATION OF TASK PERFORMANCE CAPABILITIES, IN WHICH THE INSTRUMENT AND EQUIPMENT REQUIREMENTS DERIVED FROM TASK ANALYSIS ARE COMPARED TO THE ITEMS PRESENTLY IN THE CONTROL ROOM INVENTORY.


INVENTORY
TASK ANALYSIS
CONTROL ROOM CHECKLIST
OPERATOR SURVEY
VALIDATION
VERIFICATION
1580 HEDS
0700 HEDS
ASSESSMENT
SUPPLEMENTAL REPORT
CORRECTIVE ACTION
DESIGN VERIFICATION

4. A REVIEW OF OPERATING EXPERIENCE, INCLUDING EXAMINATION OF PLANT PERFORMANCE RECORDS AND A SURVEY OF CONTROL ROOM OPERATORS.

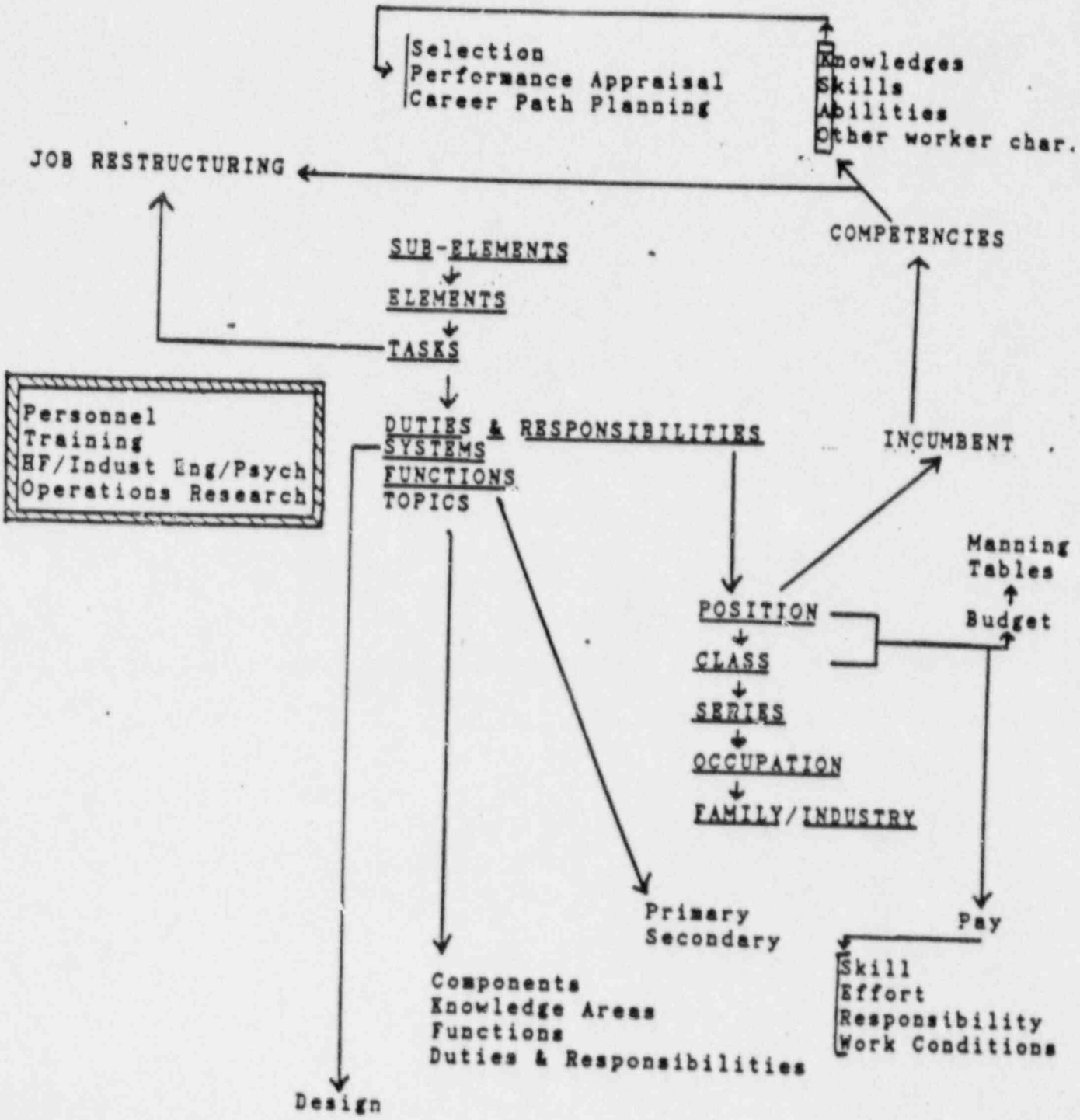
5. A SURVEY OF THE CONTROL ROOM IN WHICH THE INSTRUMENTATION, CONTROLS, OTHER EQUIPMENT, AMBIENT CONDITIONS, AND OTHER FEATURES ARE CHECKED AGAINST HUMAN ENGINEERING GUIDELINES.

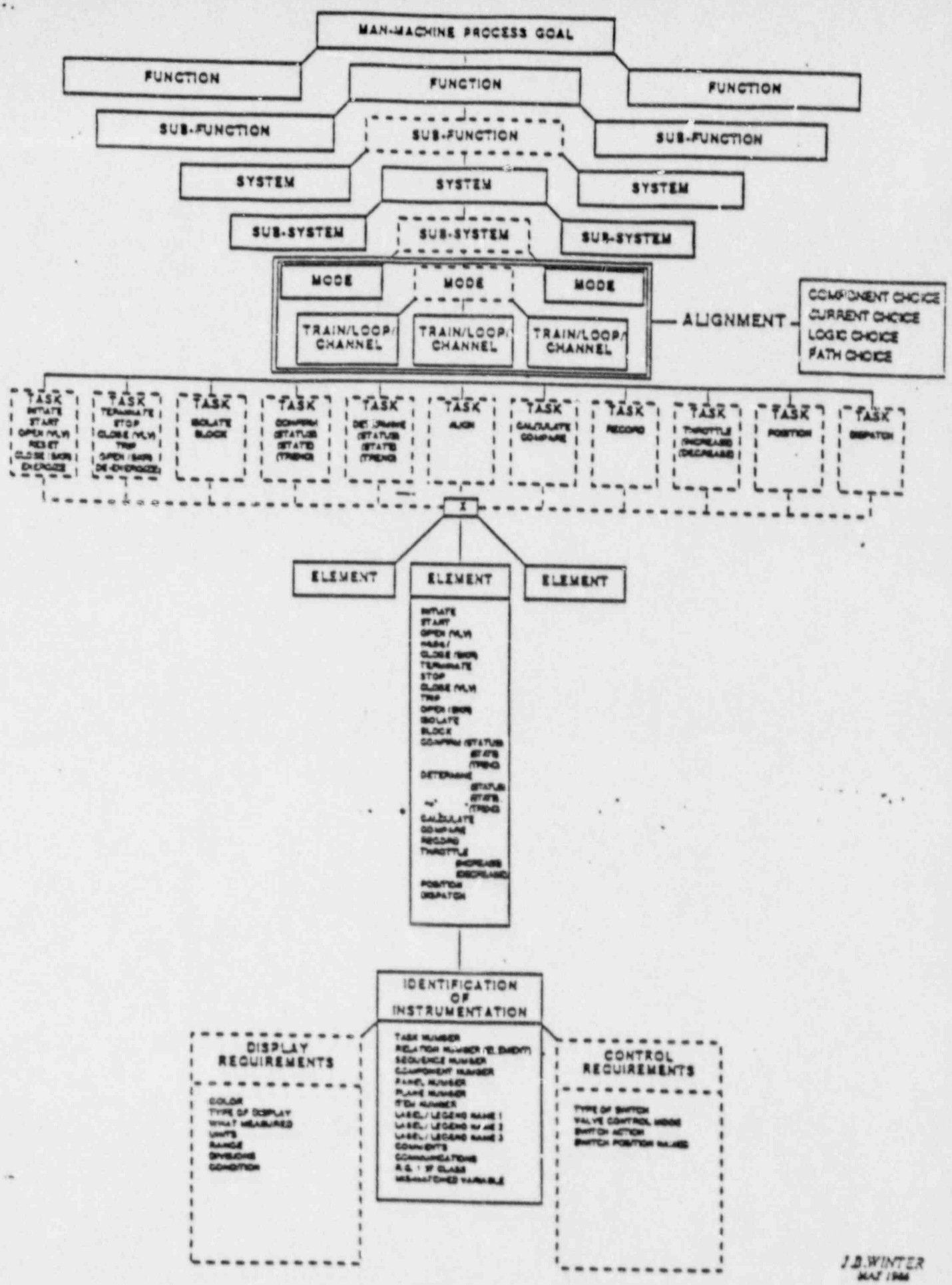
6. VALIDATION OF THE CONTROL ROOM FUNCTIONS, IN WHICH THE RELATIONSHIPS AND DEPENDENCIES IN OPERATING CREW ACTIVITIES AND BETWEEN THE OPERATORS AND PLANT PROCESS ARE EXAMINED IN THE CONTEXT OF OPERATIONAL SEQUENCES.

TASK

A TASK IS A RELATIVE CONCEPT. IT IS THE SMALLEST PORTION OF WORK THAT CAN LOGICALLY STAND ALONE, THAT IS GENERALLY PERFORMED BY ONE PERSON, AND HAS A STATED PURPOSE OR GOAL.

MULTIPURPOSE TASK ANALYSIS




MAN-MACHINE PROCESS GOAL
FUNCTION
FUNCTION
FUNCTION
SUB-FUNCTION
SUB-FUNCTION
SUB-FUNCTION
SYSTEM
SYSTEM
SYSTEM
SUB-SYSTEM
SUB-SYSTEM
SUB-SYSTEM
MODE
MODE
MODE
TRAIN/LOOP/ CHANNEL
TRAIN/LOOP/ CHANNEL
TRAIN/LOOP/ CHANNEL
ALIGNMENT
COMPONENT CHOICE
CURRENT CHOICE
LOGIC CHOICE
PATH CHOICE
TASK
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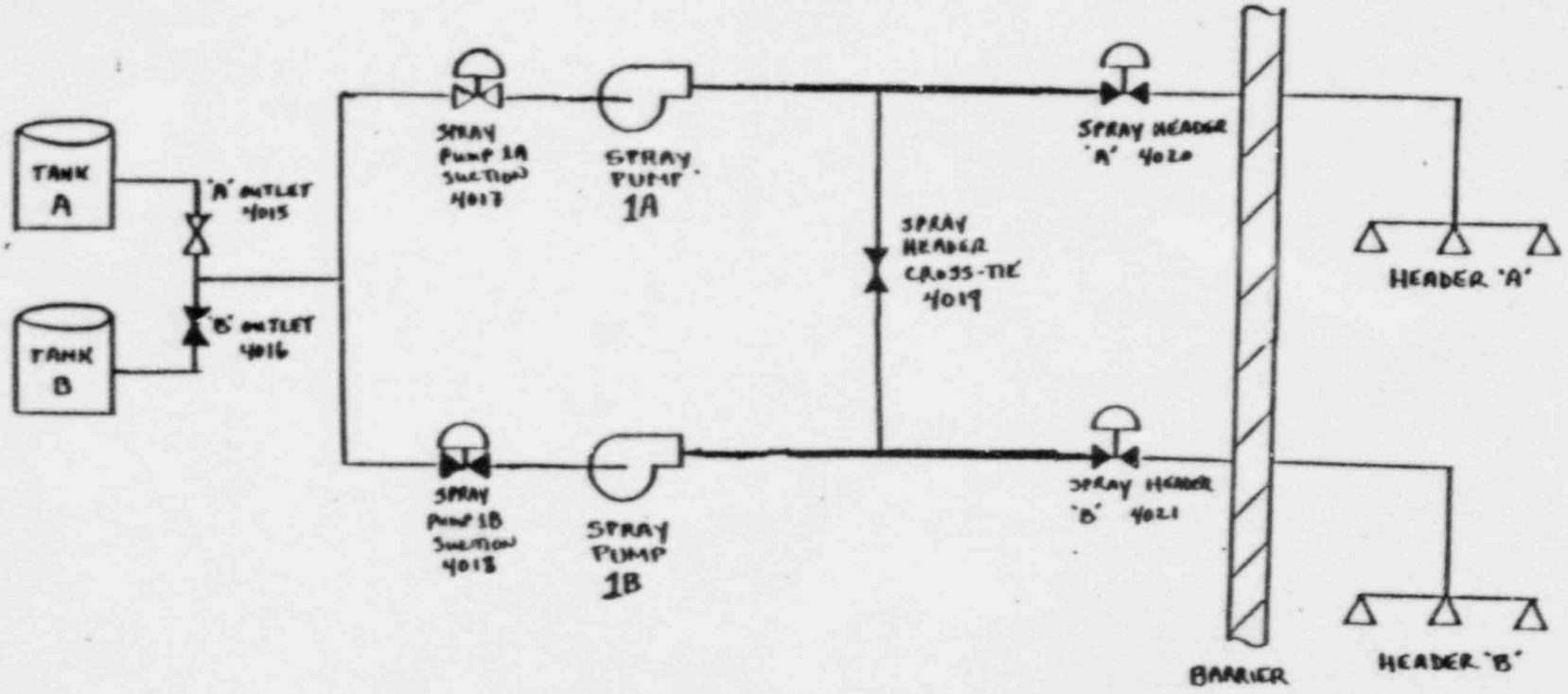
ELEMENT
ELEMENT
ELEMENT
IDENTIFICATION OF INSTRUMENTATION
DISPLAY REQUIREMENTS
CONTROL REQUIREMENTS
J.B.WINTER
MAY 1986



	'A' TANK	'B' TANK	'A' OUTLET	'B' OUTLET	1A SUCTION	1B SUCTION	1A PUMP	1B PUMP	CROSS-TIE	SPRAY HEADER 'A'	SPRAY HEADER 'B'
ALIGNMENT #1	X		X		X		X			X	
#2	X		X			X		X			X
#3	X		X		X	X	X	X		X	X
#4	X		X		X		X		X		X
					ETC.						

SYSTEM COMPONENTS →

↓ LOGICAL POSSIBILITIES

INDEPENDENCE

WHAT IS

WHAT SHOULD BE

Function — Deviation documentation

Task —
- Possible alternatives (logical)
- Rank-ordered desirability of tasks
- Context of use (practicality) eg. transmitter isolation

Element —
- Parameter addition eg. Amps, suction pressure
- Task element allocation (DISPATCH TOO/ IN CR?)

Display & Control —
- LOCATION
- INCREASED CONTROL
- TYPE OF DISPLAY (VALUE, STATE, TREND)
- RANGE (DR, WR, OP RANGE)
- TYPE OF CONTROL
- DIVISIONS
- UNITS
- CONTROL ACTION

041039 TERMINATE charging flow from BAST11 and/or BAST12 via BA pp 11 and/or 12 and charging pp 11, and/or 12, and/or 13 through Loop 11A charging isolation bypass

041040 START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing BAST 11 and/or 12 via BA pp 11, and/or 12 & charging pp 11, and/or 12, and/or 13 thru the aux spray isolation

041041 START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing BAST 11 and/or 12 via gravity feed and charging pp 11, and/or 12, and/or 13 thru the aux spray isolation

041042 START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing the RWT via RWT charging suction & charging pp 11, and/or 12, and/or 13 thru the aux spray isolation

041043 START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing the VCT via VCT charging suction & charging pp 11, and/or 12, and/or 13 thru the aux spray isolation

041044 DETERMINE boration status

041045 DETERMINE total charging flow

041046 DETERMINE pressurizer/regen heat exchanger outlet differential temperature

041047 DETERMINE regen heat exchanger temperature

041048 COMPARE letdown flow and charging flow

041049 DETERMINE pressurizer pressure/charging pump discharge pressure relationship

041050 TERMINATE letdown

041051 ENSURE letdown

041052 BLOCK charging pp automatic initiation

041053 DETERMINE volume control tank (VCT) level

041054 DETERMINE if pressurizer aux spray is available

041055 RETURN the PLCS to automatic operation

TASK BREAKDOWN REPORT

DATE: 09/22/87

TASKCODE: 041043 SYSTEM: CVCS CSF(S : PRES & INVENTORY

PROCEDURE	SECTION					
EOP2	4J					
EOP3	4D	4Y				
EOP4	4L	4N	4P	4T		
EOP5	4I	4T				
EOP6	4E					
EOP9	4A	584	585	586	587	684

TASK STATEMENT

START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing the VCT via VCT charging suction & charging pp 11, and/or 12, and/or 13 thru the aux spray isolation

CUE

SETPOINT OR OPERATING LIMIT EXCEEDED

GOAL

DECREASE RCS PRESSURE

TASK ELEMENTS

01 CHECK OPEN CHARGING LINE ISOLATION VLVs CVS18 AND CVS19

01	1ZLS19R1	1C07	3	11A CHARGING HDR ISOLATION VLV CVS19 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18
02	1ZLS19R2	1C07	3	11A CHARGING HDR ISOLATION VLV CVS19 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18
03	1ZLS18R1	1C07	2	CHARGING LINE 12B CVS18 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18
04	1ZLS19R2	1C07	3	11A CHARGING HDR ISOLATION VLV CVS19 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18

02 DETERMINE VCT LEVEL (SEE TASK 041-053)

01 PERFORM STATED ACTION or REFER TO REFERENCED TASK CODE

03 CHECK OPEN VCT OUTLET VLV MOVS01

01	1ZLS01R1	1C07	45	VCT DISCH MOVS01 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18
02	1ZLS01R2	1C07	45	VCT DISCH MOVS01 POSITION LAMP	
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED	RG1.97: 18

04 START CHARGING PUMPS

01	1HS224X	1C07	49	CHARGING PUMP 11 CONTROL		
	TYPE:SELECT UNLGHT J-HAND		CONTROLLED:PUMP	SWITCH ACTION:SPRING RETURN	POSITION:START	
02	1ZL224X-R	1C07	87	CHARGING PP 11 INDICATION LAMP		
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED		RG1.97: 3B
03	1HS224Y	1C07	48	CHARGING PP 12 CONTROL		
	TYPE:SELECT UNLGHT J-HAND		CONTROLLED:PUMP	SWITCH ACTION:SPRING RETURN	POSITION:START	
04	1ZL224Y-R	1C07	85	CHARGING PP 12 INDICATION LAMP		
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED		RG1.97: 3B
05	1HS224Z	1C07	47	CHARGING PP 13 CONTROL		
	TYPE:SELECT UNLGHT J-HAND		CONTROLLED:PUMP	SWITCH ACTION:SPRING RETURN	POSITION:START	
06	1ZL224ZA-R	1C07	81	CHARGING PP 13 BUS 11A INDICATION LAMP		
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED		RG1.97: 3B
07	1ZL224Z-R	1C07	83	CHARGING PP 13 BUS 14A INDICATION LAMP		
	TYPE:INDICATOR LP		CONDITION:ENERGIZED	COLOR:RED		RG1.97: 3B

05 DETERMINE CHARGING PUMP AMPS

01	1II224X	1C07	67	CHARGING PP 11 AMP METER				
	TYPE:VALUE		MEASURED:CURRENT		UNITS:AMPS	RANGE:0-200	DIVISIONS:5	RG1.97: 18
02	1II224Y	1C07	68	CHARGING PP 12 AMP METER				
	TYPE:VALUE		MEASURED:CURRENT		UNITS:AMPS	RANGE:0-200	DIVISIONS:5	RG1.97: 18
03	1II224Z2	1C07	69	CHARGING PP 13 BUS 11A AMP METER				
	TYPE:VALUE		MEASURED:CURRENT		UNITS:AMPS	RANGE:0-200	DIVISIONS:5	RG1.97: 18
04	1II224Z1	1C07	72	CHARGING PP 13 BUS 14A AMP METER				
	TYPE:VALUE		MEASURED:CURRENT		UNITS:AMPS	RANGE:0-200	DIVISIONS:5	RG1.97: 18

06 DETERMINE PRESSURIZER LEVEL (SEE 064-001)

01 PERFORM STATED ACTION or REFER TO REFERENCED TASK CODE

07 DETERMINE CHARGING HEADER PRESSURE AND FLOW

01	1FIA212	1C07	21	CHARGING FLOW INDICATOR				
	TYPE:VALUE		MEASURED:FLOW		UNITS:GPM	RANGE:0-150	DIVISIONS:2	RG1.97: 18
02	1PI212	1C07	64	CHARGING HEADER PRESSURE INDICATOR				
	TYPE:VALUE		MEASURED:PRESSURE		UNITS:PSIG	RANGE:0-3000	DIVISIONS:50	RG1.97: 18

08 OPEN AUX SPRAY VLV CVS17

01	1HS2517	1C07	71	AUX PIR SPRAY ISOLATION VALVE CONTROL				
	TYPE:SELECT UNLGHT KEY		CONTROLLED:MOMTHROTTL VLV		SWITCH ACTION:MAINTAINED		POSITION:OPEN	
02	1ZL517R1	1C07	1	AUX PIR SPRAY VLV CVS17 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:RED			RG1.97: 18
03	1ZL517R2	1C07	1	AUX PIR SPRAY VLV CVS17 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:RED			RG1.97: 18

09 SHUT CHARGING HEADER STOP VLVs CVS18 AND CVS19

01	1HS2518	1C07	2	CHARGING LOOP 12A CVS18 CONTROL				
	TYPE:SELECT LGHT ROUND		CONTROLLED:MOMTHROTTL VLV		SWITCH ACTION:MAINTAINED		POSITION:CLOSE	
02	1ZL518G1	1C07	2	CHARGING LOOP 12A CVS18 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:GREEN			RG1.97: 18
03	1ZL518G2	1C07	2	CHARGING LINE 12A CVS18 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:GREEN			RG1.97: 18
04	1HS2519	1C07	3	CHARGING LOOP 11A CVS19 CONTROL				
	TYPE:SELECT LGHT ROUND		CONTROLLED:MOMTHROTTL VLV		SWITCH ACTION:MAINTAINED		POSITION:CLOSE	
05	1ZL519G1	1C07	3	CHARGING LOOP 11A CVS19 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:GREEN			RG1.97: 18
06	1ZL519G2	1C07	3	CHARGING LINE 11A CVS19 POSITION LAMP				
	TYPE:INDICATOR LP		CONDITION:ENERGIZED		COLOR:GREEN			RG1.97: 18

10 DETERMINE PRESSURIZER PRESSURE (SEE 064-002)

01 PERFORM STATED ACTION or REFER TO REFERENCED TASK CODE

11 ENTER OPERATION OF AUX SPRAY VLV CVS17 INTO TRANSIENT LOG

01 CONTROL COMMUNICATION TO: UNIT 1 CR OPERATOR

02 CONTROL COMMUNICATION TO: UNIT 1 REACTOR OPERATOR

03 CONTROL COMMUNICATION TO: CONTROL ROOM SUPERVISOR

TASK DEVELOPMENT

TASK NUMBER: UNIT _____ SYSTEM _____ SEQUENCE _____

PREPARED BY: _____

SAFETY FUNCTION: _____

SOURCE: _____

INITIATING CUES: _____

TASK: _____

RELATION NUMBER	ELEMENT

GOAL OF TASK: _____

TASK DEVELOPMENT

TASK NUMBER: UNIT _____ SYSTEM _____ SEQUENCE _____

RELATION NUMBER	ELEMENT

BG&E Task Analysis Requirements

Page ____ of ____

TASK IDENTIFICATION

DISPLAY REQUIREMENTS

CONTROL REQUIREMENTS

LABEL / LEGEND REQUIREMENTS

REG GUIDE 1.97

EQUIPMENT ID

COMMENTS

SAMPLE FORMATS

What Measured		UNITS	
16	Position	39	Percent
17	Pressure	11	Feet of Water
		18	Inches of Mercury
		19	Inches of Water
		45	Pounds Per Square Inch Atmospheric
		46	Pounds Per Square Inch Differential
		47	Pounds Per Square Inch Gauge
18	Purity	39	Percent
19	Radiation	02	Counts Per Minute
		03	Counts Per Second
		27	MicroCuries Per Cubic Centimeters
		28	MicroCuries Per Second
		32	Milliroentgens Per Hour
		49	Roentgens Per Hour
		53	Units
20	Reactive Load	21	Kilovars
		22	Megavars
21	Reactor Power	01	Amperes
		03	Counts Per Second
		42	Percent Thermal Power
		53	Units
		56	Watts Per Square Centimeter
22	Rod Position	36	Notches
		52	Steps
23	Speed	30	Miles Per Hour
		48	Revolutions Per Hour
		39	Percent
24	Start-up Rate	06	ecades Per Minute
25	Temperature	08	Degrees Centigrade
		09	Degrees Farenheit
26	Time	16	Hours
		36	Minutes
		50	Seconds
27	Vacuum	11	Feet of Water
		18	Inches of Mercury
		19	Inches of Water
28	Vibration	34	Mils

TASK ANALYSIS/START-UP SYSTEM DESIGNATION

001	All Electrical
011	Service Water Cooling
012	Salt Water Cooling
013	Fire Protection
015	Component Cooling
019	Compressed Air
020	Main Condensers
024	Emergency Diesel Generators
032	Auxiliary Building and Rad Waste HV
036	Auxiliary Feedwater
037	Demin. Water and Cond. Storage
041	CVCS Charging and Letdown
044	Condensate
045	Feedwater
048	ESFAS
052	Safety Injection System
055	Control Rod Driven Mech. and Elec.
058	Reactor Protective
059	Primary Containment
060	Primary Containment H&V
061	Containment Spray
063	Steam Generators
064	Reactor Coolant
066	Cavity Cooling System
067	Spent Fuel Pit Cooling
071	Liquid Waste
077	Area Radiation Monitoring
078	Nuclear Instrumentation
079	Process Radiation Monitoring
083	Main Steam
093	Main Turbine
101	Miscellaneous

SAFETY FUNCTIONS

1. Reactivity
2. Core and RCS Heat Removal
3. Pressure and Inventory Control
4. Containment Environment
5. Containment Isolation
6. Radioactivity Control
7. Vital Auxiliaries
8. Equipment Protection
9. Miscellaneous

A - INDICATE PREPLANNED MANUAL ACTION REQUIRED

B - INDICATE IF PLANT SAFETY FUNCTIONS ARE BEING ACCOMPLISHED

- Reactivity Control
- Core Cooling
- Reactor Coolant System Integrity
- Containment Integrity

C - INDICATE POTENTIAL FOR, OR OCCURANCE OF, A BREACH

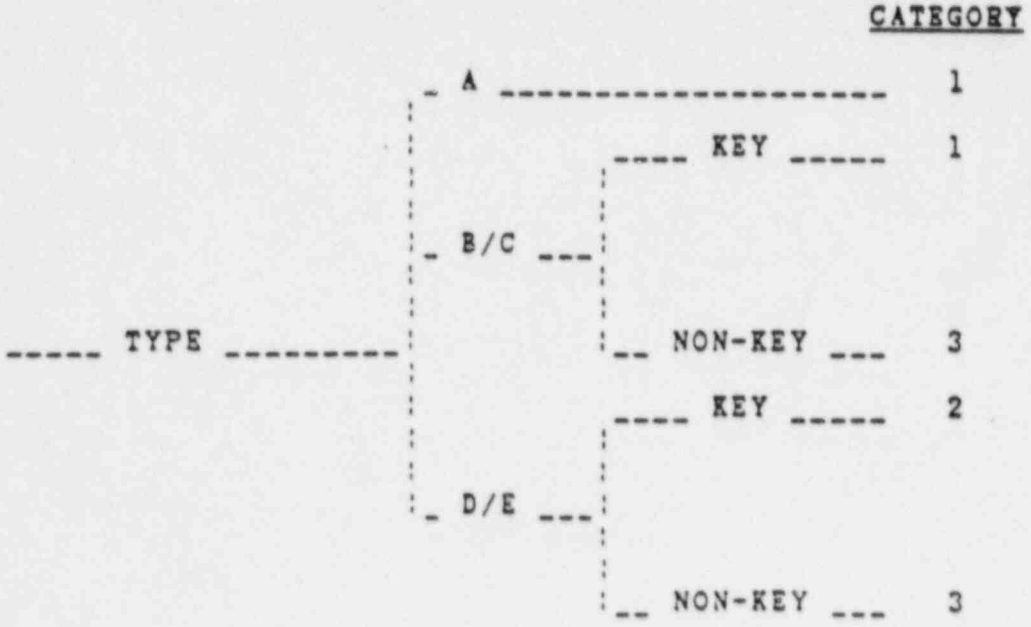
- Fuel Cladding
- Reactor Coolant Pressure Boundry
- Containment

D - INDICATE OPERATION OF INDIVIDUAL SAFETY SYSTEMS

- RHR or DHR systems
- Safety Injection Systems
- Primary Coolant System
- Secondary System (Steam Generation)
- Auxiliary or Emergency Feedwater System
- Containment Cooling System
- Chemical and Volume Control System
- Cooling Water System
- Radwaste Systems
- Ventilation Systems
- Power Supplies

E - INDICATE RELEASE OF RADIOACTIVE MATERIALS

- Area Radiation
- Airborne Radioactive Materials Released From Plant
- Environs Radiation and Radioactivity
- Meteorology
- Accident Sampling



TASK ANALYSIS VARIABLES

Task Number
Relation Number (element)
Sequence Number
Panel
Plane
Item Number
Label/Legend Name 1
Label/Legend Name 2
Label/Legend Name 3
Color
Type of Display
What Measured
Units
Range
Divisions
Condition
Type of Switch
Value Control Mode
Switch Action
Names of Switch Positions
Communications
Mismatched Variable
Reg. Guide 1.97 Classification
Comments

bundle. Currently, this procedure contains no guidance for removing S/G tube voids. The latest information indicates the only effective way to do this is to steam the S/G. Since this implies another radiation release further guidance from Combustion Engineering is being sought before specific actions are included.

F. Minimize the number of cycles of pressurizer auxiliary spray when the temperature differential is greater than 400°F.

IV. RECOVERY ACTIONS

ALTERNATE ACTIONS

A. VERIFY POST TRIP IMMEDIATE ACTIONS COMPLETED

B. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECK

C. COMMENCE COOLDOWN TO REDUCE Thot TO 515°F

1. IF condenser vacuum greater than 20 inch Hg, THEN open turbine bypass valves to reduce Thot to less than 515°F.

1. Open atmospheric dump valves to reduce Thot to less than 515°F.

D. BLOCK SGIS WHEN BLOCK PERMISSIVE RECEIVED AT 785 PSIG

E. COMMENCE DEPRESSURIZATION TO ESTABLISH SUBCOOLING BETWEEN 25° AND 35°F

1. Initiate main spray.

1. Initiate auxiliary spray.

RECOVERY ACTIONS

ALTERNATE ACTIONS

a. Place Instrument Air Containment Isolation Override handswitch HS-2080A, in "OVERRIDE."

b. Open containment instrument air supply valv IA-2080-MOV.

c. Record temperature differential between pressurizer and regenerati heat exchanger (TI-229) in transient log.

d. Open auxiliary spray isolation CVC-517-CV.

e. Shut charging loop isolations.

CVC-518-CV
CVC-519-CV

f. PLACE HIC-100 IN MANUAL"

AND shut main spray valv

RC-100E-CV
RC-100F-CV

g. Do not exceed a pressuriz cooldown rate of 200°F/h

CALVERT CLIFFS

EMERGENCY OPERATING PROCEDURES

EOP-0	POST TRIP IMMEDIATE ACTIONS	REV.0
EOP-1	REACTOR TRIP	REV.0
EOP-2	LOSS OF OFFSITE POWER/NATURAL CIRCULATION	REV.0
EOP-3	TOTAL LOSS OF ALL FEEDWATER	REV.0
EOP-4	EXCESS STEAM DEMAND	REV.0
EOP-5	LOSS OF COOLANT ACCIDENT	REV.0
EOP-6	STEAM GENERATOR TUBE RUPTURE	REV.0
EOP-8	FUNCTIONAL RECOVERY PROCEDURE	REV.0

25. Sample the RCS for radioactivity and boron concentration. Calculate and add sufficient boron to the RCS to raise the entire RCS (including the mass in the pressurizer) to the shutdown margin required by Technical Specifications.

26. Decrease and then control RCS pressure slightly above (0-100 psid) the isolated steam generator pressure and below [1000 psia]. Throughout the event, including cooldown, maintain the RCS within acceptable Post-Accident Pressure/Temperature Limits of Figure 6-1 by the following methods of RCS depressurization:

    a) Main spray
    b) Auxiliary Spray
    c) Throttling HPSI pump(s)

27. Resume an orderly reactor plant cooldown in accordance with Technical Specification limits with forced circulation (preferred) or natural circulation by:

    a) If the condenser and either the [main or auxiliary] feedwater system are available, cooldown by using the turbine bypass system.

    or

    b) If the condenser or turbine bypass system are not available, then cooldown using the unisolated (least affected) steam generator by way of the atmospheric dump on the unisolated (least affected) steam generator, and using either the [main or the auxiliary] feedwater system.

28. Sample the condensate and other connecting systems, including turbine building sumps, for activity which may have been transferred from the affected steam generator(s).

* Step performed continuously.

CE GENERIC TASK LIST

CODE	TASK STATEMENT
0906	STOP LETDOWN
0907	DETERMINE RWT LEVEL
0908	CLOSE RWT OUTLET VALVES
0909	ENSURE REALIGNMENT FROM BAMT TO SUITABLE SOURCE
0910	ENSURE RCS IS BORATED TO TECH SPEC LIMITS
0911	DETERMINE SUITABLE BORATED WATER SOURCE
0912	DETERMINE IF LETDOWN IS OPERABLE
0913	DETERMINE COLD SHUTDOWN RCS BORON CONCENTRATION
0914	DETERMINE SHUTDOWN MARGIN REQ'D BY TECH SPECS
0915	DETERMINE RCS BORON CONCENTRATION
0916	DETERMIN BAMT LEVEL
0917	DETERMINE SPENT FUEL POOL LEVEL
0918	ALIGN VIA GRAVITY FEED FROM BAMTS TO CHARGING PUMP
0919	ALIGN BORIC ACID MAKEUP PUMPS TO CHARGING PUMPS
0920	ALIGN VIA GRAVITY FEED FROM RWT TO CHARGING PUMPS
0921	ALIGN VIA GRAVITY FEED FROM SPENT FUEL POOL TO C.
0922	DETERMINE VCT LEVEL
0923	DETERMINE BORON ADDITION RATE
0924	DETERMINE CHARGING FLOW
1001	ENSURE PROPER OPERATION OF PPCS
1002	ENSURE PROPER OPERATION OF PLCS
1003	DETERMINE PZR PRESSURE
1004	DETERMINE IF PZR PRESS WITHIN LIMITS OF P/T CURVE
1005	DETERMINE PZR LEVEL
1006	MONITOR PZR LEVEL
1007	ENSURE PROPER OPER OF PZR PROPORTIONAL HEATERS
1008	ENSURE PROPER OPERATION OF PZR BACKUP HEATERS
1009	ENSURE PROPER OPERATION OF PZR MAIN SPRAY
1010	ENSURE PROPER OPERATION OF PZR AUXILIARY SPRAY
1011	VERIFY PZR MAIN SPRAY VALVES OPEN
1012	VERIFY PZR AUX SPRAY VALVES OPEN
1101	OPERATE THE REACTOR VESSEL VENT
1102	OPEN PORVS
1103	ENSURE PROPER PORV OPERATION
1104	ENSURE PROPER PORV BLOCK VALVE OPERATION
1105	OPERATE PZR VENT
1106	MONITOR QUENCH TANK PARAMETERS
1201	DETERMINE REACTOR POWER
1202	DETERMINE REACTOR START-UP RATE
1203	TRIP REACTOR
1204	OPEN REACTOR TRIP BREAKERS
1205	DETERMINE CEA INSERTION STATUS
1206	DEENERGIZE CEA MOTOR GENERATOR(S)
1207	ENERGIZE CEA MOTOR GENERATOR(S)
1208	ENSURE PROPER CEDM OPERATION
1301	ENSURE MAIN GENERATOR OUTPUT BREAKERS OPEN
1302	ENSURE STATION LOADS ARE TRANSFERRED OFFSITE
1303	ENSURE DIESELS ARE STARTED & LOADED ELECTRICALLY

24. Prevent overfilling of isolated S/G

112. Ensure proper SG blowdown
113. Determine main condenser availability
114. Ensure proper operation of turbine bypass system

25. Control Reactivity

115. Determine RCS boron concentration
116. Determine shutdown margin required by Tech. Specs.
117. Ensure RCS is borated to Tech. Spec. limits

26. Control of RCS pressure

118. Determine S/G pressure
119. Determine PZR pressure
120. Ensure proper operation of PZR main spray
121. Ensure proper operation of PZR auxiliary spray
122. Throttle HPSI pumps

27. Control RCS and core heat removal

123. Determine RCS cooldown rate
124. Determine main condenser availability
125. Ensure MFW to either/both S/G(s)
126. Ensure AFW to either/both S/G(s)
127. Ensure proper operation of Turbine Bypass System
128. Ensure proper operation of ADVs

28. Control radioactivity

129. Sample steam plant for radioactivity

29. Control Radioactivity

130. Determine steam plant radioactivity

INFO/CONTROL CHARACTERISTICS BASES

TASK STATEMENT	TASK CODE
ENSURE PROPER OPERATION OF PDR AUXILIARY SPRAY	1010

TASK ELEMENT	ELEMENT NUMBER	AFFECTED SYSTEM	COMPONENT NUMBER
READ CHARGING FLOW	06	CVCS	19

INFO/CONTROL CHARACT. ITEM	VALUE	BASIS FOR EACH REQUIREMENT
INST.		
T.O.O.	VALUE	THE CHARGING PUMPS ARE POSITIVE DISPLACEMENT, FIXED DELIVERY PUMPS 44 GPM EACH (REF PLANT DESC. SECT 091. THERE ARE 3 PUMPS. THUS FLOW COULD VARY FROM 0 TO 44, 88, TO 132 GPM. A VALVE INDICATION IS BEST FOR PROVIDING INDICATION FOR THIS RANGE.
RANGE	0-150	WITH 3 PUMPS, EACH CAPABLE OF 44 GPM, MEANS THAT FLOW CAN VARY FROM 0 - 132. THUS, A DISPLAY RANGE OF 0 - 150 IS ADEQUATE.
UNITS	GPM	GPM ARE ADEQUATE UNITS FOR SUBCOOLED FLOW IN THIS RANGE.
ACCURACY	0 - 10%	10% ACCURACY IS EQUIVALENT TO PLUS/MINUS 15 GPM, WHICH IS ADEQUATE TO DETERMINE ACCURATELY HOW MANY CHARGING PUMPS ARE OPERATING.
R.T.	1-5sec	SINCE THE CHARGING PUMPS ARE LARGE MACHINES, THEIR STARTUP TIME IS ON THE ORDER OF AT LEAST A SECOND. THEREFORE, A FLOW DISPLAY RESPONSE TIME OF 1 - 5 SEC IS ADEQUATE FEEDBACK TO THE OPERATOR.
AVAIL.	LOOP	THE CHARGING PUMPS ARE LOCATED OUTSIDE CNTMT. SINCE THE CHARGING PUMPS ARE NEEDED FOR AUX SPRAY, AND AUX SPRAY IS A PRIMARY SUCCESS PATH FOLLOWING ANY EVENT AFTER RCPs ARE LOST, AVAILABILITY REMAINS ARE POST-LOOP.

GENERIC
TASK BREAKDOWN REPORT

EPS TITLE	EPS STEP	AFFECTED SAFETY FUNCTIONS
SSTR	0026	PRESSURE CONTROL

TASK STATEMENT	TASK CODE	TASK LISTING	CUE	INPO CODE	PURPOSE
ENSURE PROPER OPERATION OF PZR AUXILIARY SPRAY	1010	121	2 3 4	0000740501	TO PERMIT THE OPERATOR TO CONTROL AND MONITOR RCS PRESSURE WHEN RCPs ARE NOT OPERATING

TASK ELEMENTS	AFFECTED SYSTEM
ENSURE PROPER CHARGING OPERATION (TASK 0902)	NONE
OPEN PZR AUX SPRAY VALVE	CVCS
DETECT PZR AUX SPRAY VALVE OPEN	CVCS
CLOSE CHARGING RCS LOOP STOP VALVE	CVCS
DETECT CHARGING RCS LOOP STOP VALVE CLOSED	CVCS
READ CHARGING FLOW	CVCS
DETERMINE PZR PRESSURE (TASK 1003)	NONE
CLOSE PZR AUX SPRAY VALVE	CVCS
DETECT PZR AUX SPRAY VALVE CLOSED	CVCS
OPEN CHARGING RCS LOOP STOP VALVE	CVCS
DETECT CHARGING RCS LOOP STOP VALVE OPEN	CVCS

MISMATCH SAMPLE

*P/RCNTMT-WR PANEL: 1C09 ITEM: #010 PLANE: C DESCRIPTION: CONTAINMENT PRESSURE RECORDER WIDE RANGE-NOT AVAILABLE

TASKCODE: 060005 04 01 DETERMINE CONTAINMMENT PRESSURE TRENDING DOWN MISMATCH: NOT AVAILABL

TYPE:TREND MEASURED:PRESSURE UNITS:PSIG RANGE:0-150 DIVISIONS:5

*PI-AFW PANEL: 1C04 ITEM: #001 PLANE: D DESCRIPTION: AFW PP SUCTION PRESSURE INDICATOR - NOT AVAILABLE

TASKCODE: 032003 02 01 ENSURE AFW PUMP SUCTION PRESSURE GREATER THAN 20 PSIG MISMATCH: NOT AVAILABL

TYPE:VALUE MEASURED:PRESSURE UNITS:PSIG RANGE:0-600 DIVISIONS:0.5

TASKCODE: 032059 03 01 DETERMINE AFW SUCTION PRESSURE MISMATCH: NOT AVAILABL

TYPE:VALUE MEASURED:PRESSURE UNITS:PSIG RANGE:0-60 DIVISIONS:0.5

*ZI-FWBYP11 PANEL: 1C03 ITEM: #043 PLANE: C DESCRIPTION: S/G 11 FEEDWATER BYPASS VLV POSITION METER

TASKCODE: 045017 06 01 DETERMINE FEEDWATER BYPASS VALVE POSITION MISMATCH: TYPE OF DISP

TYPE:VALUE MEASURED:POSITION UNITS:% RANGE:0-100 DIVISIONS:2

1DW11 PANEL: 1C15 ITEM: 0694 PLANE: D DESCRIPTION: CH D REACTOR POWER CALIBRATION AND INDICATION PANEL

TASKCODE: 078002 05 07 DETERMINE RX POWER FROM DIGITAL READOUTS ON 1C15 MISMATCH: LABEL

TYPE:SELECT UNLGHT ROUND CONTROLLED: SWITCH ACTION:MAINTAINED POSITION(S):NUCLEAR P

TASKCODE: 078002 05 08 DETERMINE RX POWER FROM DIGITAL READOUTS ON 1C15 MISMATCH: LABEL

TYPE:VALUE MEASURED:REACTOR POWER UNITS:%P(T) RANGE:0-200 DIVISIONS:.1

1HIC100 PANEL: 1C06 ITEM: 60 PLANE: C DESCRIPTION: SPRAY VALVES CONTROL

TASKCODE: 064044 02 03 PLACE HIC-100 IN MANUAL AND CLOSE PZR SPRAY VALVES MISMATCH: LABEL

TYPE:VALUE MEASURED:DEMAND UNITS:% RANGE:0-100 DIVISIONS:2

1EI1912 PANEL: 1C24A ITEM: 51 PLANE: N DESCRIPTION: VITAL AC INSTRUMENT BUS 12 VOLT METER

TASKCODE: 001011 02 02 CONFIRM BUS VOLTAGE ON 11, 12, 13, AND 14 NORMAL MISMATCH: ITEM

TYPE:VALUE MEASURED:VOLTAGE UNITS:V RANGE:0-150 DIVISIONS:2

SECTION 4E

TASKCODE	TASK STATEMENT
041041	START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing BAST 11 and/or 12 via gravity feed and charging pp 11, and/or 12, and/or 13 thru the aux spray isolation
041043	START & INCR/DECR pressurizer aux spray in order to depressurize the RCS by utilizing the VCT via VCT charging suction & charging pp 11, and/or 12, and/or 13 thru the aux spray isolation
064012	DETERMINE RCS subcooling margin using Tcold/Tsat
064013	DETERMINE pressurizer cooldown rate
064042	ENSURE main pressurizer spray

SECTION 4F

048007	BLOCK a safety injection actuation signal (SIAS)
048010	ENSURE a safety injection actuation signal (SIAS)
052006	START & MODULATE SI flow to provide make-up to the RCS from RWT via SI RWT outlets 4142 & 4143 & any two , or three HPSI pumps, 11, 12, and/or 13, thru the normal &/or aux HPSI hdr & the normal &/or aux HPSI hdr isolation valves
064002	DETERMINE pressurizer pressure

SECTION 4G

063001	DETERMINE steam generator radiation activity
063011	DETERMINE which steam generator is effected

SECTION 4H

036026	START & MODULATE AFW flow to achieve desired level in SG 11 from CST 12 via AFW pp 13

TASK ANALYSIS COMPONENT LIST
SORTED BY COMPONENT NUMBER

COMPONENT	PANEL	ITEM #	PLANE	SERVICE DESCRIPTION
1PI1574	1C1J	24	N	SERVICE WATER HEADER 12 PRESSURE INDICATOR
1PI2079	1C13	13	N	INSTRUMENT AIR HEADER PRESSURE
1PI212	1C07	64	C	CHARGING HEADER PRESSURE INDICATOR
1PI2917	1C02	2	B	MOTOR SUCT PUMP DISCHARGE PRESSURE INDICATOR
1PI301X	1C08	9	B	HPSI PP 11 DISCHARGE PRESSURE INDICATOR
1PI301Y	1C08	12	B	HPSI PP 12 DISCHARGE PRESSURE INDICATOR
1PI301Z	1C09	109	B	HPSI PP 13 DISCHARGE PRESSURE INDICATOR
1PI302X	1C08	10	B	LPSI PP 11 DISCHARGE PRESSURE INDICATOR
1PI302Y	1C09	109	B	LPSI PP 12 DISCHARGE PRESSURE INDICATOR
1PI303	1C08	8	B	LPSI HEADER PRESSURE INDICATOR
1PI307	1C09	5	B	LPSI HEADER PRESSURE
1PI308	1C08	7	B	HPSI MAIN HEADER PRESSURE INDICATOR
1PI309	1C09	107	B	HPSI MAIN HDR PRESSURE INDICATOR
1PI311	1C08	16	B	SI TANK 11A PRESSURE INDICATOR
1PI321	1C08	36	B	SI TANK 11B PRESSURE INDICATOR
1PI331	1C09	118	B	SI TANK 12A PRESSURE INDICATOR
1PI341	1C09	136	B	SI TANK 12B PRESSURE INDICATOR
1PI3814	1C13	16	N	COMPONENT COOLING PP 11 DISCHARGE PRESSURE INDICATOR
1PI3816	1C13	17	N	COMPONENT COOLING PP 12 DISCHARGE PRESSURE INDICATOR
1PI3820	1C13	18	N	COMP CLG HEAD TNK LEVEL
1PI3987	1C04	53	D	AUXILLARY FEED PUMP 11 INLET STEAM PRESSURE
1PI3989	1C04	54	D	AUXILLARY FEED PUMP 12 INLET STEAM PRESSURE
1PI4146	1C08	11	B	CNTMT SPRAY PUMP 11 DISCHARGE PRESSURE INDICATOR
1PI4147	1C09	110	B	CNTMT SPRAY PUMP 12 DISCHARGE PRESSURE INDICATOR
1PI4404	1C03	32	B	CONDENSER 11 VACUUM INDICATOR
1PI4407	1C03	33	B	CONDENSER 12 VACUUM INDICATOR
1PI4410	1C03	34	B	CONDENSER 13 VACUUM INDICATOR
1PI4436	1C03	62	C	CONDENSER PUMPS DISCHARGE HEADER PRESSURE
1PI4482	1C03	41	B	S/G FW PUMPS SUCTION HDR PRESSURE INDICATOR
1PI4490	1C03	40	B	S/G 11 FW PUMP DISCHARGE PRESSURE INDICATOR
1PI4495	1C03	42	B	S/G 12 FW PUMP DISCHARGE PRESSURE INDICATOR
1PI4501	1C04	21	C	AFW TURB DRIVEN TRAIN DISCHARGE PRESSURE INDICATOR
1PI4507	1C04	*064	B	TURB DRIVEN DISCH HDR PRESS
1PI4540	1C04	20	C	AFW MOTOR TRAIN DISCHARGE PRESSURE INDICATOR
1PI4654	1C02	3	B	TURBINE EMERGENCY OIL PUMP DISCHARGE PRESSURE
1PI4664	1C02	13	B	GLAND STEAM HEADER PRESSURE INDICATOR
1PI5097	1C03	75	B	S/G 11 FEED PUMP LUBE OIL PRESSURE INDICATOR
1PI5203	1C13	11	N	SALT WATER PUMPS DISCHARGE HDR 12 PRESSURE INDICATOR
1PI5204	1C13	12	N	SALT WATER PUMPS REDUNDANT HDR 11 PRESSURE INDICATOR
1PI5307	1C09	115	B	CNTMT 11 PRESSURE INDICATOR
1PI5308	1C09	114	B	CNTMT NARROW RANGE PRESSURE INDICATOR
1PI5310	1C09	112	B	CNTMT 11 PRESSURE INDICATOR
1PIA102A	1C06	4	B	PRESSURIZER PRESSURE INDICATOR AND HI-LO ALARM CHANN
1PIA102B	1C06	6	B	PRESSURIZER PRESSURE IND AND HI-LO ALARM CHANNEL B
1PIA102C	1C06	8	B	PRESSURIZER PRESSURE IND AND HI-LO ALARM CHANNEL C
1PIA102D	1C06	10	B	PRESSURIZER PRESSURE IND AND HI-LO ALARM CHANNEL D
1PIA116	1C06	3	B	QUENCH TANK PRESS INDICATOR HI ALARM
1PIA152	1C06	22	B	11A RCP MIDDLE SEAL PRESS
1PIA153	1C06	23	B	11A RCP UPPER SEAL PRESS
1PIA162	1C06	33	B	11B RCP MIDDLE SEAL PRESS
1PIA163	1C06	34	B	11B RCP UPPER SEAL PRESS
1PIA172	1C06	44	B	12A RCP MIDDLE SEAL PRESS

TASK LIST SORTED BY FUNCTION

TASKS ASSOCIATED WITH REACTIVITY

041036 TERMINATE charging flow from BAST11 and/or BAST12 via gravity feed and charging pp 11, and/or 12, and/or 13 through Loop 12B and 11A charging loop isolations

041037 TERMINATE charging flow from BAST11 and/or BAST12 via gravity feed and charging pp 11, and/or 12, and/or 13 thru Loop 11A charging isolation bypass

041038 TERMINATE charging flow from BAST11 and/or BAST12 via BA pp 11 and/or 12 and charging pp 11, and/or 12, and/or 13 through Loop 12B and 11A charging loop isolations

041039 TERMINATE charging flow from BAST11 and/or BAST12 via BA pp 11 and/or 12 and charging pp 11, and/or 12, and/or 13 through Loop 11A charging isolation bypass

041044 DETERMINE boration status

041043 DETERMINE total charging flow

041048 COMPARE letdown flow and charging flow

041049 DETERMINE pressurizer pressure/charging pump discharge pressure relationship

041050 TERMINATE letdown

041051 ENSURE letdown

041052 BLOCK charging pp automatic initiation

048008 ENSURE a partial safety injection actuation signal (SIAS) (i.e., A6 & B6)

048009 RESET a safety injection actuation signal (SIAS)

048010 ENSURE a safety injection actuation signal (SIAS)

048014 DETERMINE if the LOCI sequencer has actuated

052001 DETERMINE HPSI pump flow

052002 DETERMINE LPSI flow

052003 DETERMINE total HPSI flow

052005 DETERMINE core flush injection flow

BALTIMORE GAS AND ELECTRIC TASK ANALYSIS EOP GEN TIE

BG&E TASK NO.	GENERIC TASK
052012	0508
052013	0508
052014	0508
052015	0508
052016	0508
052017	0508
052018	0508
052019	0508
052020	0508
052021	0508
052022	0508
052023	0508
052027	0508
052032	0508
052033	0508
052006	0509
052008	0509
052012	0509
052014	0509
052006	0510
052008	0510
052012	0510
052014	0510
048008	0511
048010	0511
048007	0512
059014	0513
052007	0514
052007	0514
052013	0514
052017	0514
048011	0515
052026	0516
NONEOP	0517
NONEOP	0518
048010	0519
052031	0520
052002	0520
052008	0520
052009	0520
052014	0520
052015	0520
052018	0520
052019	0520
052020	0520
052021	0520
052032	0520
052033	0520
052002	0521
052005	0521
041032	0522
041033	0522

August 12, 1987

Mr. B. B. Mrowca
DCRDR Project Manager
CCNPP

SUBJECT: CE Generic task analysis / CCNPP site specific task analysis cross-reference

It has come to my attention that there are several tasks which are described as being performed in Combustion Engineering's generic procedures document CEN-152 Rev. 2 that are not described in Rev. 0 of Calvert Cliffs EOPs. These tasks are listed below, utilizing the TASKCODE associated with each that is found in the generic task analysis document CEN-NPSD-299. At present they have no corresponding TASKCODE in our site-specific task analysis system. A deviation rationale should exist for each of these differences. In the next few weeks I will attempt to procure the needed deviation documentation for DCRDR purposes.

Each of these tasks should be evaluated for inclusion into the latest EOP revision (Rev. 1).

TASKCODE	TASK STATEMENT
0101	Determine Reactor Vessel level
0303	Determine S/G delta pressure
0517	Vent SITs
0518	Drain SITS
0614	Align containment spray pumps for cold leg injection
0702	Block CIAS
0917	Determine Spent Fuel Pool level
0921	Align via gravity feed from Spent Fuel Pool to CP
1105	Operate PZR vent
1207	Energize CIA motor generator(s)

J. B. Winter
WORKSCIENCE CORP

cc: P. Pieringer
W. Birney
K. Umphrey

01* Similiar inst on U-1 & U-2 should be set up with ranges that a in same direction ie. U-1 cond vacuum, U-2 cond vacuum are 180 degr out.

13* Condenser vacuum indication....disparity between Units.

	0"		30"
Unit 1 indicates	|	Unit 2 indicates	|
	30"		0"

STEAM FLOW/FEED FLOW

13* 1/2C03 Steam flow/Feed flow recorders. When at 100%, feed flo is at the top of the band making it inaccurate and its a judgement call as to what it really is. Solution..replace indicator with digital display or install wider range indication. This indication used for heat rate calculation. Therefore, input from this can effe system performance.

06* Steam flow, feed flow transmitters are almost off-scale in norm operating range...Need to change range to make the indicators indica 2/3 scale when at 100% power condition.

16* 1C03..The recorder for steam flow/feed flow should provide a greater range at the upper end to allow the operator to spot an exce: steam demand. (FR 1011/1111 & 1021/1121)

CLOCKS

03* Panel 1C04/2C04..Replace analog clocks with digital 24 hour cloc

03* Replace analog clocks on 1C04/2C04 with digital 24 hour clocks. All log notations and computer alarm printouts are in 24 hour time, control room clocks should be too.

MIMICS

09* The only good mimic is AUX FEED. All others are complex and indicate very poor planning.

12* I would like to see seperate little system mimics for the Saltwater system, Component Cooling system, and the Service Water system, which are all safety related systems. Regroup all these systems to their own little mimic and out front on its own unit.

OPERATOR SURVEY QUESTIONNAIRE
SAMPLE

IDENTIFICATION (LABELS/NOMENCLATURE/LISTS)

10.1 The following are examples of how one entity is currently described.

AUX SG FD PMPS STM ISO VLV
AFW PMPS. STM. SUPP. SG 11
S/G 11 AFW PP STEAM ISOLATION CV4070 CONTROL
11 S/G STM ISOL CV 4070
AFW PUMP STEAM ISOLATION VALVE HS-4070
1-MS-4070 MAIN STEAM ISOLATION TO AUXILIARY FEED PUMPS
Main steam to auxiliary feed pumps MS-4070-MOV

Identify labels which need to be added or modified considering the following:

- Consistency in the order or choice of entities such as:
  - Unit designations (eg. 1, 2)
  - Systems (eg. MS, AFW, CVCS)
  - Subsystems (eg. Letdown, Charging)
  - Major Components (eg. Steam Generator 11, Pressurizer)
  - Minor Components (eg. Valves, Pumps, Fans, Breakers)
  - Parameters (eg. Level, Pressure, Flow)
  - Display numbers (eg. FI-322, FR-322, FE-322, FT-322)
  - Control numbers (eg. CV, SOV, MOV, FIC, ECV, HS)
  - Component Function (eg. isolation, discharge, suction)
  - Component Relationship (eg. Pump / Amp meter)
  - Location (eg. inboard/outboard, upstream/downstream)
- Consistency in placement (the line on which each entity appears....typically LINE 1, LINE 2, or LINE 3)
- Consistency in identifying the numbering scheme either for the control room component (eg. 1HS4070) or the component which is controlled in the plant (eg. 1CV4070)
- Current source labeling (eg. bus, MCC)
- Use of capital letters, hypens or spaces
- Engineering/Operations differences in need or use
- Vendor supplied panels
- Updates in procedures after modifications have been performed
- Consistency between control room labels, plant labels and procedure nomenclature
- Plant abbreviations
- Color coding by system
- Hierarchical labeling
- Size of label
- Font
- Letter height
- Stroke width
- Reflectance
- Cleaning
- Use of a coding scheme to identify Reg. Guide 1.97 instrumentation
- Use of ESFAS symbols (eg. # = CIS, * = SIAS)
- Similarity of content (cause confusion or inadvertant activation)
- Letter or number reversals (eg. 11B/11A, 12A/11A)