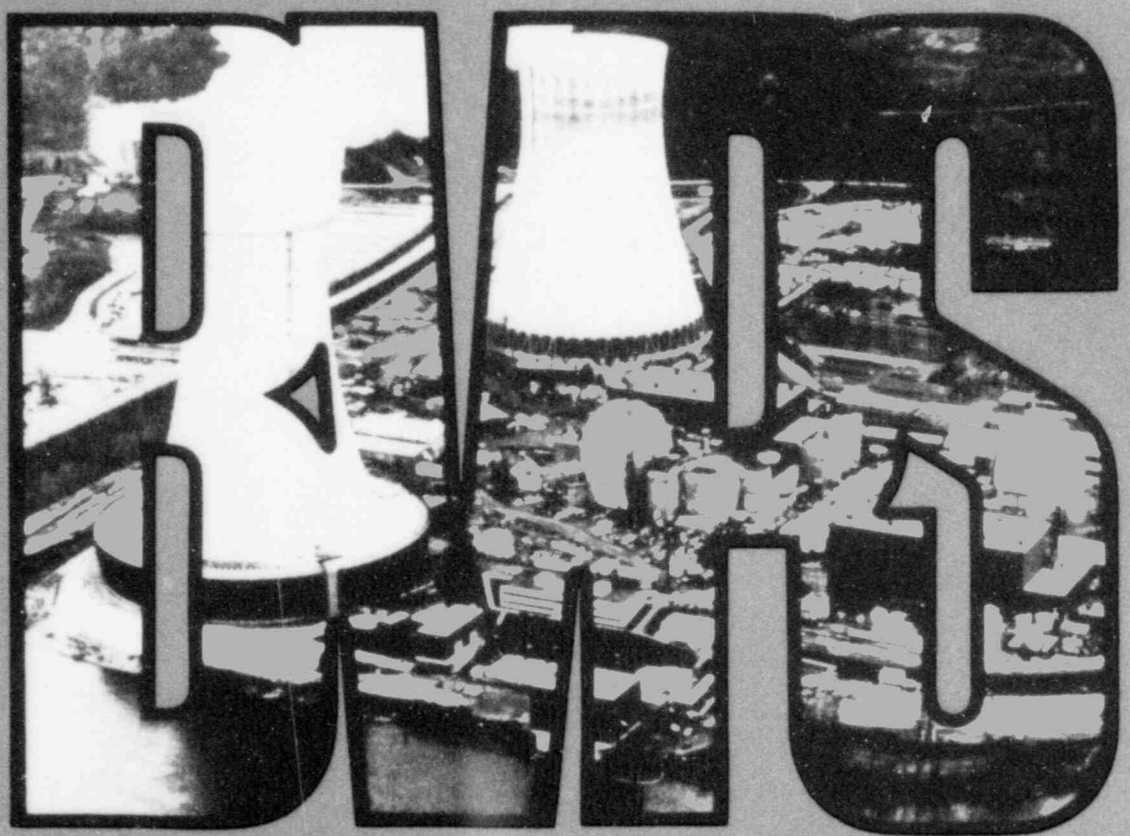
CONTROL ROOM DESIGN REVIEW

Appendices

Volume 2



BEAVER VALLEY POWER STATION UNIT 2

Duquesne Light

BEAVER VALLEY POWER STATION UNIT - 2

CONTROL ROOM DESIGN REVIEW

Volume 2

VOLUME 2
APPENDICES

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APPENDIX A

BVPS - 2 CRDR CHARTER

BEAVER VALLEY POWER STATION - UNIT NO. 2

CONTROL ROOM DESIGN REVIEW CHARTER

APPROVED:

E. F. Kurtz
DLC-Manager, Regulatory Affairs — 12-13-84 (Date)

E. T. Eilmann
DLC-Review Team Leader — 12-13-84 (Date)

M. E. Deflin
DLC-Technical Coordinator — 12/13/84 (Date)

D. J. Vochinsky
M-Program Coordinator — 12/13/84 (Date)

T. J. Lex
M-Project Management — 12/13/84 (Date)

TABLE OF CONTENTS

1.0 PURPOSE:

The purpose of the Control Room Design Review (CRDR) is to evaluate, from a human engineering point of view, the total control room work space, environment, instrumentation, controls, and other equipment for both system demands and operator capabilities; and to identify, assess, and recommend control room design modifications. The review is conducted to ensure that the BVPS-2 control room and remote shutdown panels will support safe plant operation during emergency conditions.

2.0 OBJECTIVES:

To ensure that the CRDR fulfills its stated purpose, several objectives will be met. These objectives are as follows:

a) To meet the intent of the requirements specified in NUREG 0737, Supplement 1, Item I.D. 1, "Detailed Control Room Design Review."

b) Review input documentation, including any applicable operating experience data, plant design information, and any applicable standards and regulations.

c) Provide an inventory of the control room instrumentation.

d) Perform a human factors control room survey that compares the existing control room design with accepted human engineering guidelines.

e) Determine the input and output requirements of control room operator tasks during emergency conditions.

f) Verify that the instrumentation required for the above operator tasks during emergency conditions is available and suitable.

g) Validate that control room functions can be exercised.

h) Identify Human Engineering Discrepancies (HEDs).

i) Assess identified HEDs.

j) Identify corrective actions for HEDs.

k) Verify that improvements will provide necessary correction of HEDs.

l) Verify that improvements will not introduce new HEDs.

3.0 CRDR ACTIVITIES:

The following areas of activities will be addressed during the CRDR to assess the control room for both completeness and suitability of the design.

- Review Phase

  Task 1 - Operating Experience Review
  Task 2 - Control Room Inventory
  Task 3 - Control Room Survey
  Task 4 - System Review and Task Analysis (SRTA)
  Task 5 - Verification of Task Performance Capabilities
  Task 6 - Validation of Control Room Functions

- Assessment and Implementation Phase

- Documentation Phase

4.0 CRDR ORGANIZATION:

An overview of the CRDR organization and a CRDR task matrix chart are attached for reference. An overview of the CRDR organization may be found in Attachment A and a CRDR task matrix may be found in Attachment B.

5.0 SCHEDULE:

The CRDR schedule shall be maintained by the DLC CRDR review team leader. The schedule may be revised on an informal basis with DLC approval.

6.0 MONTHLY REPORT:

The CRDR monthly report format may be found in Attachment C.

7.0 CONTRACTOR/SUBCONTRACTOR

The following identifies the commercial responsibility between DLC, Westinghouse Electric Corporation, and Essex Corporation.

a) As per the terms and conditions of the commercial agreement between DLC and Westinghouse, Westinghouse will serve as contractor to DLC during the BVPS-2 CRDR.

b) As a subcontractor to Westinghouse, Essex will function under the direction of Westinghouse during the BVPS-2 CRDR.

8.0 RECORDS:

Resumes/qualifications of active participants will be maintained in the Westinghouse shop order files. Microfilm copies of the entire CRDR shop order file will be released to DLC at fuel load. The CRDR shop order file shall be structured consistently with that of Attachment D.

9.0 FINAL REPORT FORMAT:

The CRDR final summary report format will be consistent with that of Attachment E.

10.0 REGULATORY ISSUES:

The DLC CRDR review team leader will be responsible for keeping the CRDR team informed of all regulatory changes pertaining to the CRDR or other related post-TMI activities.

11.0 AUDITS:

The DLC CRDR review team leader will have the responsibility of coordinating DLC/NRC audits and inspections.

12.0 REVISIONS TO CHARTER:

The DLC CRDR review team leader has the authority to revise the BVPS-2 CRDR charter and must notify the core team of any revisions.

13.0 DOCUMENT CONTROL:

Issuance of the BVPS-2 CRDR charter and instructions will be the responsibility of the DLC review team leader in accordance with the existing DLC Nuclear Construction Division Document Control procedures.

14.0 INSTRUCTIONS:

Instructions shall be generated for all CRDR tasks outlined in the Review and Assessment Phases. These instructions shall address the following:

a) Scope
b) Acceptance criteria, if applicable.
c) Records

d) Responsibilities
e) Task review cycle

Each instruction shall be signed by the preparer, reviewed by the CRDR review team leader, and approved by Manager, Regulatory Affairs.

PROJECT TEAM

Manager, Regulatory Affairs
E. F. Kurtz, Jr.

Manager, NCD Engineering
H. M. Siegel

Superintendent, BVPS-2 Operations
T. P. Noonan

SWEC Project Engineer
P. Knobel

Westinghouse Project Manager
T. Lex

CORE TEAM

Review Team Leader
E. T. Eilmann

Technical Coordinator
M. E. Deflin

I&C Engineer
D. J. Wochinsky

Reactor Operator
R. G. Orendi

Human Factors Specialist
W. T. Talley/T. J. Voss

SUPPORT

I&C Engineer
D. Szucs
W. Young

BOP Systems Engineer
P. Knobel

Nuclear Safety/Licensing
M. E. Deflin

Human Factors Specialists
D. Eike
J. Farbry
H. VanCott
C. Baker

Operator
F. Schuster

TASK IDENTIFICATION

TASK 1A:	LER Review
TASK 1B:	CROPS
TASK 2:	Control Room Inventory
TASK 3:	Control Room Survey
TASK 4:	SRTA
TASK 5:	Verification
TASK 6:	Validation
TASK 7:	Assessment and Implementation
TASK 8A:	Final Report
TASK 8B:	Chapter 18

CRDR TASK MATRIX

Team Member	Tasks									
	1A	1B	2	3	4	5	6	7	8A	8B
Review Team Leader (DLC)	R	R	R	R	R	R	R	R	R	P
Technical Coordinator/ Licensing Engineer (DLC)	P	A	P	A	A	P	P	P	P	P
I&C Engineer (W)	P	R	P	A	A	P	P	P	P	R
Reactor Operator (W)	A	A		A	P	A	P	A		
Human Factors Specialist (Essex)	A	P	R	P	R	A	P	P	P	R
I&C Engineering Support (DLC, W)	A		A	A	R	A	R	P	A	R
BOP System Engineer (SWEC)	A		A	A	A	A	R	P	A	R
NSSS Engineer (W)					P					
Human Factors Supplemental Specialists (Essex)		P		P				R	R	
Operations Support (DLC)		A				A	P			

KEY:

P - Primary
A - Assist
R - Review

BEAVER VALLEY UNIT 2
CONTROL ROOM DESIGN REVIEW
MONTHLY REPORT FORMAT

1) Highlights

2) Personnel:

   a) names, titles
   b) time involved
   c) changes/additions

3) Activities performed

4) Performance indicator (scheduled activities)

5) Scheduled activities for the following month(s)

6) Workscope changes

7) Current problem areas

8) Miscellaneous

DATA BASE MANAGEMENT SYSTEM
(File Index)

1.0 DATA FILE INDEX

2.0 REGULATORY ISSUES

- 2.1 Letter 82-33
- 2.2 Safety Evaluation Report
- 2.3 Miscellaneous

3.0 PROGRAM PLAN

- 3.1 Submittal to NRC
- 3.2 NRC Comments
- 3.3 Response to NRC Comments
- 3.4 Exceptions to Program Plan

4.0 REFERENCE MATERIAL INDEX

5.0 CORRESPONDENCE

- 5.1 Meeting Minutes
- 5.2 Agendas
- 5.3 Attendance Lists
- 5.4 Monthly Reports

6.0 DETAILED CRDR IMPLEMENTATION PLAN FLOW DIAGRAM

7.0 SCHEDULES

- 7.1 Overall
- 7.2 Individual Phases

8.0 ORIENTATION/TRAINING

- 8.1 Agenda
- 8.2 Attendance Lists
- 8.3 Presentation Material
- 8.4 Team Member's Resumes/Qualifications

9.0 REVIEW PHASE DOCUMENTATION

- 9.1 Operating Experience Review
  - 9.1.1 LER Review
    - 9.1.1.1 Instructions/Guidelines
    - 9.1.1.2 LER Summary Sheet
    - 9.1.1.3 Results - Completed LER Summary Sheets
    - 9.1.1.4 Final Report Input

9.1.2 Control Room Operating Personnel Surveys (CROPS)

- 9.1.2.1 Instructions/Guidelines
- 9.1.2.2 Questionnaires/Interviews
- 9.1.2.3 Results
- 9.1.2.4 Final Report Input

9.2 Control Room Inventory

- 9.2.1 Instructions/Guidelines
- 9.2.2 Inventory Data Sheet
- 9.2.3 Results - Completed Inventory Data Sheets
- 9.2.4 Final Report Input

9.3 Control Room Survey

9.3.1 Task Plans

- 9.3.1.1 Work Space
- 9.3.1.2 Anthropometrics
- 9.3.1.3 Emergency Equipment
- 9.3.1.4 HVAC
- 9.3.1.5 Lighting
- 9.3.1.6 Ambient Noise
- 9.3.1.7 Maintainability
- 9.3.1.8 Communications
- 9.3.1.9 Annunciator System
- 9.3.1.10 Controls
- 9.3.1.11 Displays
- 9.3.1.12 Labels and Location Aids
- 9.3.1.13 Computer Systems
- 9.3.1.14 Conventions

- 9.3.2 Instructions/Guidelines
- 9.3.3 Task Plans - NUREG 0700 Section 6 Cross Reference
- 9.3.4 Results - Completed Task Plans
- 9.3.5 Final Report Input

9.4 System Review and Task Analysis

- 9.4.1 Instructions/Guidelines
- 9.4.2 Task/System Sequence Matrix
- 9.4.3 Element Table
- 9.4.4 Instrumentation Requirements Table
- 9.4.5 Control Requirements Table
- 9.4.6 Results - Completed Matrices and Tables
- 9.4.7 Final Report Input

FINAL SUMMARY REPORT FORMAT

1) Executive Summary

2) Introduction

3) Methodology

4) CRDR Results

5) Short-term corrective action recommendations

6) Long-term corrective action recommendations

7) Implementation schedule

APPENDIX B

BVPS - 2 CRDR INSTRUCTIONS

R401A -- LER Review

R401B -- CROPS

R402 -- Inventory

R403 -- Control Room Survey

R404 -- SRTA

R405 -- Verification

R406 -- Validation

R407 -- Assessment

R408 -- Final Summary Report

R409 -- HED Report

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 401 A	1	11/20/84	1 of 10

PREPARED BY: M. E. Dapkin EFE 7/24/84 DATE: 7/24/84

APPROVED BY: B. F. Hyde DATE: 7-25-84

CONTROL ROOM DESIGN REVIEW
TITLE: TASK 1A, LER REVIEW

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1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.1.1 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 1A of the BVPS-2 CRDR, License Event Report (LER) Review.

2.0 APPLICABILITY

This instruction applies to Task 1A of the CRDR, LER Review.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.12, "NCD Instruction Manual"

3.3 NCDP 1.3, "Procedure Format"

3.4 NCDP 1.6, "Document Control"

3.5 BVPS-2 CRDR Charter

3.6 BVPS-2 CRDR Program Plan

4.0 DEFINITIONS

4.1 Control Room Design Review (CRDR)

An evaluation from a human engineering point of view of the total control room work space, environment, instrumentation, controls, and other equipment for both system demands and operator capabilities.

4.2 CRDR Core Team

The CRDR Core Team is comprised of the Review Team Leader, the Technical Coordinator, an Instrumentation & Control Engineer, a Reactor Operator (RO), and an HFS.

4.3 Licensee Event Report (LER)

The process for reporting operational experiences at nuclear power plants (10CFR50.73).

4.4 LER Review

A review of available documentation of operating difficulties and incidents, as outlined in plant-specific LER's, in order to identify conditions that may cause human performance problems.

4.5 Human Engineering Discrepancy (HED)

A departure from some benchmark of system design suitability for the roles and capabilities of the human operator.

4.6 Human Factors Specialist (HFS)

One who specializes in human factors engineering, the science of optimizing the performance of human beings.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 1A of the CRDR, LER Review.

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 1A of the CRDR, LER Review.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the LER Review, when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the LER Review under the direction of the RTL in accordance with this instruction. The Core Team and Support Team are defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The CRDR LER Review shall be conducted in accordance with the methodology presented in this instruction.

6.1.1 The CRDR kTL, or designee, shall review and finalize the LER Review instruction.

6.1.2 The CRDR RTL, or designee, shall submit the LER Review instruction to the MRA in accordance with the BVPS-2 CRDR Charter for review and approval.

6.2 The CRDR Core Team members shall compile the LER's to be reviewed.

6.2.1 The LER's shall be from nuclear power plants with similar plant designs as that of BVPS-2. These plants shall include North Anna Unit No. 1 and Surry Unit No. 1.

6.2.2 The LER's reviewed shall date back no earlier than February 28, 1976.

6.2.3 The LER's shall be representative of the following cause codes:

6.2.3.1 Operator error
6.2.3.2 Defective procedures
6.2.3.3 Equipment/component failure

6.3 The CRDR Core Team shall develop the LER Report Summary form to be used in Section 6.8 (See Figure R 401A-1).

6.4 The CRDR Core Team shall determine the LER Review screening criteria based on their interpretation of guidelines set forth in Section 3.3.1.2 of NUREG 0700 issued September 1981.

6.4.1 The CRDR Core Team shall initially screen LER's and eliminate those that are not associated with the following screening criteria:

6.4.1.1 Operator error
6.4.1.2 Lack of operator reaction
6.4.1.3 Inappropriate/deficient operational procedures
6.4.1.4 Operator unaware of maintenance problems

6.5 The Preoperational Test Section shall review the LER's which have been eliminated per Section 6.4 of this instruction to assure that no control-room related LER's have been included. The Preoperational Test Section shall document all discrepancies via formal correspondence. 1

6.6 The HFS shall review the LER's which have been eliminated per Section 6.4 to assure that no LER's with human factors implications have been included. The HFS shall document all discrepancies via formal correspondence.

6.7 Upon completion of the screening associated with Sections 6.4, 6.5, and 6.6, the remaining LER's shall be divided among the CRDR Core Team members by the CRDR RTL.

6.8 Each Core Team member shall complete the LER Report Summaries, Sections I, II, and III.A (Figure R 401A-1). LER Report Summary Instructions may be found in Figure R 401A-2.

6.9 Each core team member shall divide the completed LER Report Summaries into the following categories:

6.9.1 Corrective action taken terminated the consequences associated with the event.

6.9.2 Corrective action taken was adequate but in the judgment of the reviewer, sufficient action was not taken to prevent the recurrance of the problem.

6.9.3 Corrective action taken was not sufficient in the judgment of the reviewer.

6.10 Those LER's and Report Summaries pertaining to Section 6.9.1 shall be forwarded to the HFS. The HFS shall verify that no LER's with human factors implications were eliminated during this screening process.

6.11 Upon review of section 6.9.1 LER's, the HFS shall document all discrepancies via formal correspondence. 1

6.12 Those LER's and Report Summaries pertaining to Sections 6.9.2, 6.9.3, and 6.11 shall be reviewed by the core team for concurrence/nonconcurrence.

6.13 The CRDR Core Team shall review the LER Report Summaries for concurrance/nonconcurrance. The RTL, or designee, shall then complete Section III.B. The remaining core team members shall complete Section III.C of the LER Report Summary.

6.14 The CRDR Core Team shall then determine whether or not the event has any relevance to BVPS-2.

6.14.1 If the event has no relevance to BVPS-2, no preliminary HED is assigned (check "no" in Section 3.D of Figure R 401A-1).

6.14.2 If the event is relevant to BVPS-2, and introduces a deficiency that is within the BVPS-2 CRDR scope, a preliminary HED is issued by placing a check in the "yes" category of Section 3.D of Figure R 401A-1.

6.14.3 If the event is relevant to BVPS-2, and introduces a deficiency not within the BVPS-2 CRDR Scope, no preliminary HED is issued (check "no" in Section 3.D of Figure R 401A-1). 1

6.15 The CRDR RTL is responsible for assigning a number to each preliminary HED in Section III.D of the LER Report Summary. In addition to preliminary HED's generated during the BVPS-2 CRDR LER Review, HED's generated from the BVPS-1 document review will be obtained and assigned a BVPS-2 number. 1

6.16 All preliminary HED's generated during the LER Review shall be filed in accordance with the BVPS-2 Charter and retained for further analysis during the BVPS-2 CRDR Assessment Phase.

6.17 The RTL reviews the Core Team LER Review results by signing the LER Report Summary Section III.E.

6.18 The CRDR team shall prepare the LER Review results in the final report format.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9 - 1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R 401A-1, "LER Report Summary"

8.2 Figure R 401A-2, "LER Report Summary Instructions"

LER REPORT SUMMARY

SECTION 1 - APPLICATION

Duquesne Light Company Beaver Valley Power Station, Unit 2

Reviewer: _____ Date: _____

SECTION 2 - SUMMARY

A. Utility, Station, Unit (if different): _____

B. Report Date: _____

C. Report No.: _____

D. Operating Status: _____

E. Report Title: _____

F. Summary:

G. Result:

___ An operating limit was exceeded

___ Incident without consequence

___ Incident with consequence

___ Off-normal equipment status without damage

___ Reduced plant availability:

___ Trip (Scram) ___ hrs

___ Shutdown ___ hrs

___ Derated to ___%, ___ hrs

H. Error Classification by Utility:

___ Operator Error

___ Equipment Failure

___ Procedure Problem

___ Other

_____

_____

_____

_____

I. Immediate corrective action:

J. Follow-up action:

SECTION 3 - LER ANALYSIS

A. Follow-up action adequate? ___ Yes ___ No (explain:)

B. Core Team Review: ___ Concur ___ Do not concur
(reason for nonconcurrence:)

C. Core Team Member's Initials: _____

D. HED Report generated: ___ No ___ Yes, HED No. _____

E. Core Team Leader: _____

Figure R 401A - 1

LER REPORT SUMMARY INSTRUCTIONS

1 Only Section 1, Section 2 A through J, and Section 3.A are to be completed by the reviewer.

2) Complete Section 1 as follows:

A) Reviewer

Name of review team member completing LER Report Summary.

B) Date

The date Sections 1, 2 A through J, and 3.A of the LER Report Summary were completed.

3) Complete Section 2 A through J as follows:

A) Enter the utility, station, and unit for which the LER was issued.

For example:

VEPCO/SURRY/1
VEPCO/NA/1

B) Enter the date the report was issued for the LER. This can be found under "REPORT DATE" in the left-hand column of the LER printout.

For example:

If "REPORT DATE" reads 840124, then the date to be entered shall be 01/24/84.

C) Report Number

This corresponds to the "LER NUMBER" in the left-hand column of the LER printout.

D) Operating Status

This can be found under "FACILITY STATUS" in the left-hand column of the LER printout.

E) Report Title

Provide the subject of the LER report.

Figure R 401A - 2
(Page 1)

F) Summary

Briefly describe the event. This does not include technical specification numbers. A description of the event may be found under "EVENT DESC" in the upper right-hand quadrant of the LER printout.

G) Result

Check the appropriate item(s) which resulted from the event. This information must be extracted from the LER printout.

An Operating Limit Was Exceeded

A tech. spec. violation in which an operating limit was exceeded. For example, P/T, boron concentration, etc.

Incident Without Consequence

An incident with no damage to equipment, no injury to personnel, or no radiation release to the public.

Incident With Consequences

An incident with damage to equipment, injury to personnel, or radiation release to the public.

Off-Normal Equipment Status Without Damage

A tech. spec. violation in which the minimal amount of required equipment was not available.

H) Error Classification by Utility

Check the appropriate item(s) which caused the event. This may be found under "PROXIMATE CAUSE" in the left-hand column of the LER printout.

I) Immediate Corrective Action

Enter the immediate corrective action that was taken to respond to the event.

This can be found under the "CAUSE DESC" in the lower right quadrant of the LER printout. If no corrective action was taken, write "NONE".

Figure R 401A - 2
(Page 2)

J) Follow-Up Action

Provide a description of the follow-up action taken, if any, to prevent the recurrance of this event. This may be found in the "FUTURE ACTION" and/or "CAUSE DESC" sections of the LER printout.

In cases where follow-up action is not applicable, analyze immediate corrective action in its place.

4) Complete Section 3.A as follows:

A) Indicate whether or not follow-up action was adequate.

B) If not, explain in detail.

C) If the reviewer cannot determine if the follow-up action was adequate, leave blank.

Figure R 401A - 2
(Page 3)

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 401 B	1	11/20/84	1 of 11

PREPARED BY: ETE 7/25/84 M.E Dolan DATE: 7/24/84

APPROVED BY: G.F. Kunkle Jr. DATE: 7-25-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 1B, (CROPS)
CONTROL ROOM OPERATING PERSONNEL SURVEY

PAGES	DATE	REVISION
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1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.i.2 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 1B of the BVPS-2 CRDR, Control Room Operating Personnel Survey (CROPS). 1

2.0 APPLICABILITY

This instruction applies to Task 1B of the CRDR, CROPS.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format"

3.3 NCDP 1.6, "Document Control"

3.4 NCDP 1.12, "NCD Instruction Manual"

3.5 BVPS-2 CRDR Charter

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R409 "Human Engineering Discrepancy (HED) Report"

3.8 Task Plan 1.1, "Workspace Survey"

3.9 Task Plan 1.2, "Anthropometrics Survey"

3.10 Task Plan 1.3, "Emergency Equipment Survey"

3.11 Task Plan 1.4, "HVAC Survey"

3.12 Task Plan 1.5, "Illumination Survey"

3.13 Task Plan 1.6, "Ambient Noise Survey"

3.14 Task Plan 1.7, "Maintainability Survey"

3.15 Task Plan 2.1, "Communications Survey"

3.16 Task Plan 3.1, "Annunciator System Review"

3.17 Task Plan 4.1, "Controls Survey"

3.18 Task Plan 5.1, "Displays Survey"

3.19 Task Plan 6.1, "Labels and Location Aids Survey"

3.20 Task Plan 7.1, "Computer Systems Review"

3.21 Task Plan 8.1, "Conventions Survey"

4.0 DEFINITIONS

4.1 Human Engineering Discrepancy (HED) Report

An especially formatted report of an HED (see reference 3.7)

4.2 Task Plan

A detailed procedure for the collection, reduction, and analysis of data which results in the comparison of control room design features to guidelines contained in NUREG-0700. Each task plan identifies the objectives, scope, required personnel, required facilities and equipment, required inputs to the task and an overview of the methods and procedures. Appendix A of each task plan contains a subset of the Section 6.0 guidelines from NUREG-0700 applicable to that task as criteria. Appendix B of each task plan contains detailed procedures and all required data collection and analysis forms. Included in Appendix B is an operator's questionnaire/interview concerning topics pertinent to that task plan. A standalone, complete interview form is constructed by taking copies of each task plan's questionnaire/interview form and collating them into one document. Appendices C and D contain information for the documentation and control of the technical accuracy and completeness of each task plan (not required for conduct of the task). 1

4.3 Questionnaire

An abbreviated set of interview questions in a self-administered format which is distributed to the operators to familiarize them with the CRDR interviews in which they will participate (see also Task Plan). It is also used to familiarize the interviewers to any general or special conditions that should be observed during the interview process.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 1B of the CRDR, CROPS.

5.2 Review Team Leader (RTL) 1

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 1B of the CRDR, CROPS.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the LER Review, when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the CROPS under the direction of the RTL in accordance with this instruction. The Core Team and Support Team are defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTIONS

6.1 The CRDR CROPS shall be conducted in accordance with the methodology presented in this instruction. 1

6.2 The CROPS instruction consists of the (1) development and finalization of an operator's interview, (2) conduct of interviews with operators, and (3) the analysis of the operator questionnaire/interview data to identify any HED's.

6.3 The BVPS-1 questionnaire results shall be forwarded to the HFS.

6.3.1 BVPS-1 questionnaires shall be reviewed by the Core Team HFS and will be used to revise, as required, the interview booklet. Results of this review shall also be used by the Core Team HFS to indoctrinate and familiarize the interviewers to any general or special considerations which should be observed during the individual operator interviews. 1

6.4 The TC shall establish a place and a schedule for conduct of the interviews. Interviews shall be scheduled at the rate of three per day per interviewer. Each interview will take approximately 2 nours.

6.5 Upon receipt of the interview schedule, the Core Team HFS shall be responsible for insuring that interviewers are available at the time and place indicated and that interviews are conducted in accordance with the interview protocol listed in steps 6.5.1 through 6.5.5 below.

6.5.1 All interviewers shall be instructed by the Core Team HFS as to the correct attitude and general approach to use in conduct of an interview. At minimum, the following elements must be understood and applied by the interviewer:

6.5.1.1 The interviewer must display an open-minded, appreciative, and non-judgmental attitude towards the respondent.

6.5.1.2 The interviewer should introduce himself or herself to the respondent and should indicate to the operator that (1) we (i.e., the evaluators) consider the operator an expert on the control room; (2) that we need his or her expert opinion; (3) that we will be recommending changes that, to a great extent, have already been identified by the operators. What we are furnishing is a management-supported mechanism to give such changes serious consideration.

6.5.2 The interviewer must advise the operator of the following points concerning the interview:

6.5.2.1 The interview has about 110 questions, one half dozen to one dozen on each major area of interest such as lighting, controls, displays. The interviewer will let him or her know when a new area is being discussed.

6.5.2.2 The interview will take about two hours.

6.5.2.3 All responses are confidential. We will not reveal the name of any person who gave a specific response. We

will compile responses to give a summary of the operating personnel's viewpoint. We may quote a specific response, but we will not identify the respondent.

6.5.2.4 Depending upon the answer, we may ask for brief explanations.

6.5.2.5 We are interested in problems that have not been resolved rather than problems that have already been eliminated.

6.5.3 The interviewer should insure that the respondent is the one scheduled and that all of the information on the biographical data form (from the questionnaire) is correct and complete before proceeding with the actual interview.

6.5.4 During the course of the interview, the interviewer must employ the following techniques:

6.5.4.1 If the operator does not understand a question, it must be explained in a frank and matter-of-fact manner. The interviewer must not be judgmental towards any question. As an example, do not say: "I know this is a stupid question, but I have to ask it." Say instead, "I know you may find it difficult to respond, but please try."

6.5.4.2 If an operator is having difficulty responding to a question, use probes such as: "Could you briefly describe why you feel this is a problem (or a good feature)?" or "With what specific components (displays, controls, etc.) do you have this problem?"

6.5.5 When the interview is over, the interviewer must inform the respondent that we appreciate the effort that was made to answer the questions.

6.6 The interviewers shall summarize, analyze, and document all interview data as described in steps 6.6.1 through 6.6.7 below.

6.6.1 Review operator biographical data and separate interview booklets into 2 to 3 different experience level groups based upon years of plant experience, licensing level, other related experience, and education level.

6.6.2 Put interview booklets into sequential groups by the determined experience level and number all booklets starting with the lowest experience level first. As an example, if there were twelve

least experienced operators, number their booklets 1 through 12. If there were ten next higher level experienced booklets, 13 through 22. Finally, if there were eleven high level experienced operators, number their booklets 23 through 33.

6.6.3 Make up a supply of data summary forms similar to that shown in Figure R401B-2. This example (Figure R401B-2) is for question 1 from the Anthropometrics Survey Task Plan. This form should identify the task plan number and name, and the question and question number should be written at the top. Numbers which coincide with the numbered booklets are written vertically down the left side.

6.6.4 Complete each data summary form by entering operator responses next to the appropriate booklet number. Enter any necessary clarification statements next to the response.

6.6.5 Make up a supply of tabulation forms similar to that shown in Figure R401B-3.

6.6.6 Tabulate all response summary data from the summary forms onto the tabulation forms.

6.6.7 Using the tabulation forms, generate preliminary HED reports and attach copies of all related tabulation forms to the appropriate HED report. Insure that problems which were differentially responded to based on different experience levels are so noted on the HED report. See Reference 3.7 for HED report instructions.

6.8 The Core Team HFS shall review all summarized response data and preliminary HED reports.

6.9 The Core Team HFS shall submit all preliminary HED reports in accordance with Reference 3.7.

6.10 The Core Team HFS shall generate a summary of results for the CROPS in final report format.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R401B-1, "Example of Operator Questionnaire Instruction Form"

8.2 Figure R401B-2, "Example of an Interview Question Response Summary Form"

8.3 Figure R401B-3, "Example of an Interview Question Tabulation Form"

EXAMPLE OF OPERATOR QUESTIONNAIRE
INSTRUCTION FORM

Instructions

1. The following are questions concerning the operations within the control room. Most of the questions will require a YES or NO answer, with some additional information.

2. When you have comments or suggestions, use the space provided below each question. If you need additional room, use the backs of the sheets.

3. If you do not understand a question, please contact any of the following people at Essex Corporation at (703) 548-4500:

   - Cliff Baker
   - Danna Beith
   - David Eike
   - Tom Talley
   - Harold Van Cott.

4. Please answer all of the questions as completely as possible citing as many examples as you wish.

5. If any question does not apply to your control room, please mark it as N/A.

6. All of your answers and your biographical information will be kept in the strictest confidence and will be used only to aid in the performance of the detailed control room design review. No one at DCL will see your answers.

7. When you finish the questionnaire, please put it in the envelope provided and mail it to Essex Corporation.

FIGURE R401B-1

EXAMPLE OF AN INTERVIEW QUESTION
RESPONSE SUMMARY FORM

TP-1.2
1 May 1983

ANTHROPOMETRICS

OPERATOR INTERVIEW/QUESTIONNAIRE

1.(1) Have you ever had any problems operating a control because it was too high? YES NO

If yes, please explain:

Operator number	Response
1.	DK *
2.	Yes - Unit 2 - Panel C - Heater Drn Pumps start + Stop
3.	NO
4.	NO
5.	NO
6.	NO
7.	NO
8.	NO
9.	NO
10.	YES - On Isolation Pnl; Charcoal Filter Damper Selector S/O; AES Pnl
11.	NO
12.	DK
13.	NO
14.	NO
15.	NO
16.	NO
17.	NO
18.	NO
19.	NO
20.	NO - have step stools
21.	YES - On VS, IV, C, T, SIS, SPY, & RHR Panels
22.	NO

* DK - Don't Know

FIGURE R401B-2

EXAMPLE OF AN INTERVIEW QUESTION
TABULATION FORM

Controls/Instr

1(i) Have you ever had any problems operating a control ... Too high ?

EXPERIENCE LEVEL	F	U	NR
AEO n= 14	72% n=10	14% n= 2	14% n= 2
RO n= 20	95% n= 19	5% n= 1	0% n= 0
SRO/SS n= 15	80% n=12	20% n= 3	0% n= 0
TOTAL n= 49	84% n= 41	12% n=6	4% n= 2

Major Concerns - Heater Drn Pumps start & stop (Panel C-Unit 2), Charcoal Filter Dampers Selector switch (AES Panel).

FIGURE R401B-3

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 402	1	11/20/84	1 of 8

PREPARED BY: M. E. Dejpan 7/24/84 DATE: 7/24/84

APPROVED BY: E. F. Kent Jr. DATE: 7-25-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 2, CONTROL ROOM INVENTORY

PAGES	DATE	REVISION
1 - 9	07/25/84	0
1 - 8	11/20/84	1

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.2 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 2 of the BVPS-2 Control Room Design Review (CRDR), Control Room Inventory.

2.0 APPLICABILITY

This instruction applies to Task 2 of the CRDR, Control Room Inventory.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format"

3.3 NCDP 1.12, "NCD Instruction Manuals"

3.4 NCDP 1.6, "Document Control"

3.5 BVPS-2 CRDR Charter

3.6 Stone & Webster Engineering Corporation Control Systems Instrument Schedule Equipment Type List

3.7 Stone & Webster Engineering Corporation Control System Orientation dated February 27, 1984

3.8 BVPS-2 CRDR Program Plan

4.0 DEFINITIONS

4.1 Control Room Inventory

The process of identifying all instrumentation, controls, and equipment within the main control room, the emergency shutdown panel, and the alternate shutdown panel. This task will be conducted using the latest design information.

4.2 Inventory Data Sheet

The standard form which will be used to record all attributes of the control panel mounted instrumentation and control devices.

4.3 Photomosaic

A planar engineering model of the BVPS-2 control room used during Task 3 of the CRDR, Human Factors Control Room Survey.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 2 of the CRDR, Control Room Inventory.

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 2 of the CRDR, Control Room Inventory.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the Control Room Inventory, when the RTL is not available.

5.4 CRDR Core Team and Support Team

The TC may call upon members of the core and support teams to assist in the Control Room Inventory.

6.0 INSTRUCTION

The BVPS-2 control room inventory shall be conducted in accordance with the following instruction:

6.1 Standard Inventory Format

All inventory information (taken from the latest design drawings and the BVPS-2 photomosaic) shall be recorded on an "Inventory Data Sheet" which can be found in Figure R402-1.

The following items/portions shall be inventoried:

6.2 Main Control Room

6.2.1 Inventory all instrumentation, control, and other devices on main control board bench and vertical sections A, B, and C.

6.2.2 Inventory all instrumentation and other devices on main control room center island.

6.2.3 Inventory all instrumentation, control, and other devices on main control room building services control. 1

6.3 Emergency Shutdown Panel

6.3.1 Inventory all instrumentation, control, and other devices on the emergency shutdown panel bench and vertical sections A, B, C, and D.

6.4 Alternate Shutdown Panel

6.4.1 Inventory all instrumentation, control, and other devices on the alternate shutdown panel vertical and bench sections A and B.

6.5 Compare main control board and emergency shutdown panel photomosaics to inventory results. List all discrepancies.

6.6 Adjust photomosaics to reflect inventory results.

6.7 As approved design changes are implemented, up to and including August 17, 1984, adjust inventory results to reflect the design changes.

6.8 Adjust photomosaics to reflect the latest approved design changes up to and including August 17, 1984.

6.9 A record of approved design changes made after August 17, 1984 shall be maintained by the RTL.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R402-1, "Inventory Data Sheet"

8.2 Figure R402-2, "Inventory Data Sheet Instructions"

8.3 Figure R402-3, "Panel Abbreviation Codes"

INVENTORY DATA SHEET

a) Control Board Section: _____

b) Mark No.: _____

c) Train (A/B): _____

d) Controlled Device: _____

e) Indication/Control (I/C): _____

f) Vendor Name: _____

g) Model: _____

h) Description:

1) Scale (if applicable): Range _____ Type _____ Engr. Units _____

2) Switch Type (if applicable): _____

3) Switch Position Labeling (if applicable): _____

4) Nameplate Engraving: _____ (1)

_____ (2)

_____ (3)

_____ (4)

_____ (5)

FIGURE R402-1

CONTROL ROOM INVENTORY DATA SHEET INSTRUCTIONS

A. Control Board (CB) Section

Enter the short abbreviation for the panel location (See Figure 3.10.3-3).

B. Mark No. (if applicable)

Reference Tab 3 of Reference 3.7. Also include bill of material item number.

C. Train (A/B) (if applicable)

If device is safety-related, state whether TRAIN A or B. (If indicator or recorder, state PAM1 or PAM2.)

D. Controlled Device (if applicable)

Briefly describe the device that is manipulated from the control panel.

E. Indication/Control

Stipulate whether control panel device functions as an indication or control.

F. Vendor Name

Denote the manufacturer of the control panel device.

G. Model

Identify manufacturer's device model number.

H. Description

Include the following:

1. Scale (if applicable):

   a. Range
   b. Type
   c. Engr. Units

FIGURE R402-2
(page 1)

2. Switch Type (if applicable)

   State if switch is spring return, maintained, push button, or other. Also state knot type, for example, oval, lever, pistol grip, etc.

3. Switch Position Labeling (if applicable)

   State purpose of each switch position.

   EXAMPLE: Trip Auto Close

4. Nameplate Engraving

   Describe label associated with each device.

FIGURE R402-2
(page 2)

PANEL ABBREVIATION CODES

I. MAIN CONTROL ROOM

A. Main Control Board

Description	Short Abbreviation
Bench Section	
A1	BA1
A2	BA2
A3	BA3
A4	BA4
Vertical Section	
A5	VA5
A6	VA6
A7	VA7
A8	VA8
A9	VA9
Bench Section	
B1	BB1
B2	BB2
B3	BB3
B4	BB4
Vertical Section	
B5	VB5
B6	VB6
Bench Section	
C1	BC1
C2	BC2
C3	BC3
C4	BC4
Vertical Section	
C5	VC5
C6	VC6
C7	VC7
C8	VC8
C9	VC9

1

B. Building Services Control

Cabinet	
1	BSCP

II. EMERGENCY SHUTDOWN PANEL

ES1
ES2
ES3
ES4

III. ALTERNATE SHUTDOWN PANEL

A. Bench Section

A	ABA
B	ABB

FIGURE R402-3

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 403	1	10/28/85	1 of 7

PREPARED BY: ETC 7/25/84 M. E. Doffin DATE: 7/24/84

APPROVED BY: E. F. Kurtz Jr. DATE: 7-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 3, HUMAN FACTORS CONTROL ROOM SURVEY

PAGES	DATE	REVISION
1 - 7	07/26/84	0
1 - 7	10/28/85	1

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.3 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction will be used during Task 3 of the BVPS-2 Control Room Survey.

2.0 APPLICABILITY

This instruction applies to Task 3 of the CRDR, Control Room Survey.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Review," September 1981.

3.2 NCDP 1.3, "Procedure Format"

3.3 NCDP 1.6, "Document Control"

3.4 NCDP 1.12, "NCD Instruction Manual"

3.5 BVPS-2 CRDR Charter.

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R 409, "Human Engineering Discrepancy (HED) Report"

3.8 Task Plan 1.1, "Workspace Survey"

3.9 Task Plan 1.2, "Anthropometrics Survey"

3.10 Task Plan 1.3, "Emergency Equipment Survey"

3.11 Task Plan 1.4, "HVAC Survey"

3.12 Task Plan 1.5, "Illumination Survey"

3.13 Task Plan 1.6, "Ambient Noise Survey"

3.14 Task Plan 1.7, "Maintainability Survey"

3.15 Task Plan 2.1, "Communications Survey"

3.16 Task Plan 3.1, "Annunciator System Review"

3.17 Task Plan 4.1, "Controls Survey"

3.18 Task Plan 5.1, "Displays Survey"

3.19 Task Plan 6.1, "Labels and Location Aids Survey"

3.20 Task Plan 7.1, "Computer Systems Review"

3.21 Task Plan 8.1, "Conventions Survey"

4.0 DEFINITIONS

Not applicable to this instruction.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 3 of the CRDR, Control Room Survey.

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 3 of the CRDR, Control Room Survey.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the Control Room Survey when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the control room survey under the direction of the RTL. The Core Team and Support Team are defined in Attachments A and B of the BVPS-2 CRDR Charter.

5.5 Human Factors Specialist (HFS)

The Core Team HFS shall ensure than all phases of the Control Room Survey are conducted and documented as specified in this instruction and in the task plans.

5.6 Support HFS

The Support HFS, under the direction of the HFS, is responsible for the data collection, data recording, data reduction and data analysis procedures detailed in each task plan.

6.0 INSTRUCTION

6.1 The CRDR Control Room Survey shall be conducted in accordance with the methodology presented in this instruction and in the referenced Task Plans.

6.1.1 The CRDR RTL shall review and finalize the Control Room Survey instructions.

6.1.2 The CRDR RTL shall submit the Control Room Survey instruction to the MRA for review and approval.

6.2 For purposes of defining data collection, data reduction, data analyses, and HED report generation methods and procedures, the task plans referenced in Section 3.0 shall be considered an integral part of this instruction.

6.3 The Core Team HFS shall insure that all phases of the Control Room Survey are conducted and documented as specified in this instruction and in the task plans.

6.3.1 The Core Team HFS shall assign a support HFS to perform the data collection procedures detailed in each task plan. For each task plan, data collection procedures will consist of one or more of the following methods:

(1) Measurement of a defined control room design feature using specified instrumentation.

(2) Observation of a defined control room design feature.

(3) Review of documentation and related design engineering information sources for a defined control room design feature.

6.3.2 Measurement data for the DLC CRDR will consist of linear, force, and torque values (illumination and ambient noise cannot be adequately measured until the unit is operating and construction in the control room is complete).

6.3.2.1 Linear measurements will consist of three general types:

(1) Large measurements for workspace assessment made with tape measures to an accuracy no greater than $\pm$ 1/8 inch

(2) Small measurements for the controls survey made with machinist's type scales to an accuracy no greater than ± .015 inch.

(3) Fine measurements made for labeling and meter scale evaluations with line comparator devices and magnifying reticles to an accuracy no greater than ± .001 inch for line comparators or ± .0005 inch for magnifying reticles

6.3.2.2 Force measurements will consist of linear control activation forces in the range of 1 to 80 ounces measured with various push-pull gauges made to an accuracy no greater than ± 1 ounce for 0-to-32-ounce values and no greater than ± 3 ounce for 2-to-15-pound values

6.3.2.3 Torque measurements will consist of rotary control activation values in the range of 1-to-10-inch-ounces made with torque wrenches to an accuracy no greater than ± .5 inch-ounces.

6.3.3 Observation data shall be collected using checklists from Appendix B of each task plan. The method employed will be to check all of a given type of component against one NUREG-0700, Section 6, guideline at a time making appropriate notes in the remarks column of the checklist.

6.3.4 Documentation review data shall be collected using checklists from Appendix B of each task plan. The method employed will be to familiarize oneself with all guidelines for a given document then review the document for conformance to all guidelines making appropriate notes in the remarks column of the checklist.

6.3.5 The Support HFS shall record all data on appropriate forms contained in Appendix B of each task plan as directed by that task plan.

6.3.6 The Essex Human Factors Project Manager shall review all data documented on the data collection forms. |1

6.3.7 The Core Team HFS shall assign the same or a different Support HFS to perform the data reduction/data analysis procedures detailed in each task plan. For each task plan, data reduction and data analysis will consist of one or both of the following methods:

(1) Mathematically calculating, converting, and/or summarizing any numerical data into the required form for direct comparison to the appropriate criterion or criteria

(2) Comparing raw data that does not require reduction directly to the appropriate criterion or criteria

6.3.8 Mathematical reduction will consist of algebraically calculating viewing and reach distances, trigonometrically calculating viewing angles and visual angles, and arithmetically calculating ranges and means for forces and torques.

6.3.9 Analysis of all reduced and raw data will consist of comparing each datum to its related criterion. The criteria are contained in Appendix A of each task plan in checklist format and consist of guidelines taken from NUREG 0700, Section 6.0. For all criteria not met in this comparison, preliminary HED reports are generated with appropriate cross-references to the data forms and criteria lists.

6.3.10 The Support HFS shall record all data reduction and analysis steps and results in the designated areas of the data forms and task plan appendices.

6.3.11 The Essex Human Factors Project Manager shall review all data reduction and analyses documented in the task plans to ensure accuracy and completeness. |1

6.3.12 The Essex Human Factors Project Manager shall review all preliminary HED reports and shall append to these reports recommended solutions (if any) for the identified problems. |1

6.3.13 The Core Team HFS shall submit all preliminary HED reports to the in accordance with Reference 3.7.

6.4 The CRDR RTL shall issue the preliminary HED's for Core Team review and disposition, and shall be responsible for assigning all HED report numbers.

6.5 The Core Team HFS shall generate a summary of results for the Control Room Survey in final report format.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the

Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

Not applicable to this instruction.

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 404	1	10/28/85	1 of 14

PREPARED BY: M. E. [signature] 7/24 DATE: 7/24/84

APPROVED BY: E. F. [signature] DATE: 7-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 4, SYSTEM REVIEW AND TASK ANALYSIS (SRTA)

PAGES	DATE	REVISION
1 - 13	07/26/84	0
1 - 14	10/28/85	1

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.4 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction will be used as a guideline during Task 4 of the BVPS-2 CRDR, System Review and Task Analysis (SRTA).

2.0 APPLICABILITY

This instruction applies to Task 4 of the CRDR, SRTA.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September, 1981

3.2 NUREG 0737, Supplement 1, "Clarification of TMI Action Plan Requirements," December, 1982

3.3 Westinghouse Owners Group, "System Review and Task Analysis," dated April, 1983

3.4 INPO NUTAC 83-046, "Control Room Design Review Task Analysis Guideline," dated December, 1983

3.5 WOG-84-164, "Summary of March 29, 1984 WOG Meeting with NRC on Task Analysis," dated April 24, 1984

3.6 NCDP 1.3, "Procedure Format"

3.7 NCDP 1.6, "Document Control"

3.8 NCDP 1.12, "NCD Instruction Manual"

3.9 BVPS-2 CRDR Charter

3.10 BVPS-2 CRDR Program Plan

4.0 DEFINITIONS

4.1 Emergency Operating Procedures (EOPs)

Plant procedures directing the operator actions necessary to mitigate the consequences of transients and accidents that cause plant parameters to exceed reactor protection setpoints, engineered safety feature setpoints, or other appropriate technical limits.

4.2 System Function Review

The determination of system functions required to meet system goals.

4.3 Task Analysis

A tool used to delineate system functions and the specific actions that must take place to accomplish those functions. In the CRDR context, task analysis is used to determine the individual tasks that must be completed to allow successful emergency operation. This activity checks the Control Room match to the EOPs.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 4 of the CRDR, SRTA.

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 4 of the CRDR, SRTA.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the SRTA when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the SRTA under the direction of the RTL. The Core Team and Support Team are defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The CRDR System Review and Task Analysis (SRTA) documentation for BVPS-2 shall be developed consistent with the requirements set forth in NUREG 0700, Supplement 1 to NUREG 0737, Item 5.b (II) and in accordance with the methodology presented in this instruction.

6.1.1 The SRTA documentation shall be based on the generic SRTA developed by the Westinghouse Owners Group (WOG).

6.1.2 The documents that comprise the SRTA program are identified in the following sections.

6.2 System Sequence Matrices shall be developed to identify systems accessed during a specific task performance. Tasks are identified as a step, note, or caution in the EOP. A System Sequence Matrix table shall be completed for each EOP identified in Section 6.7.5. A System Sequence Matrix table shall also be developed for any unique task as identified in Section 6.10. (An example of a System Sequence Matrix is provided as Figure R404-1.) |1

6.2.1 The Step column shall identify the specific step in the associated BVPS-2 EOP.

6.2.2 The Systems section shall identify those BVPS-2 systems which must be accessed to perform the associated step. (The System Code List is provided as Figure R404-2.) |1

6.3 Element Tables shall be developed to identify the requirements the user must address in evaluating the Control Room capability. (An example of an Element Table is provided as Figure R404-3.) |1

6.3.1 The Function element identifies the operator function(s) that the task or subtask supports. (A listing summarizing the EOP operation functions and associated operator function categories is provided as Figure R404-4.) |1

6.3.2 The Step element identifies the task identification number and the task title.

6.3.3 The Purpose element identifies "what" the EOP task or subtask is intended to accomplish.

6.3.4 The Actions element identifies the operator action requirements necessary to perform the task or subtask.

6.3.5 The Instrumentation element identifies the instrumentation requirements necessary to provide operator information needs for decision and action requirements.

6.3.6 The Control/Equipment element identifies the controls necessary to perform the action requirements.

6.4 Instrumentation Requirements Tables shall be developed to identify and review requirements for individual instruments. (An example of an Instrumentation Requirements Table is provided as Figure R404-5.) |1

6.4.1 The System heading identifies the applicable plant system for the subject instrumentation.

6.4.2 The Instrumentation heading identifies the subject instrumentation.

6.4.3 The Criteria Requirements column identifies the specific instrumentation criteria utilized in the BVPS-2 EOPs as a basis for operator decisions or actions.

6.4.4 The Procedure and Step columns identify the specific EOP locations that utilize the subject instrumentation as a source of information for operator decisions or actions.

6.5 Controls/Indication Requirements Tables shall be developed to identify and review requirements for individual controls. (An example of a Controls Requirements Table is provided as Figure R404-6.) 1

6.5.1 The System heading identifies the applicable plant system for the subject control.

6.5.2 The Control/Indication heading identifies the subject control.

6.5.3 The I.D. No. heading identifies the control/indication tag number, if applicable.

6.5.4 The Criteria Requirements column identifies the specific controls criteria utilized in the BVPS-2 EOPs.

6.5.5 The Procedure and Step columns identify the specific EOP locations that utilize the subject controls and/or indications for operator action. 1

6.6 The final form of the documentation identified in Sections 6.2, 6.3, 6.4, and 6.5 shall be defined at the start of CRDR SRTA program.

6.7 SRTA data shall be developed for event sequences that reflect a spectrum of plant emergency operations.

6.7.1 The event sequences shall be selected to comply with the recommendations in NUREG 0700.

6.7.2 The SRTA documentation shall address the important areas of emergency operations (e.g., event diagnosis, critical safety function monitoring, high risk event sequences, etc.)

6.7.3 The event sequences shall exercise all the BVPS-2 emergency systems.

6.7.4 The event sequences selected for the BVPS-2 SRTA are itemized below:

6.7.4.1 Spurious safety injection

6.7.4.2 Loss of reactor coolant (small break - 1 inch diameter)

6.7.4.3 Loss of reactor coolant (small break - 4 inch diameter)

6.7.4.4 Loss of reactor coolant (large break)

6.7.4.5 Loss of secondary coolant

6.7.4.6 Combined loss of reactor and secondary coolant

6.7.4.7 Steam generator tube rupture (design basis)

6.7.4.8 Steam generator tube rupture (multiple ruptures in one steam generator)

6.7.4.9 Steam generator tube rupture (ruptures in more than one steam generator)

6.7.4.10 Anticipated transient without scram

6.7.4.11 Inadequate core cooling (resulting from failures in emergency core cooling system)

6.7.4.12 Inadequate core cooling (resulting from loss of secondary heat sink)

6.7.4.13 Pressurized thermal shock

6.7.4.14 Containment Integrity

6.7.5 SRTA data for the emergency event sequences identified in Section 6.7.4 shall be developed based on the following BVPS-2 EOPs:

6.7.5.1 Reactor Trip or Safety Injection

6.7.5.2 SI Termination

6.7.5.3 Loss of Reactor or Secondary Coolant

6.7.5.4 Post LOCA Cooldown and Depressurization

6.7.5.5 Transfer to Cold Leg Recirculation

6.7.5.6 Transfer to Hot Leg Recirculation

6.7.5.7 Faulted Steam Generator Isolation

6.7.5.8 Steam Generator Tube Rupture

6.7.5.9 Post-SGTR Cooldown Using Steam Dump

6.7.5.10 Critical Safety Function Status Trees

6.7.5.11 Response to Nuclear Power Generation/ATWS

6.7.5.12 Response to Inadequate Core Cooling

6.7.5.13 Response to Loss of Secondary Heat Sink

6.7.5.14 Response to Imminent Pressurized Thermal Shock Conditions

6.7.5.15 Response to High Containment Pressure

6.8 The SRTA documentation shall be prepared by adapting the generic WOG SRTA documentation. The basis for adaptation shall be the BVPS-2 EOPs as identified in Section 6.7.5.

6.9 Where necessary, the generic SRTA documentation shall be augmented to identify any specific instrumentation and controls necessary to perform the tasks in the BVPS-2 EOPs.

6.10 Following the preparation for the BVPS-2 SRTA documentation, the EOPs omitted from Section 6.7.5 shall be reviewed to identify any additional instrumentation, controls or operator tasks that do not appear in the selected EOPS.

6.10.1 This review shall ensure that the selected EOPs are representative of energency operations.

6.10.2 Any unique instrumentation, controls, or tasks identified in this review shall be evaluated for inclusion in the BVPS-2 SRTA documentation.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R404-1, "System Sequence Matrix"

8.2 Figure R404-2, "System Code List for System Sequence Matrix Tables"

8.3 Figure R404-3, "Element Table"

8.4 Figure R404-4, "Operator Functions"

8.5 Figure R404-5, "Instrumentation Requirement Table"

8.6 Figure R404-6, "Control/Indication Requirements Table" 1

SYSTEM SEQUENCE MATRIX TABLE

PROCEDURE: E-0, REACTOR TRIP OR SAFETY INJECTION

STEP	SYSTEMS																														
	GMS	ENS	CCP	CHS	CNM	CVS	DAS	DGS	ESF	EGS	FPW	FWE	FWS	GNS	HVC	HVP	HVR	HVS	IAC	CSS	MSS	NIS	PGS	QSS	RCS	RDI	RHS	RMS	RPS	RSS	SIS	SSR	SWS	NNS	VRS
1-N																																			
1																						▲			▲				▲						
2																																			
3																													▲						
4																					▲														
5-N																																			
5	▲																																		
6		▲	▲							▲							▲									▲									
7					▲					▲											▲				▲										
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10												▲									▲														
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19												▲	▲								▲				▲										
20					▲																														
21			▲			▲	▲	▲	▲		▲		▲	▲	▲	▲		▲			▲			▲			▲			▲	▲	▲	▲		▲

FIGURE R404-1

BEAVER VALLEY POWER STATION UNIT NO. 2
SYSTEM CODE LIST FOR
SYSTEM SEQUENCE MATRIX TABLES

BDC	Blowdown - Steam Generator
BRS	Boron Recovery System
CCP	Primary Component Cooling
CHS	Charging and Volume Control System
CNM	Condensate - Main Condensate
CSS	Containment Depressurization System
CVS	Containment Vacuum System
DAS	Drains (Aerated) System
DGS	Drains (Hydrogenated) System
EGS	Emergency Diesel Generator System
ENS	4160V Switchgear Emergency System
ESF	Engineered Safeguards
FNC	Fuel-Nuclear-Fuel Pool Cooling & Purification
FPW	Fire Protection - Water
FWE	Feedwater - Emergency Feedwater
FWS	Feedwater - System
GMS	Main Generator - System
GNS	Primary Plant Gas Supply - System
HCS	Hydrogen Control System (Post DBA)
HVC	HVAC - Control Building
HVP	HVAC - Primary Auxiliary Building
HVR	HVAC - Reactor Building (and Purge)
HVS	Supplementary Leak Collecting System
HVZ	HVAC - Service Building
IAC	Instrument Air Containment
LMS	Leakage Monitoring System
MSS	Main Steam System
NIS	Nuclear Instrumentation
NNS	4160V Switchgear Normal-System
PGS	Primary Grade Water System
QSS	Quench Spray System (Containment)
RCS	Reactor Coolant System
RDC	Reactor Rod Drive Control
RDI	Reactor Rod Drive Instrumentation
RHS	Residual Heat Removal System
RMS	Radiation Monitoring System
RPS	Reactor Protection System
RSS	Recirculation Spray System - Containment
SIS	Safety Injection System
SSR	Sampling System - Radioactive System
SWS	Service Water System
TMS	Main Turbine System
VRS	Vents Gaseous (Hydrogenated) System

FIGURE R404-2

ELEMENT TABLE FOR E-0

STEP 7

FUNCTION: Diagnose plant condition

STEP: Check if SI Is Actuated

PURPOSE: To determine if SI is in service or is required

ACTIONS:

- o Determine if SI is actuated
- o Determine if any of the following annunciators are lit:
  - Steamline pressure low reactor trip and safety injection
  - Containment pressure high reactor trip and safety injection
  - Pressurizer low pressure reactor trip and safety injection
  - Reactor trip and low Tavg or SI main feedwater valve closed
- o Determine if emergency diesels have auto started
- o Determine if LHSI pumps have auto started
- o Determine if charging valves have auto aligned for cold leg injection flow
- o Determine if RCS pressure is less than 1875 psig
- o Determine if CNMT pressure is greater than 1.5 psig
- o Determine if steamline pressure is less than 525 psig
- o Actuate SI

INSTRUMENTATION:

- o SI status indication (actuated)
- o Status indication for
  - diesel generators (running; stopped)
  - LHSI pumps (running; stopped)
- o Position indication for cold leg injection valves [2SIS-MOV867A, B, C, D] (open; closed)
- o Wide range RCS pressure indication [2RCS-PI402, 403] (less than 1875 psig)
- o Containment pressure indication [2LMS-PI950, 951, 952, 953] (greater than 1.5 psig)
- o SG pressure indication [2MSS-PI474, 484, 494; 475, 485, 495; 476, 486, 496] (less than 525 psig)
- o Tavg indication [2RCS-TI413, 423] (below low Tavg setpoint)

CONTROL/EQUIPMENT:

Switches to actuate SI (actuate)

FIGURE R404-3

OPERATOR FUNCTION	CATEGORY
VERIFICATION OF AUTOMATIC ACTUATIONS	VERIFICATION
DIAGNOSIS OF PLANT CONDITION	DIAGNOSIS
DIAGNOSIS OF PLANT SAFETY STATE	
MONITOR/REGULATE RCS BORON CONCENTRATION	CONTROL
MONITOR/REGULATE RCS PRESSURE	
MONITOR/REGULATE RCS TEMPERATURE	
MONITOR/REGULATE RCS INVENTORY	
MONITOR/REGULATE SECONDARY PRESSURE	
MONITORY/REGULATE SECONDARY INVENTORY	
MONITORY/REGULATE CONTAINMENT ENVIRONMENT	
EVALUATE EQUIPMENT STATUS	
MONITOR/RESTORE SUBCRITICALITY	
MONITOR/RESTORE CORE COOLING	
MONITOR/RESTORE INTEGRITY	
MONITOR/RESTORE HEAT SINK	CONTROL
MONITOR/RESTORE CONTAINMENT	
MONITOR/RESTORE INVENTORY	

FIGURE R404-4

INSTRUMENTATION REQUIREMENTS TABLE

SYSTEM: LEAKAGE MONITORING SYSTEM

INSTRUMENTATION: Containment Pressure (2LMS-P1950,951,952, 953)

CRITERIA REQUIREMENTS:	PROCEDURE	STEP
GREATER THAN 45 PSIG	F-0.5	STEP 1
GREATER THAN 10 PSIG	ES-1.3	STEP 4
GREATER THAN 8.0 PSIG	ECA-1.1	STEP 6
GREATER THAN 8.0 PSIG	FR-Z.1	STEP 3
GREATER THAN 3.0 PSIG	E-0	STEP 15
GREATER THAN 1.5 PSIG	E-0	STEP 7
LESS THAN 45 PSIG	F-0.5	STEP 1
LESS THAN 8.0 PSIG	ECA-1.1	STEP 5
NORMAL	E-0	STEP 26

FIGURE R404-5

CONTROL/INDICATION REQUIREMENTS TABLE

SYSTEM: Reactor Coolant System

CONTROL/INDICATION: Reactor Coolant Pumps

I.D. NO: [2RCS-P21A,B,C]

CRITERIA REQUIREMENTS	PROCEDURE	STEP
STOP	E-0	STEP 16
RUNNING; STOPPED	E-0	STEP 22
STOP	E-0	STEP 22
RUNNING; STOPPED	E-0	STEP 23
STOP	E-0	STEP 23
RUNNING;STOPPED	E-1	STEP 1
STOP	E-1	STEP 1
RUNNING; STOPPED	ES-0.1	STEP 20
RUNNING; STOPPED	ES-0.1	STEP 24-CAUTION 1
RUNNING; STOPPED	ES-0.1	STEP 24
START/STOP	ES-0.1	STEP 24
RUNNING; STOPPED	ES-1.2	STEP 14
RUNNING; STOPPED	ES-1.2	STEP 15-CAUTION 2
RUNNING; STOPPED	ES-1.2	STEP 15
START/STOP	ES-1.2	STEP 15
RUNNING; STOPPED	ES-1.2	STEP 16
RUNNING; STOPPED	ES-1.2	STEP 17
RUNNING; STOPPED	ES-1.2	STEP 19-CAUTION 2
RUNNING; STOPPED	ES-1.2	STEP 21
START/STOP	ES-1.2	STEP 21
RUNNING; STOPPED	ES-1.2	STEP 31
STOP	ES-1.2	STEP 31
RUNNING; STOPPED	E-3	STEP 1
STOP	E-3	STEP 1
RUNNING; STOPPED	E-3	STEP 18
STOP	E-3	STEP 18
RUNNING; STOPPED	E-3	STEP 19-NOTE
RUNNING; STOPPED	E-3	STEP 30
RUNNING; STOPPED	E-3	STEP 36-CAUTION 2
RUNNING; STOPPED	E-3	STEP 36
START/STOP	E-3	STEP 36
RUNNING; STOPPED	ES-3.3	STEP 6
RUNNING; STOPPED	ES-3.3	STEP 11-NOTE
RUNNING; STOPPED	ES-3.3	STEP 11
START/STOP	ES-3.3	STEP 11
RUNNING; STOPPED	ES-3.3	STEP 12
STOP	ES-3.3	STEP 12
RUNNING; STOPPED	F-0.2	STEP 3

FIGURE R404-6

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R405	0	12-26-84	1 of 7

PREPARED BY: M. E. Dalton EEE 12/26 DATE: 12-26-84

APPROVED BY: E F Kurtz, EEE DATE: 12-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 5,
"VERIFICATION OF TASK PERFORMANCE CAPABILITIES"

PAGES	DATE	REVISION
1 - 7	12-26-84	0

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.5 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 5 of the BVPS-2 CRDR, "Verification of Task Performance Capabilities."

2.0 APPLICABILITY

This instruction applies to Task 5 of the CRDR, "Verification of Task Performance Capabilities."

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format," Revision 0

3.3 NCDP 1.6, "Document Control," Revision 0

3.4 NCDP 1.12, "NCD Instruction Manual," Revision 1

3.5 BVPS-2 CRDR Charter, Revision 2

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R-409, "Human Engineering Discrepancy (HED) Report"

3.8 Task Plan 9.2, Appendix A-1, "Criteria -- Verification of Task Performance Capabilities"

4.0 DEFINITIONS

4.1 Verification

The process for determining whether instrumentation, controls, and other equipment meet the specific requirements of the emergency tasks performed by operators. The control room survey is a verification activity, checking the control room match to the human operator. In the DCRDR context, verification implies a static check of the plant instrumentation and controls against human engineering criteria.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 5 of the CRDR, "Verification of Task Performance Capabilities."

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 5 of the CRDR, "Verification of Task Performance Capabilities."

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with the respect to the "Verification of Task Performance Capabilities" when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the "Verification of Task Performance Capabilities" under the direction of the RTL in accordance with this instruction. The Core Team is defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The verification of task performance capabilities phase of the CRDR shall be conducted in accordance with the methodology presented in this instruction.

6.1.1 The CRDR RTL, or designee, shall review and finalize the verification of task performance capabilities instruction.

6.1.2 The CRDR RTL, or designee, shall submit the verification of task performance capabilities instruction to the DLC MRA in accordance with the BVPS-2 CRDR Charter for review and approval.

6.2 Verfication of Availability

The CRDR Team members shall verify the presence of instruments and equipment that provide the information and control capabilities necessary to implement each operator task (availability) identified in the SRTA as follows:

6.2.1 The operator information and control requirements (needs) listed in the element tables produced during the system review and task analysis (SRTA) shall be compared to the inventory data sheets and full-scale photo mock-up to ensure the following:

6.2.1.1 A device exists on the Main Control Board to provide the information and control capabilities necessary to implement each operator task identified in the SRTA.

6.2.1.2 The input/output capabilities of existing Main Control Board devices satisfy the input/output requirements specified in the SRTA.

6.2.2 The results of 6.2.1 will be recorded on a standard form, as shown in Figure R405-1. Any mismatches between the operator information and control needs and the inventory results will be identified as a HED, as described in Reference 3.7.

6.2.3 The main control board devices will then be compared against the remaining NUREG 0700, Section 6, guidelines that pertain to verification of task performance capabilities (listed in Task Plan TP-9.2 under "availability;" see Reference 3.8). Any discrepancy that exists between TP-9.2 and the main control board devices will be identified as a HED, as described in Reference 3.7.

6.3 Verification of Human Engineering Suitability

The CRDR Team members shall verify that the characteristics of available equipment and instruments in the control room will support the implementation of each operator task as described in the SRTA, i.e., Human Engineering Suitability. This will be accomplished as follows:

6.3.1 The operator information and control requirements (needs) listed in the element tables produced during the SRTA shall be compared to the inventory data sheets, instrumentation precision tables (as required), and photo mock-up to ensure that the devices which exist on the Main Control Board have appropriate characteristics (range/accuracy or positions/precision) to support the implementation of each operator task identified in the SRTA.

6.3.2 The results of 6.3.1 will be recorded on a standard form, as shown in Figure R405-2. Any mismatches between the characteristics needed to support information and control requirements and those present on the Main Control Boards as described in the inventory results or photo mock-up will be identified as a HED, as described in Reference 3.7.

6.3.3 The characteristics of Main Control Board devices will then be compared against the remaining NUREG-0700, Section 6, guidelines that pertain to verification of task performance capabilities (listed in Task Plan - 9.2 under "Suitability;" see Reference 3.8). Any discrepancy that exists between TP-9.2 guidelines and the Main Control Board devices will be identified as a HED, as described in Reference 3.7.

6.4 The CRDR Team shall prepare the verification results in final report format, as described in Instruction R-408.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R405-1, "Verification of Task Performance Capabilities -- Equipment Availability"

8.2 Figure R405-2, "Verification of Task Performance Capabilities -- Human Engineering Suitability"

VERIFICATION OF TASK PERFORMANCE CAPABILITIES

EQUIPMENT AVAILABILITY

PROCEDURE/ TASK STEP	INFORMATION OR CONTROL REQUIREMENT	MCB SECTION	MARK NO.	REMARKS •OK (✓) •NEED MOD.

FIGURE R405-1

VERIFICATION OF TASK PERFORMANCE CAPABILITIES
HUMAN ENGINEERING SUITABILITY

PROCEDURE & TASK STEP	INFORMATION OR CONTROL REQUIREMENT	REQUIRED •RANGE •ACCURACY •POSITIONS •PRECISION	ACTUAL •RANGE •ACCURACY •POSITIONS •PRECISION	MCB SECTION	MARK NO.	REMARKS •OK (✓) •POTENTIAL CONCERNS •HED NO.

FIGURE R405-2

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R406	0	12-26-84	1 of 6

PREPAPED BY: M. E. Oyston DATE: 12-26-84

APPROVED BY: E F Kurtz / EFK DATE: 12-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 6
"VALIDATION OF CONTROL ROOM FUNCTIONS"

PAGES	DATES	Revision
1 - 6	12-26-84	0

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 4.6 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 6 of the BVPS-2 CRDR, "Validation of Control Room Functions."

2.0 APPLICABILITY

This instruction applies to Task 6 of the CRDR, "Validation of Control Room Functions."

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format," Revision 0

3.3 NCDP 1.6, "Document Control," Revision 0

3.4 NCDP 1.12, "NCD Instruction Manual," Revision 1

3.5 BVPS-2 CRDR Charter, Revision 2

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R-409, "Human Engineering Discrepancy (HED) Report"

3.8 Task Plan 9.2, Appendix A-2, "Criteria -- Validation of Control Room Functions."

4.0 DEFINITIONS

4.1 Validation

The process for determining whether the control room operating crew can perform their functions effectively given the control room instrumentation, procedures, and training. In the DCRDR context, validation implies a dynamic performance evaluation.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 6 of the CRDR, "Validation of Control Room Functions."

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 6 of the CRDR, "Validation of Control Room Functions."

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with the respect to the "Validation of Control Room Functions" when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the "Validation of Control Room Functions" under the direction of the RTL in accordance with this instruction. The Core Team is defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The validation of control room functions phase of the CRDR shall be conducted in accordance with the methodology presented in this instruction.

6.1.1 The CRDR RTL, or designee, shall review and finalize the validation of control room functions instruction.

6.1.2 The CRDR RTL, or designee, shall submit the validation of control room functions instruction to the DLC MRA in accordance with the BVPS-2 CRDR Charter for review and approval.

6.2 Using a full-scale photo mock-up, the CRDR Team members, along with DLC operations staff, shall perform a walk-through/talk-through validation process in accordance with the guidelines specified in NUREG 0700.

6.2.1 The CRDR Team members shall make a comparison of the inventory results with the full-scale mock-up, and adjust the full-scale mock-up accordingly.

6.2.2 The CRDR Team and DLC operations shall perform walk-throughs covering each of the following procedures using the BVPS-2 validation scenarios:

6.2.2.1 Start-up from cold shutdown to power operation (5%).

6.2.2.2 Load follow from 100% power to 50% power.

6.2.2.3 Reactor trip or safety injection.

6.2.2.4 S.I. termination.

6.2.2.5 Loss of reactor or secondary coolant.

6.2.2.6 Post-LOCA cooldown and depressurization.

6.2.2.7 Transfer to cold leg recirculation.

6.2.2.8 Transfer to hot leg recirculation.

6.2.2.9 Faulted steam generator isolation.

6.2.2.10 Steam generator tube rupture.

6.2.2.11 Post-SGTR Cooldown using steam dump.

6.2.2.12 Critical safety function status trees.

6.2.2.13 Response to nuclear power generation (ATWS).

6.2.2.14 Response to inadequate core cooling.

6.2.2.15 Response to loss of secondary heat sink.

6.2.2.16 Response to imminent pressurized thermal shock conditions.

6.2.2.17 Response to high containment pressure.

6.2.3 Prior to performing the walk-through, the CRDR Team will brief the operating crew on the purpose, objective, and the procedure to be used during the control room validation process.

6.2.4 Prior to performing the walk-through, the foreman or shift supervisor will allocate task between the control room operators.

6.2.5 During the walk-through, the foreman or shift supervisor will ensure that the operators verbally describe:

- The component or parameter being controlled or monitored.
- The purpose of the action.
- The expected result of the action in terms of system response.
- How system responses can be verified.
- What actions should be taken if the expected responses do not occur.

6.2.6 During the walk-through, the CRDR Team will note and document any deviations from the applicable 0700 Section 6 Guidelines (see

Reference 3.8). In addition, any concern or questions that surface during the walk-throughs will be noted.

6.2.7 If, for the given procedure, the chosen scenario creates any difficulties or confusion with the operations staff, the walk-through will immediately stop. The problems will be discussed with the operating crew (talk-through) and when the problem is resolved, the walk-through will continue.

6.2.8 During the walk-through, the CRDR Team will trace and document the movement patterns of the reactor operator, the plant operator, and the foreman or shift supervisor. The movement patterns will be documented on control room layout drawings, as shown in Figure R406-1.

6.2.9 All walk-throughs will be recorded (both video and sound) for CRDR Team review and walk-through documentation.

6.2.10 At the end of each walk-through, a debriefing will be held between the operating crew and the CRDR Team discussing any procedural, operational, or control/display problem that was encountered during the scenario.

6.2.11 At the completion of all the walk-throughs, core team meetings will be held to compare the checklists, operating crew movement patterns, and review walk-through recordings. Any discrepancy that exists between the validation results and the guidelines set forth in Section 6 of the NUREG 0700 shall be reported as described in Reference 3.7.

6.2.12 All HED's generated during the validation of control room functions shall be filed in accordance with the BVPS-2 Charter and retained for further analysis during the BVPS-2 assessment phase.

6.2.13 The CRDR Team shall prepare the validation results in final report format, per Instruction R408.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974 and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R406-1, "Control Room Layout"

CONTROL ROOM LAYOUT

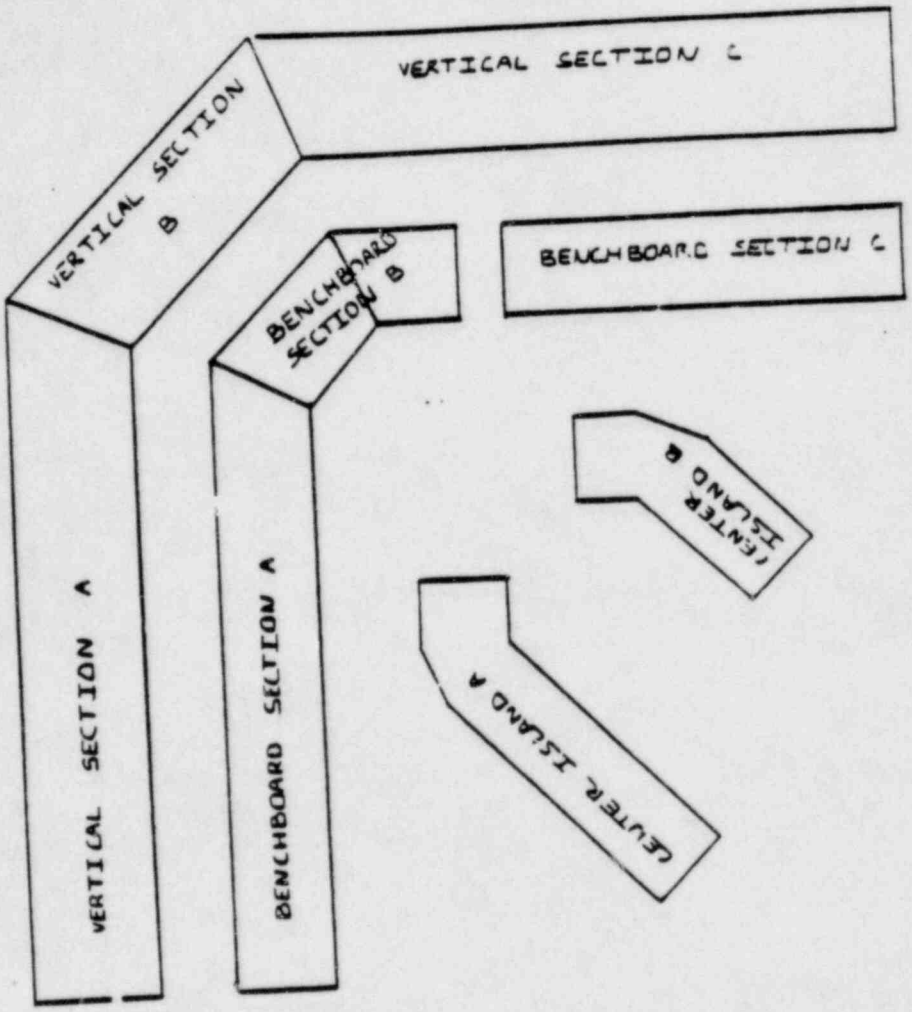


FIGURE R406-1

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R407	0	12-26-84	1 of 10

PREPARED BY: M. E. Oplin DATE: 12-26-84

APPROVED BY: E. F. Kurtz / EFK DATE: 12-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 7, "ASSESSMENT"

PAGES	DATE	REVISION
1-10	12-26-84	0

1.0 PURPOSE AND SCOPE

This instruction is established to meet Section 5.0 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 7 of the BVPS-2 CRDR, "Assessment."

2.0 APPLICABILITY

This instruction applies to Task 7 of the CRDR, "Assessment."

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format," Revision 0

3.3 NCDP 1.6, "Document Control," Revision 0

3.4 NCDP 1.12, "NCD Instruction Manual," Revision 1

3.5 BVPS-2 CRDR Charter, Revision 2

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R-409, "Human Engineering Discrepancy (HED) Report"

4.0 DEFINITIONS

Not applicable to this instruction.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 7 of the CRDR, "Assessment."

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 7 of the CRDR, "Assessment."

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with the respect to the Assessment task when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for performing the Assessment task under the direction of the RTL in accordance with this instruction. The Core Team is defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The Assessment Phase of the CRDR shall be conducted in accordance with the methodology presented in this instruction.

6.1.1 The CRDR RTL, or designee, shall review and finalize the assessment instruction.

6.1.2 The CRDR RTL, or designee, shall submit the assessment instruction to the DLC MRA in accordance with the BVPS-2 CRDR Charter for review and approval.

6.2 After an HED is identified in the review phase, it shall be submitted to the CRDR assessment team (comprised of the RTL, TC, I&C engineer, RO, human factors specialist, and control systems engineer) to determine the implications of the discrepancy with regard to possible safety and operational sequences.

6.2.1 The outcome of this process shall be dispositioned HED's; i.e., HED's that have been categorized and assigned levels of priority in line with their safety importance and operational significance.

6.2.2 The HED Priority Record, Figure R407-1, shall be used to assess the priority of all HED's. The form contains a section for assessment and a logic diagram. The logic diagram shall be used to determine how the data is integrated to assign categorized priority levels to HED's.

6.2.2.1 The category (I, II, or III) of an HED shall be defined as the likelihood of occurrence (potential for degrading performance). Category I HED's are those which have been noted from documented errors, Category II are those which have not been noted but have relatively high potential for degrading performance, and Category III discrepancies are those which are associated with a relatively low potential for degrading performance. Category I, II, and III HED's are all considered to increase error potential, but system consequence and HED impact shall be assigned to further determine priority levels.

6.2.2.2 The priority (1 through 9) of an HED shall relate its overall importance from a human factors perspective. Priority shall relate all HED's to one another and provide the necessary input, from a human factors point of view, to Duquesne Light Company management for determinig what recommendations will result in design, procedural, training, or administrative changes.

6.3 Each HED shall be evaluated for correction by surface enhancement, design alternatives, or procedural, training, or administrative changes.

6.3.1 HED review and recommendations (see Figure R409-1, Section K, Instruction R409) shall first consider resolution/recommendation by surface enhancement. Surface enhancements include such techniques as demarcation, adding system or sub-system mimics, using color patches, and modifying labeling.

6.3.2 If surface enhancements do not provide adequate resolution to the HED, or if surface enhancements are not applicable to the HED, it shall be analyzed for correction by design alternative recommendations. Various alternatives shall be considered to ensure that an effective and reasonable design solution will be provided to Duquesne Light Company management for their review and disposition. Specific considerations in this process include the extent of resolution possible, the impact on the existing design, general cost and scheduling considerations, and where applicable, effects on operator training.

6.3.3 In cases where neither enhancement nor design alternative offers an appropriate solution, a procedure change or an operator training solution may be recommended.

6.3.4 In instances in which a decision is made to only partially correct or not to correct an HED, a justification shall be provided. If deemed appropriate by the human factors specialists, a justification based upon human factors principles and practices shall be given. Otherwise, an engineering constraint/cost-effectiveness justification shall be supplied by the team assessing the HED's for Duquesne Light Company management review and disposition.

6.4 Once HED recommendations have been agreed upon by the assessment team, and the extent of HED correction determined, candidate recommendations shall be assessed using the reassessment of probable error and deviation form, Figure R407-2, to ensure that the HED's have been adequately addressed. This reassessment process has the two objectives of determining whether the correction satisfactorily resolved the existing discrepancy and if it will introduce new discrepancies.

6.4.1 Reassessment criteria shall include extent of deviation from guidelines, error potential, and consequence of error. The criteria shall be scaled subjective judgments (from 1 to 6, see Figure R407-2).

6.5 The major output of the assessment phase shall consist of satisfactorily resolved HED's, or partially resolved and unresolved HED's for which justifications have been written. All HED report forms shall have completed HED priority records and reassessment of probable error and deviation forms attached to them before submittal to Duquesne Light Company management.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R407-1, "HED Priority Record" (3 pages)

8.2 Figure R407-2, "Reassessment of Probable Error and Deviation" (2 pages)

HED PRIORITY RECORD

HED #						
1. DOCUMENTED ERROR?	NO					YES
2. DOCUMENTED UNSAFE CONDITION OR TECH. SPEC. VIOLATION?	NO					YES
3. HIGH SAFETY IMPORTANCE (PAM OR 1E)?	NO					YES
4. ERROR POTENTIAL?	1 LOW	2	3	4	5	6 HIGH
5. CONSEQUENCE OF ERROR:	1 LOW	2	3	4	5	6 HIGH

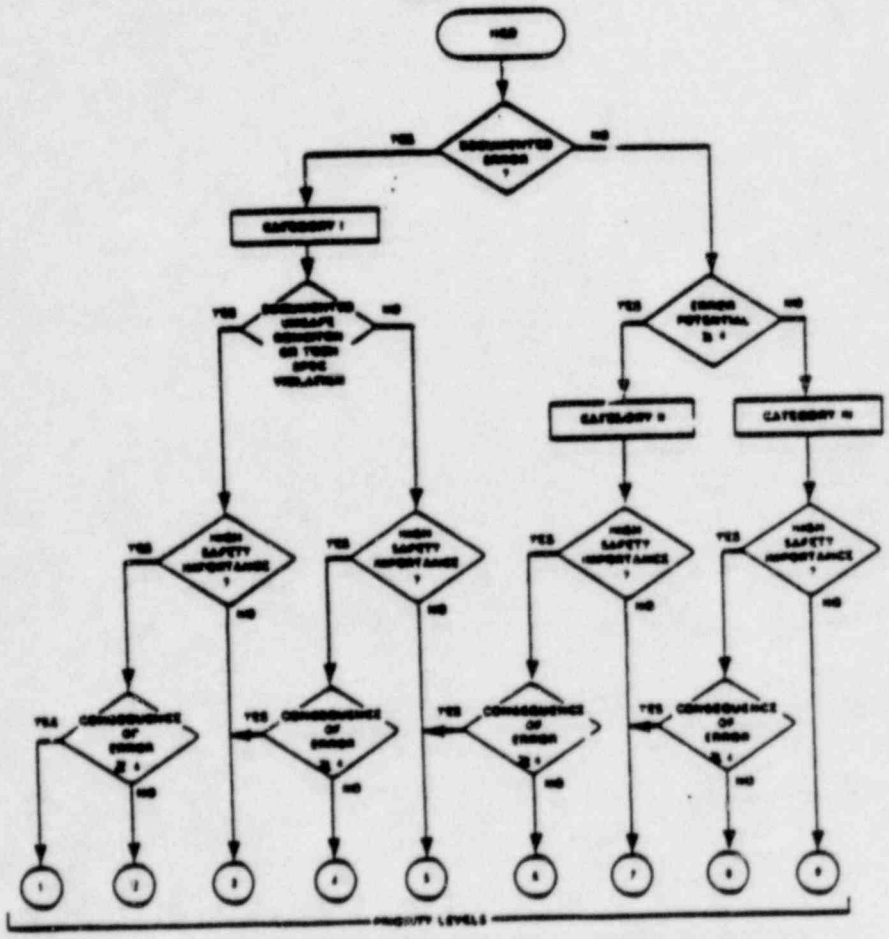


FIGURE R407-1
(SHEET 1)

HED PRIORITY RECORD

1. DOCUMENTED ERROR

Documented error refers to an error which has actually occurred at the plant or a plant of similar design as reported in Licensee Event Reports (LERs), or as verifiable events (i.e. supported by official plant documentation reported by plant operations personnel during the DCRDR Operating Experience Review interviews.

2. DOCUMENTED UNSAFE CONDITION OR TECHNICAL SPECIFICATION VIOLATION

A documented unsafe condition or technical specification violation refers to an unsafe condition or a violation of technical specifications which is evidenced through and suppoorted by official plant records and design information.

3. HIGH SAFETY IMPORTANCE

All human engineering discrepancies identified during the review phase will be assessed for their potential impact on safety. If error can impact a safety function (actuation of a 1E control, or interpretation of PAM instrumentation), the HED shall be categorized as high safety importance.

4. ERROR POTENTIAL

Refers to probability or likelihood of error occurance. Error potential is related more to the physical aspects of the specific situation rather than its relationship within a system and is effected by training and experience.

e.g. 1 = "EMERGENCY FEET WATER"
6 = 1% of all process controllers working backwards from rest

FIGURE R407-1
(SHEET 2)

5. CONSEQUENCE OF ERROR

Refers to the seriousness of error consequences. Very much related to system interrelationships not effected by training or experience except both can lessen consequences once error occurs.

e.g. 1 = Identical switches in close proximity:men's room light and men's room fan.

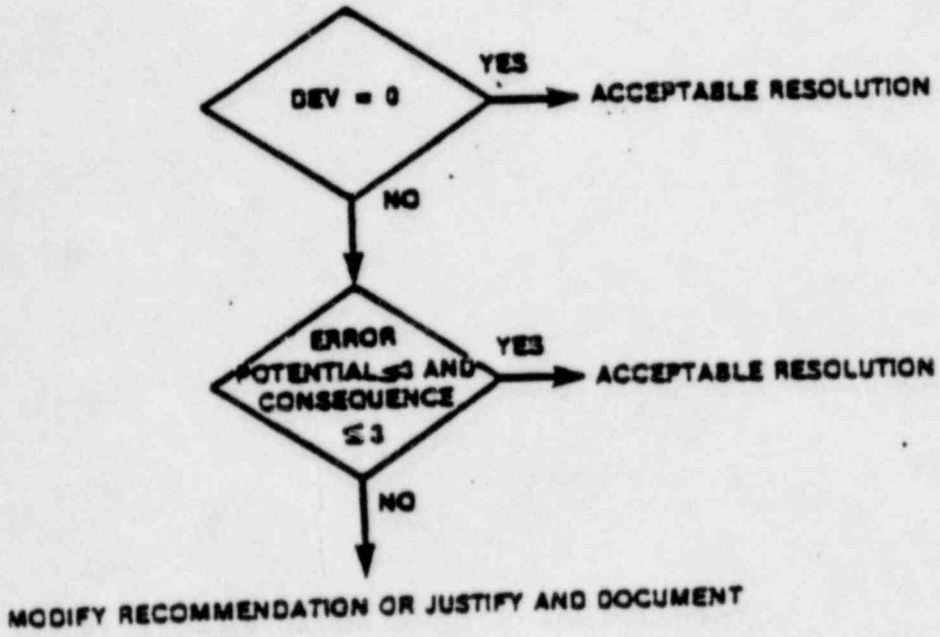
6 = Identical switches in close proximity: Release to atmosphere and containment isolation.

FIGURE R407-1
(SHEET 3)

REASSESSMENT OF PROBABLE ERROR AND DEVIATION

HED #

1. EXTENT OF DEVIATION FROM GUIDELINES	NONE 0	SOME 1	2	3	4	5	COMPLETE 6
2. ERROR POTENTIAL		LOW 1	2	3	4	5	HIGH 6
3. CONSEQUENCE OF ERROR		LOW 1	2	3	4	5	HIGH 6



SIGNOFF: DLC-RTL

_____

DATE: _____

FIGURE R407-2
(SHEET 1)

EXPLANATION OF REASSESSMENT CRITERIA (SCALED JUDGMENTS FROM 1-6)

1. EXTENT OF DEVIATION FROM GUIDELINES

Rating as to how much a specific discrepancy does not conform to guideline recommendations. To make judgment, a thorough understanding of criteria is important. Experience in relating HF criteria to nuclear power systems is also very heloful. Rating is subjective, as are all three ratings.

e.g. 1 = Space between lines of labeling is slightly less than ½ of letter height, but lables are very readable.

2. ERROR POTENTIAL

Refers to probability or likelihood of error occurance. Error potential is related more to the physical aspects of the specific situation rather than its relationship within a system and is affected by training and experience.

e.g. 1 = "EMERGENCY FEEDWATER"

6 = 1% of all process controllers working backwards from rest.

3. CONSEQUENCE OF ERROR

Refers to the seriousness of error consequences. Very much related to system interrealtionships not effected by training or experience except both can lessen consequences once error occurs.

e.g. 1 = Identical switches in close proximity:men's room light and men's room fan.

6 = Identical switches in close proximity: Release to atmosphere and containment isolation.

FIGURE R407-2
(SHEET 2)

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION
INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R408	0	12-28-84	1 of 4

PREPARED BY: M. E. Deffler DATE: 12-26-84

APPROVED BY: E F Kurtz / EFE DATE: 12-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: TASK 8
"FINAL SUMMARY REPORT"

PAGES	DATE	Revision
1 - 4	12-26-84	0

1.0 PURPOSE AND SCOPE

This instruction is established to meet Sections 5.4 and 6.0 of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during Task 8 of the BVPS-2 CRDR, "Final Summary Report."

2.0 APPLICABILITY

This instruction applies to Task 8 of the CRDR, "Final Summary Report."

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September 1981

3.2 NCDP 1.3, "Procedure Format," Revision 0

3.3 NCDP 1.6, "Document Control," Revision 0

3.4 NCDP 1.12, "NCD Instruction Manual," Revision 1

3.5 BVPS-2 CRDR Charter, Revision 2

3.6 BVPS-2 CRDR Program Plan

3.7 NCD Instruction R-409, "Human Engineering Discrepancy (HED) Report"

4.0 DEFINITIONS

Not applicable to this Instruction.

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with Task 8 of the CRDR, "Final Summary Report."

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of Task 8 of the CRDR, "Final Summary Report."

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with the respect to the "Final Summary Report" when the RTL is not available.

5.4 CRDR Core Team and Support Team

The CRDR Core Team and Support Team are responsible for writing the "Final Summary Report" under the direction of the RTL in accordance with this instruction. The Core Team is defined in Attachments A and B of the BVPS-2 CRDR Charter.

6.0 INSTRUCTION

6.1 The reporting phase of the CRDR shall be conducted in acccordance with the methodology presented in this instruction.

6.1.1 The CRDR RTL, or designee, shall review and finalize the final summary report instruction.

6.1.2 The CRDR RTL, or designee, shall submit the final summary report instruction to the DLC MRA in accordance with the BVPS-2 CRDR Charter for review and approval.

6.2 The final summary report shall be maintained in draft form until all sections have been reviewed by the core team and DLC MRA.

6.3 The final summary report shall contain three major sections: methodology, review findings, and implementations.

6.3.1 The methodology section shall reference the program plan report and update that material with any changes made during the course of the review. In addition. the final revision to all the instructions utilized during the CRDR shall be placed in this section, along with the CRDR charter.

6.3.2 The review findings section shall summarize all review phase results. This section shall contain all HED report forms, HED priority record, and the reassessment of probable error forms generated during the review and assessment phases of the CRDR. Discrepancies related to operational dynamics in crew performance and procedures, along with discrepancies with safety consequences shall be discussed. All discrepancies for which no corrective actions will be administered, shall be adequately justified from a human factors, engineering, or cost/benefit perspective, as appropriate to the individual HED.

6.3.3 The implementation section shall provide a summary of control room design improvements already completed, and shall identify and schedule all improvements, approved by DLC management, to be completed at a later date. Improvements deemed "Long-Term Implementation" by DLC management shall also be discussed.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

Not applicable to this Instruction.

Duquesne Light Company

NUCLEAR CONSTRUCTION DIVISION INSTRUCTION

INSTRUCTION NO.	REVISION NO.	EFFECTIVE DATE	PAGE
R 409	2	03/25/85	1 of 14

PREPARED BY: M. E. Coffin DATE: 7/24/84

APPROVED BY: E. F. Kurtz Jr. DATE: 7-26-84

TITLE: CONTROL ROOM DESIGN REVIEW: HUMAN ENGINEERING DISCREPANCY (HED) REPORT

PAGES	DATE	REVISION
1 - 13	07/26/84	0
1 - 14	11/20/84	1
1 - 14	03/25/85	2

1.0 PURPOSE AND SCOPE

This instruction is established to meet the Section 4.0 documentation requirements of the BVPS-2 Control Room Design Review (CRDR) Program Plan. In addition, this instruction shall be utilized as guidelines during the completion of the Human Engineering Discrepancy (HED) Report.

2.0 APPLICABILITY

This instruction applies to the completion of the HED Report (See Figure R409-1). The HED Report applies to each task of the CRDR effort.

3.0 REFERENCES

3.1 NUREG 0700, "Guidelines for Control Room Design Reviews," dated September, 1981.

3.2 NCDP 1.3, "Procedure Format"

3.3 NCDP 1.6, "Document Control"

3.4 NCDP 1.12, "NCD Instruction Manual

3.5 BVPS-2 CRDR Charter

3.6 BVPS-2 CRDR Program Plan

4.0 DEFINITIONS

Not applicable to this instruction

5.0 RESPONSIBILITIES

5.1 Manager Regulatory Affairs (MRA)

The MRA is responsible for the overall effort associated with the HED Report completion.

5.2 Review Team Leader (RTL)

The RTL, under the direction of the MRA, is responsible for the coordination and direction of the HED Report completion.

5.3 Technical Coordinator (TC)

The TC assumes the duties of the RTL, with respect to the HED Report.

5.4 CRDR Core Team and Support Team

The CRDR Core Team is responsible for developing and prioritizing recommendations concerning the HED. The TC may call upon members of the Support Team to assist in the HED Report effort.

5.5 Instrumentation and Control (I&C) Engineer

The I&C engineer (W Program Coordinator) is responsible for reviewing the HED Report to ensure accuracy and completeness from a technical standpoint.

5.6 Human Factors Specialist

The Human Factors Specialist (Essex Human Factors Project Manager) is responsible for reviewing the HED report to ensure accuracy and completeness from a Human factors standpoint.

6.0 INSTRUCTION

The BVPS-2 CRDR HED Report shall be completed in accordance with the following instruction.

6.1 HED Report Format

All information relevant to the HED shall be recorded on a "Human Engineering Discrepancy (HED) Report", which can be found in Figure R409-1.

6.2 HED Report Instructions

6.2.1 Plant/Unit

Indicate to what plant and unit HED Report applies (for the Beaver Valley Unit No. 2 CRDR, "BVPS/2" shall be used).

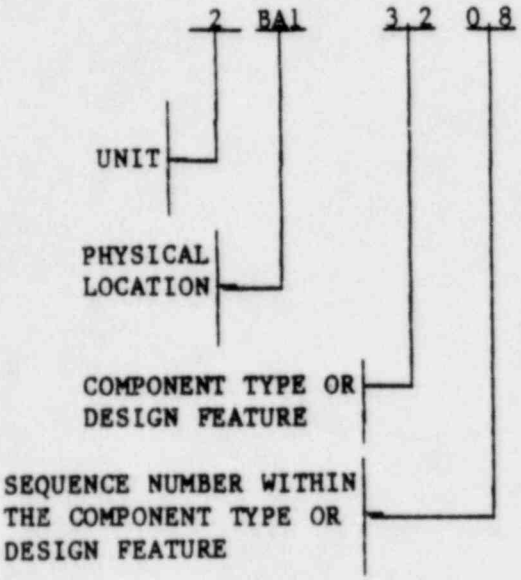
6.2.2 Originator

Name of CRDR team member who identifies the HED.

6.2.3 HED No.

HED numbers are composed of an eight digit alpha-numeric identifier divided into two groups of four digits by a hyphen (done for ease of reading). All but the last two digits have been assigned special meanings which are listed on the attached pages. The last two digits are a sequence number for the preceding two

digits. This allows for up to 100 separate HEDs for any given (component type or design feature) two-digit identifier. Sorting and storing of HEDS should normally be done independent of the physical location code. Below is an example of an HED number which describes a discrete rotary control HED written against the A1 Benchboard section of the main control board (MCB) for Unit 2.



The originator shall leave the last two digits (sequence number) blank. The last two digits (sequence number) shall be completed by the W Program Coordinator after the preliminary HED is reviewed in accordance with paragraph 6.3.

6.2.4 Date

Date HED Report is initiated.

6.2.5 HED Title

Provide the subject of the HED Report.

6.2.6 Items Involved

List the tag no.(s) of the equipment involved or procedure title and number in the HED Report. If the equipment does not have a tag number, provide a description of the equipment, and its location.

6.2.7 Problem Description and 0700 Paragraph Number

Describe the problem/discrepancy, and record what specific paragraph/sub-paragraph in NUREG 0700 the problem/discrepancy pertains to.

6.2.8 Data Collection Description and Duquesne Light Company Instruction Number

Describe the data collection technique (OER review, control room survey, verification, or validation) used when uncovering the human engineering discrepancy. Also state the number of the Duquesne Light Company instruction that was followed during data collection.

6.2.9 Specific Human Error(s) or Equipment Design Problem

Explain the effect the problem/discrepancy has on human performance or equipment design.

6.3 The W Program Coordinator and the Essex Human Factors Project Manager shall review all sections completed by the originator for completeness and accuracy as follows:

6.3.1 If the W Program Coordinator and Essex Human Factors Project Manager concur with the sections completed by the originator, their signatures are placed in Section D. The W Program Coordinator will then assign the last two digits of the HED number (Section C).

6.3.2 If the W Program Coordinator and Essex Human Factors Project Manager do not concur with the sections completed by the originator, then:

6.3.2.1 The sections containing the inaccuracies are corrected, and Sections C & D are completed as described in paragraph 6.3.1.

6.3.2.2 The Human Engineering Discrepancy Report is discarded if a NUREG 0700 section 6 guideline is misinterpreted.

6.4 Section K shall be completed at a Core Team meeting. The HED will be reviewed and recommendations shall be listed in Section K and ranked from most to least desirable. Upon concurrance, the W Program Coordionator, the Duquesne Light Company review team leader, and the Essex Human Factors Project Manager shall sign in the space provided in Section K.

6.5 Section K shall then be reviewed by Duquesne Light Company Engineering Manager, Regulatory Affairs Manager, and Operations Manager. Approval of the recommendation in Section K will be denoted by the Managers' signatures in Section L. If a Manager disapproves of the recommendation, he shall provide justification in Section L. 2

6.6 An approved HED recommendation will be dispositioned via the CRDR implementation schedule. Disapproved HEDs will be sent back to the Core Team for an alternate recommendation.

7.0 RECORDS

7.1 The documents resulting from this instruction are Quality Assurance records as defined in ANSI N45.2.9-1974, and may be included in the Quality Assurance audits of the Nuclear Construction Division. As such, these documents shall be retained for information as outlined in Section 8.0 of the BVPS-2 CRDR Charter.

8.0 FIGURES

8.1 Figure R409-1, "Human Engineering Discrepancy (HED) Report". (2-sided)

8.2 Figure R409-2, "HED Number: Physical Location." (5 sheets)

8.3 Figure R409-3, "HED Number: Component Type or Design Feature"

HUMAN ENGINEERING DISCREPANCY (HED) REPORT TITLE: CRLR: HED REPORT

a) _____
PLANT/UNIT

b) ORIGINATOR: _____ c) HED NO.: _____

d) REVIEWED BY: _____ e) DATE: _____
(Westinghouse)

_____
(Essex)

f) HED TITLE: _____

_____

g) ITEMS INVOLVED:

h) PROBLEM DESCRIPTION AND 070C PARAGRAPH NUMBER:

i) DATA COLLECTION DESCRIPTION AND DUQUESNE LIGHT COMPANY INSTRUCTION NUMBER:

j) SPECIFIC HUMAN ERRORS(s) OR EQUIPMENT DESIGN PROBLEM:

Figure R409-1
(Side 1)

k) REVIEW AND RECOMMENDATIONS:

ESSEX HUMAN FACTORS PROJECT MANAGER

DUQUESNE LIGHT COMPANY REVIEW TEAM LEADER

WESTINGHOUSE PROGRAM COORDINATOR

l) REVIEW AND DISPOSITION:

DUQUESNE LIGHT COMPANY ENGINEERING MANAGER

DUQUESNE LIGHT COMPANY REG. AFFAIRS MANAGER

DUQUESNE LIGHT COMPANY OPERATIONS MANAGER

Figure R409-1 (Side 2)

HED NUMBER
PHYSICAL LOCATION

I. MAIN CONTROL ROOM

A. MAIN CONTROL BOARD

1. Section A

Description	Short Abbreviation
Bench Section	
A1	BA1
A2	BA2
A3	BA3
A4	BA4
All Section A Bench Sections	BA*
Vertical Section	
A5	VA5
A6	VA6
A7	VA7
A8	VA8
A9	VA9
All Section A Vertical Sections	VA*
Other	
All of Section A	*A*

2. Section B

Bench Section	
B1	BB1
B2	BB2
B3	BB3
B4	BB4
All Section B Bench Sections	BB*

Figure R409-2
(Sheet 1 of 5)

Description	Short Abbreviation
Vertical Section	
B5	VB5
B6	VB6
All Section B Vertical Sections	VB*
Other	
All of Section B	*B*

3. Section C

Bench Section	
C1	BC1
C2	BC2
C3	BC3
C4	BC4
All Section C Bench Sections	BC*
Vertical Section	
C5	VC5
C6	VC6
C7	VC7
C8	VC8
C9	VC9
All Section C Vertical Sections	VC*
Other	
All of Section C	*C*

4. Other

All of the Main Control Board	***

Figure R409-2
(Sheet 2 of 5)

B. NUCLEAR INSTRUMENTATION RACKS

Channel	Short Abbreviation
I	NI1
II	NI2
III	NI3
IV	NI4
All Instrumentation Racks	NI*

C. INCORE INSTRUMENTATION RACKS

Channel	Short Abbreviation
I	IC1
II	IC2
III	IC3
IV	IC4
All Instrumentation Racks	IC*

D. RADIATION MONITORING PANELS

Cabinet	Short Abbreviation
1	RM1
2	RM2
3	RM3
4	RM4
5	RM5
6	RM6
7	RM7
8	RM8
All Monitoring Panels	RM*

E. AXIAL POWER MONITORING CABINETS

Cabinet	Short Abbreviation
1	APM

Figure R409-2
(Sheet 3 of 5)

F. BUILDING SERVICES PANEL

Cabinet	Short Abbreviation
1	BSP

G. LOOSE PARTS MONITORING PANEL

Cabinet	Short Abbreviation
1	LPM

H. FAULT RECORDER PANEL

Cabinet	Short Abbreviation
1	FR1

I. LOAD PROGRAM CONTROL CABINET

Cabinet	Short Abbreviation
1	LPC

J. CENTER ISLAND CONSOLE — CIC

K. SHIFT'S SUPERVISOR'S DESK — SSD

L. MAIN CONTROL ROOM, IN GENERAL — MCR

Figure R409-2
(Sheet 4 of 5)

II. EMERGENCY SHUTDOWN PANEL

Section	Short Abbreviation
1	ES1
2	ES2
3	ES3
4	ES4
All of the Emergency Shutdown Panel	ES*

III. ALTERNATE SHUTDOWN PANEL

Bench Section	Short Abbreviation
A	ABA
B	ABB
All of the Alternate Shutdown Panel	AB*

Figure R409-2
(Sheet 5 of 5)

HED NUMBER
COMPONENT TYPE OR DESIGN FEATURE

00 - General (Ltg, Noise, Etc.)
01 - Layout (Furnishings)
02 - Communications
03 - Computer Related
04 - Staffing and Personnel
05 - Protective/Safety Equipment
06 -
07 -
08 -
09 -
10 - Panel, General
11 - Labels
12 - C/D Arrangement
13 - Conventions
14 - Anthropometrics
15 -
16 -
17 - Maintainability
18 -
19 -
20 - Displays, General
21 - Annunciators
22 - Meters
23 - Lights (Light boxes, simple indicator lights, legend lights, etc.)
24 - Strip Chart Recorders
25 - Counters (Mechanical)
26 - Mimics
27 - Digital Type Displays (Electronic, Projection, etc.)
28 - CRTs, Plasma Panels, etc.
29 - Auditory Displays/Signals
30 - Controls, General
31 - Process Controllers
32 - Discrete Rotary Switches (J-Handles, T-Handles, etc.)
33 - Toggle/Levers/Joysticks
34 - Pushbuttons
35 - Thumbwheels
36 - Continuous Rotaries (not Process Controllers)
37 - Slide Switches
38 - Blade Switches
39 - Key Pads
40 - Procedures, General
41 - Maintenance Test Procedures
42 - Administrative Procedures
43 - Design Documents
44 -
45 -
46 -
47 -
48 -
49 -
50 - Systems, General
51 -
52 -
53 -
54 -
55 -
56 -
57 -
58 -
59 -
60 - Fuses, General
61 - Indicator Light Fuses
62 - Circuit Breakers
63 -
64 -
65 - Relays
66 - Relay Groups
67 -
68 - Timers
69 -
70 - Connectors, General
71 - Phone Jacks
72 - Coax Connectors (BNC)
73 - Banana Jacks
74 - Binding Posts
75 - Multi-Pin Connectors
76 - Probe Jacks
77 - Patch Panels
78 -
79 -
80 - Tape Recorders

Figure R409-3

APPENDIX C

UNIT 1 OPERATOR INTERVIEWS AND QUESTIONNAIRES METHODOLOGY

(Extracted from a draft of the Unit 1 CRDR Summary Report)

2.4.2 Operator Questionnaires

As part of the DCRDR, a survey of operating personnel was performed through the administration of a questionnaire and an interview of operating personnel. The intent of the survey was to gain as much firsthand information as possible regarding problem areas in the control room.

The following subsections describe the methods, instrument, and analysis employed in this part of the CRDR.

2.4.2.1 Method

The operator questionnaire part of the survey of operating personnel was conducted in three steps as follows:

1. Questionnaire construction
2. Questionnaire distribution
3. Compilation and analysis of responses.

Questionnaire Construction

An open-ended, confidential, self-administered questionnaire approach was adopted. By employing this method, the majority of the operating personnel could be questioned. The survey covered 10 content-topics. Specifically the areas covered were as follows:

1. Workscope layout and environment
2. Panel design
3. Annunciator warning system
4. Communications
5. Process computers
6. Corrective and preventive maintenance
7. Procedures

8. Staffing and job design
9. Training
10. Other areas for operator comment

The questions for each area were evaluated for inclusion in the questionnaire using the following criteria:

Simplicity - Questions were direct, employed common everyday language, and were as brief as possible.

Clarity - Questions were unambiguous so that the response received would be unbiased and accurate.

Objectivity - Questions were free of emotionally charged words such as good/bad, strong/weak, etc.

Error Free - Surveys are susceptible to social desirability, leniency, central tendency, and halo-type errors. The questions selected were those that have the minimum tendency toward these error types.

The Safety and Licensing Department assembled questions for each topic area of the questionnaire so that each area was well represented in item content. Each topic area contained items soliciting suggestions for improvements.

A cover letter attached to each questionnaire was prepared. The cover letter (1) explained the purpose and gave background information, (2) described the questionnaire and provided instructions, (3) ensured respondent confidentiality, (4) conveyed what will be done with the results, and (5) requested biographical information.

Questionnaire Distribution

Questionnaires were administered to the control room shift supervisors, foremen, and licensed onshift operations personnel.

Compilation and Analysis of Responses

As each questionnaire was retrieved, it was assigned a code number. These code numbers were used to trace item responses to individual respondents in the event it became necessary to do followup interviewing.

After the responses were completed, retrieved, and logged in, they were compiled by item. This was done by members of the Review Team. Then the responses were submitted to the human factors consultant for a human engineering review. The purposes of that review were to:

1. Assess responses to determine if violations of human engineering principles may be incurred.

2. Eliminate redundancies among responses (a count of respondees who made a particular response was maintained).

3. Eliminate responses that were not relevant to the goals and objectives of the CRDR.

4. Identify and organize responses that were expressions of preference for a type of component, a procedure, etc., rather than a description of a potential problem area that may contribute to operator error.

Upon completion of the human factors review, the HFC presented a compilation of the responses to the Review Team for final evaluation and disposition. The objectives of the Review Team evaluation and disposition were as follows:

1. To verify the existence of any problems that were identified (i.e., identify HEDs).

2. For those problems that were cited to:

   - o Determine if any corrective action had been taken or was planned that would eliminate the problem.
   - o Determine if proposed corrective action posed additional human factor problems and/or increased the potential for human error.

3. To determine if more information was needed and to identify the appropriate CRDR activity (e.g., operator interview, survey, or task analysis) for further investigation of the problem.

2.4.3 Operator Interviews

The purpose of the structured interviews was to clarify issues or potential problem areas that were identified in (1) the operator questionnaire or (2) the historical document review.

The structured interview items specifically addressed problem areas previously defined. The operators were interviewed by the HFC. No DLC personnel, other than the operators, were present during the interviews. This ensured an objective approach towards the interviews and established a situation where the interviewee should have felt at liberty to comprehensively discuss the issues.

The HFC interviewer was experienced in conducting structured interviews for CRDRs. The interviewer also was knowledgeable of the prior Beaver Valley-1 CRDR activities and had participated in the reviews of the historical documents and the operator questionnaire responses.

2.4.3.1 Method

Interview Development

The HFC was responsible for developing the structured interview. The interview addressed each item identified in the operator questionnaire and the historical document review that needed clarification or additional information. The HFC structured an initial interview question and outlined subsequent points to be probed in greater detail.

Interview Implementation

The HFC conducted 12 interviews resulting in comprehensive responses to each item. The interviews were conducted in an area where there was direct access to the control room. In addition, a layout drawing of the control room was provided for reference. Interviews lasted approximately 90 minutes.

Evaluation and Disposition by CRDR Team

The HFC presented the summary of interview responses to other CRDR team members for final evaluation and disposition. The objectives of the CRDR team evaluation and disposition were as follows:

- To ensure that adequate information has been obtained and all unresolved issues have been addressed.

- To verify that any new problem(s) identified actually exist and that it is CRDR related.

- For those new problems where there is a CRDR-related problem or discrepancy, to identify if corrective actions have been planned and to:

1. Verify that the corrective action has been completed, and
2. Determine if the corrective action poses additional human factors problems and/or increases the potential for human error.

The CRDR team reviewed the interview summaries with the HFC. All problems and their implication for operators in the control room were discussed and evaluated. For each of the problems, one of the following conclusions was reached:

1. There are no implications for the CRDR (no control room operator errors attributable to design deficiencies, including procedures and training, were involved), however, there is a problem. In this case, the proper personnel (e.g., maintenance) will be notified.

2. There is no problem.
3. The cause of the problem had been adequately corrected.
4. An HED exists.

In the event an HED was identified, the HFC completed the appropriate documentation.

2.4.3.2 Results

During the interviews, 30 specific questions were asked to each interviewee, and each interviewee was asked to identify any other problem that he may encounter when performing his job. In response to these items, 57 problems or problem areas were identified.

There were four categories of outcomes from the Review Team disposition of the 57 items. These included the following:

1. No Action Required - When it was clear that the problem (1) was not related to operator job performance in the control room or (2) had been corrected.

2. Referral to Previous HED Writeup - When the problem had been previously reported and written up as a HED, the only action required was to ensure that the HED Form included the operator interview as another source for identifying the HED.

3. Preparation of a HED form - When the problem was a HED and had not been previously reported.

4. Miscellaneous Action - When a action other than a HED was required (e.g., review survey data or check item in more detail during another part of the CRDR).

The following chart summarizes the results.

Action Category	Number of Problems
No Action	14
Referral to Previous HED	17
Prepare New HED	17
Miscellaneous Action	9
	57

OPERATOR QUESTIONNAIRE DOCUMENTATION AND FORMS

COVER LETTER TO OPERATOR QUESTIONNAIRE

PURPOSE AND IMPORTANCE

The purpose of this questionnaire is to provide operational data to be used for the Control Room Design Review (CRDR) by the CRDR team. Some topics to be addressed in the upcoming CRDR will not be evident to an outsider's examination of the control room. They require direct experience in operating the equipment. The attached questions cover areas in which your experience is essential for an adequate review.

Background

Following the Three Mile Island (TMI) incident, the Nuclear Regulatory Commission issued recommendations to utilities in order to avoid these types of things which collectively caused or contributed to the TMI incident. By recent letter, No. 82-33, Office of Nuclear Reactor Regulation, utilities received further directives on the performance of a CRDR. The objective is to "improve the ability of nuclear power plant control room operators to prevent accidents or cope with accidents if they occur by improving the information provided to them." One element of the CRDR is the use of Human Engineering principles to evaluate human factors in the control room, i.e., the man-machine interface. Therefore, the control room will be evaluated for lighting, noise, control characteristics, instruments, displays, procedures, systems and other items that could impact on operator performance.

Description and Instructions

The questionnaire is open ended and self administered. The questions cover basic topics from workspace layout to training. They are designed to solicit most of your answers and comments. However, space is provided for any additional comments that you may have. Feel free to use it for pertinent information to this effort.

Please be as specific as possible in answering the questions by listing particular components, types of components, systems or panels, operating status, sequence of events or whatever information might be applicable to a particular question. No answers should be left as a simple "yes" or "no" but should include as much pertinent detail as you can provide. Qualify your answers whenever they need be.

Read over the complete questionnaire before you start answering the questions. This will give you a better idea as to where certain answers fit since some of the questions may seem identical at first glance. Doing this will also help to control the specific content of a question-answer pair and to maintain the question groupings. It is suggested that the questions be completed in the control room or with the aid of a training mock-up (at Johnson Street) for the benefit of recall and improved responses.

Please return your completed questionnaire in the envelope provided within eight (8) weeks of the issuance date given at the top of the cover letter. Fill in your name, date of completion and biographical information on the Personnel Information and Biographical Data Sheet (PIBD), only.

Confidentiality

Confidentiality will be maintained for you and the information you supply. This will be accomplished in the following way. Upon receipt of an envelope containing a completed questionnaire, a code number will be assigned to the PIBD sheet and the questionnaire. The PIBD sheet and the questionnaire will then be separated. If additional information or clarification of a particular response is required by the review team, the code number will be used to trace back to individual respondents. A follow-up interview may be required. Code numbers will be used only for this purpose and only by the review team. We will not identify the writer of any responses without your consent.

After the questionnaires have been completed, received and logged in, they will be examined and reviewed on an item for item basis. Responses will then be summarized on a Questionnaire Item Summary Form. Biographical data will be handled in a similar way, being summed and averaged.

If you have any questions about the questionnaire, please feel free to contact Ed Coholich on Pax 5224 or 643-5010/5304.

Thank you for your consideration and help.

OPERATOR QUESTIONNAIRE ITEMS

OPERATOR QUESTIONNAIRE ITEMS

Workspace and Environment

OQ-1 What equipment or equipment arrangement has hindered your movement about the control room in the course of normal or emergency operations?

OQ-2 What peripheral console/cabinet arrangements are ineffective and/or obstruct your movement about the control room?

OQ-3 Does your specific work location station provide adequate access to storage or desk facilities?

OQ-4 Are you required to leave the primary control boards for instruments/displays in other areas? (How often, how long?)

OQ-5 What do you dislike about the arrangement of restrooms, kitchen, place to eat and break area?

OQ-6 Is the furniture arrangement adequate and/or convenient for your use?

OQ-7 How adequate is the control room lighting and illumination control?

OQ-8 Do you have problems with glare and/or reflections in the control room?

OQ-9 Were there incidents where lighting has been ineffective and/or interfered with job performance?

OQ-10 What specific times is the noise level in the control room at an unreasonable level and the cause of annoying distractions?

OQ-11 What particular sources (equipment and/or people) of noise cause annoyance and/or distraction in the control room?

OQ-12 What problems do you have with the heating/air conditioning system, humidity, and ventilation system in the control room?

OQ-13 Has static electricity caused you any particular problems in the control room?

OQ-14 Do you have any problems controlling the number of people in the control room during normal or emergency operations?

OQ-15 Do you feel there is a need for additional policies or actions to limit traffic and distractions in the control room? Identify what they could be.

OQ-16 Are there any operations in the control room where the actions of another operator interfere with your tasks?

OQ-17 What problems do you have in reaching any of the controls on the control board?

OQ-18 What important controls or displays are not easily visible to you?

OQ-19 Is the overall layout and shape of the control board/console adequate for effective monitoring and operations?

OQ-20 Is it significantly difficult to move back and forth between the vertical boards and the bench board?

OQ-21 Which major systems are not organized properly around the control boards for both normal and emergency operation?

OQ-22 Have there been incidents where you had to be in two places at once because of board layout to control and monitor a specific plant evolution?

OQ-23 Did you or would you have any problems in the operation of the emergency shutdown panel? Consider location, design, and controls at the shutdown panel.

OQ-24 Describe features about the control board layout which have assisted you in job performance, i.e., color codes, etc.

OQ-25 Describe other features about the control room environment which have interfered with job performance.

Panel Design

OQ-26 What do you consider to be the three easiest systems to operate? Include system/panel location, why you feel they are easiest to use and any inadvertent activation of these systems.

OQ-27 What do you consider to be the three most confusing or difficult systems to operate and why? Give examples of incidents in which there was difficulty in operating the systems.

OQ-28 What systems do you operate that give you problems with a particular panel arrangement? Describe what you think is wrong with the arrangement.

OQ-28a Are there any problems in the operation, location, or design of the emergency shutdown panel?

OQ-29 Which controls and indications are difficult for you to recognize as a related group?

OQ-29a It has been proposed to establish a "green is normal" convention for all control lights associated with pumps, valves, and breakers. The normal arrangement would be based on 100% power operation. The intent is to provide prompt operator recognition of a change in component status. This means, however, that you will not be able to tell a component's status until you view these status lights associated with the switch, for example, if the left side is green and lit then the valve switch is closed or the pump is on. Do you consider this proposal an advantage or disadvantage to operations? Consider any problems with particular switches, status of switches, difficulty in the thought process of green being normal, red is not, etc.

OQ-30 Which types of modifications (mimics, color codes, etc.) to the boards would you consider the most useful to you?

OQ-31 Which types of modifications to the boards have created a hindrance for you?

OQ-32 Describe panel design characteristics and/or panel locations not discussed above which create particular problems for you as an operator.

OQ-33 What controls and displays of particular systems are too far away from each other for proper operation?

OQ-34 Are there any controls that are difficult to adjust as precisely as they need to be adjusted?

OQ-35 Are there any switches that are operated differently but physically are identical to other switches?

OQ-36 Are there switches that are difficult to turn?

OQ-37 Which controls do you find too large or too small to operate easily?

OQ-38 Are there meters that are scaled in different units than the procedures you have to use with them? For example, do you have to use nomographs or conversion factors other than powers of 10?

OQ-38a Are there instrument indicators that are pegged low or high during normal operation making it impossible to monitor the steady state performance of a process?

OQ-39 Are there controls and displays that work together in unusual ways (i.e., containment temperature affecting seal leak off indication)?

OQ-40 Are there instruments that are difficult to compare with backups because of differences in scale units, elevated zeros, etc.?

OQ-41 Are there instruments that are hard to use because they have to be read more precisely than the scale allows?

OQ-42 Do you have any difficulties with lamp replacement such as shock, accidental activation, or need to replace from behind panel?

OQ-43 Are there important instruments on back panels that do not have either an alarm you can hear in the control room or their own annunciator?

OQ-44 Are there labels (on controls or displays) that are unclear about what is actually being controlled or displayed, what the control does, what position a control is in, or which could cause a mistaken identity with another control?

OQ-45 Are there key switches where the key can be removed when the switch is not in its "Off" or "Safe" position?

OQ-46 Has there been any interference to instrumentation by radio or walkie-talkie signals?

OQ-47 Are there any control devices which you find confusing or difficult to operate?

OQ-48 When operating controls, do you use any of the existing coding and how important is it to you as an operating aid, i.e., color, sound, shape, location, etc.? What coding schemes are most useful to you? What types of color coding would you like to see on controls or indicators (i.e., power supply coding on instruments)?

OQ-49 Are there any occurrences where the wrong control has been activated or where a control was activated inadvertently or incorrectly? Do you know what caused this to happen and how and when the error was discovered?

OQ-50 What were the consequences of the occurrences asked about in the previous question?

OQ-51 Have there been recurring instances where the wrong control has been activated, or a control was activated inadvertently or incorrectly? What would you recommend to prevent recurrence of any of these problems?

OQ-52 Are there controls where it is not always apparent as to what position they are turned to (i.e., pointer indicators are not obvious because of poor contrast due to design, location, level or glare)?

OQ-53 Are there emergency or other critical controls which are neither coded nor guarded (e.g., turbine trip push buttons, rod control startup push button)?

OQ-54 Are there controllers with inconsistent relationship between control effects and indicator (e.g., open is indicated by 0% and close by 100%)?

OQ-55 Are there multiple-position controls or speed changer controls which do not follow conventional use for right-center-left positions or clockwise movement (i.e., diesel generator ground switch deviates from normal convention)?

OQ-56 Are there positive means to determine indicator light failure?

OQ-57 Are display scales adequately marked for normal operating ranges or setpoints?

OQ-58 Is it always apparent to the operator when a vital indicator fails or becomes inoperative?

OQ-58a Are there recorders that cannot be viewed from several locations on the board where equipment is routinely controlled that heavily influence changes to the recorded parameters (i.e., pressurizer level, pressure, and T Recorders, etc.)?

OQ-58b Do you have significant operational problems with chart recorders?

OQ-58c Are there times when chart recorders are not operational? What problems does this cause for you?

OQ-58d What additional comments do you have on controls and displays?

Annunciator Warning System

OQ-59 Are nuisance alarms a significant problem? Please describe.

OQ-60 Do you get particular recurring invalid alarms? Please describe.

OQ-61 What alarms are insignificant from an operational point of view?

OQ-62 What significant problems has the existing annunciator system design caused you?

OQ-63 Are there any problems with identifying new alarms when they come in?

OQ-64 Are there features of the annunciator warning system that have resulted in inefficient or erroneous fault identification?

OQ-65 Does the annunciator system provide an adequate amount of information to you during a major transient?

OQ-66 Are visual and auditory alarms satisfactory?

OQ-67 Are auditory signals annoying? Can you easily differentiate between different auditory signals?

OQ-68 Are any important annunciators missing or located where they should not be?

OQ-69 Do you have problems reading or identifying annunciators while you are conducting normal or emergency operations?

OQ-69a What additional comments do you have on annunciators?

Procedures

OQ-70 Do you have any problems finding or retrieving procedures that you need during emergency situations?

OQ-71 Are there adequate props for using procedures while you operate? What would be useful to you in this respect?

OQ-72 Are procedures maintained in good physical condition (e.g., are pages properly and securely inserted, are updates and changes handled properly, etc.)?

OQ-73 Do you feel there are too many procedures that operators are required to memorize? How does it affect operator performance during emergency operations?

OQ-74 Are operator comments or requested changes to written procedures satisfactorily considered and processed?

OQ-75 What plant procedures (i.e., startup, shutdown) have insufficient detail or are not clearly written to the point that errors could be introduced?

OQ-76 Are there incidents whereby following procedures resulted in ineffective or erroneous performance by the operator? What was the origin of the deficiency in the procedures and how was the deficiency corrected?

OQ-77 What specific problems have you found with following routine procedures and how could they be corrected most effectively?

OQ-77a What additional comments do you have on procedures?

Communications

OQ-78 Are there nuisance problems with unauthorized communications to the control room?

OQ-79 What problems do you have with the page phones, loudspeakers, and radios? Consider equipment condition, availability of the system to the operator and outside interference (noise level, people, etc.).

OQ-80 Are the page phones and loudspeakers serviceable to you for effective communication with auxiliary operators, maintenance personnel, etc.?

OQ-81 Are there instances where control room phones have prevented or interfered with your ability to communicate with other personnel? Consider for example, delays, interference, availability of a phone, etc.

OQ-82 Are there situations where the lack of proper communications caused operational problems?

OQ-83 What characteristics of the control room communications systems do you find most ineffective in providing you timely, intelligible contact with other personnel?

Process Center

OQ-84 Does the process computer provide inaccurate data at any time? Consider operating conditions, important system parameters, etc.

OQ-85 Is the process computer data timely? Are there emergency situations in which you would be reluctant or hesitant to use the computer for information because of its response time?

OQ-86 Is there data on the computer which you do not find useful?

OQ-87 What computer program do you feel could be better utilized or eliminated?

OQ-88 Is there data on the computer which you find difficult to use? Consider format of printout, type of parameter trending, etc.

OQ-89 What percentage of computer printout is useful to the operator during operation? Consider normal, abnormal, and emergency operations.

OQ-90 Are there other specific computer difficulties on which you would like to comment? Consider especially emergency operations but do not limit yourself to emergency operations only.

Staffing

OQ-91 Are there incidents in which the number of personnel on duty impeded your prompt response to an operational situation?

OQ-92 Are there incidents where workload requirements restricted your response to any operational situation?

OQ-92a Is the control room adequately staffed during normal, abnormal, and emergency periods and during all shifts?

OQ-93 Are job responsibilities clearly defined such that a response to a transient or an emergency situation proceeds smoothly?

OQ-94 List the three most desirable characteristics of the staffing program and job assignments which provide for smooth, continuous, system operation.

OQ-95 Do your procedures provide adequate coverage for turning over a shift to incoming personnel? Consider the amount of time allowed for shift turnover, information exchange, etc.

OQ-96 Are there incidents where you were given incorrect and/or insufficient information during shift turnover?

OQ-97 Are there incidents where your efficiency was significantly degraded because of shift work or overtime?

OQ-97a Is the control room sufficiently staffed to allow for vacations and other justified reliefs?

OQ-98 To what degree does shift work impact on your homelife, social life, and/or work attitudes?

OQ-99 In what ways can your job be made more interesting and your time more productively spent? Consider ways that would increase operator alertness, combat monotony, make backshifts more admissible, etc.

OQ-100 Are your duties explained to you such that you clearly understand what they are?

OQ-101 Are there incidents where it was unclear or confusing as to who was in charge and/or who should be reporting what to whom? What was the cause and was the problem corrected or did it recur?

OQ-102 Are there enough avenues open to you for resolving a personal or job related problem? Are they effective?

OQ-103 Are there other problems with staffing and/or job design on which you would like to comment?

Corrective and Preventive Maintenance

OQ-104 Are there incidents where an operator surveillance test caused an operational problem? Consider the cause, operational status, effect on operation and/or the operator, corrective action, etc.

OQ-105 Are there incidents where maintenance actions affected the safe operation of the plant? Consider the cause, operational status, effect on operation and/or the operator, corrective action, etc.

OQ-106 Are there control room preventive maintenance procedures and/or characteristics which are ineffective?

OQ-107 What is the most effective characteristic of the maintenance program?

OQ-108 What maintenance or surveillance test procedures would you like to see changed because of their negative impact on operations?

OQ-109 Are there other things in the maintenance and/or surveillance test programs on which you would like to comment?

Training

OQ-110 Are there plant control, protection, electrical, or mechanical systems on which you would like more intensive training and in what respect (simulator, class, discussion, lecture)?

OQ-111 Has your training provided you with the confidence that you could perform successfully during an emergency situation? Are there situations about which you feel inadequately prepared?

OQ-112 Are you adequately trained in the operation of the emergency shutdown panel?

OQ-113 What characteristics of your classroom training have been most effective in preparing you for control room operation?

OQ-114 Have you received training on effective communications techniques?

OQ-115 Is the use of protective gear and equipment included in your training program?

OQ-116 Are you adequately trained in using the process computer to full advantage?

OQ-117 What characteristics of your requalification training or practice sessions have been most effective in preparing you for control room operations?

OQ-118 What aspects of your training do you feel were especially ineffective or need improvement?

OQ-119 Are there other comments which you would like to make on the quality of your training?

OQ-120 What characteristics of simulator training have you found and/or do you think will be most effective in preparing you for control room operations?

Simulator Training

OQ-121 What aspects of simulator training do you feel should be eliminated or modified?

OQ-122 Are there specific operations on which more emphasis should be placed during simulator training?

OQ-123 What amount of time do you feel would be adequate for simulator training?

OQ-124 What situations, transients, etc. which have or could arise would you like to see run on the simulator?

OQ-125 Are there other aspects of simulator training and use on which you would like to comment?

Use the space below for additional comments on any of the topics covered herein or others that you may consider pertinent to this effort.

OPERATOR INTERVIEW DOCUMENTATION AND FORMS

INTERVIEW ITEMS

A. CONTROLS

1. Are there switches that do not "snap" into position or that can be left halfway between switch positions or, where appropriate, do not have spring return? (NUTAC OQ-3)

2. Are there switches that are difficult to turn? (NUTAC OQ-3)

3. Are there control knobs or handles that slip or move loosely on their shaft? (NUTAC OQ-7)

4. Are there any problems with switch designations stop, off, PTL - are they clearly understood? (IR 75-21)

5. Is there a convention for use of stop, off, PTL? (IR 75-21)

6. There have been several instances where P-10 setpoints have been violated, attributed frequently to operator inattentiveness, is there an instrumentation, TS, or procedure problem? (76-80)

7. There have been several instances where there has been a loss of an inverter, not attributed to operator, but is there a need for more instrumentation? (79-57, 58)

8. There have been several instances where the RWST level is below TS,

   a. Is instrumentation adequate? (80-100)
   b. Is OST procedure a problem? (80-100)

9. There was an instance of inadvertent operation of boronometer relief valve (RV-CH-103), is there a problem with control guarding or identification? (83-19)

10. There was a problem of loss of IA SYS STA Service Transformer due to problem with tap changers. Is there a problem with instrumentation? (83-27)

11. When bringing down load, is BASE ADJUST difficult to manipulate? (78-33)

12. What are the control and instrumentation problems associated with feedwater during startup? (76-50)

B. DISPLAYS

13. Do you have to use nomographs while performing operations? Do you have any trouble with any of the nomographs? Which ones specifically? (OQ-9)

B. DISPLAYS (Cont'd)

14. Are there indicator lights where equipment status is indicated by a light being off (for example, pump is off when light is off)? (OQ-19)

15. Which indicators or groups of indicators show that a control signal has been sent rather than the resultant system condition? (EQ-4; OQ-20)

    a. What are the back-up displays for these indicators?

16. Do chart recorders operate at a high speed when fast tracking rates or trending is required? (OQ-21)

    a. If no, what do you use to get information?

17. Which displays would fail in normal operating range on loss of power or input signal? (EQ-5)

18. There have been problems with Boron Concentration being out of spec, is there adequate instrumentation to perform jobs associated with Boron Concentration? (76-27)

19. There have been several problems with discharge of liquid waste tanks, is instrumentation adequate for jobs? (76-39)

20. Occasionally there are problems with dual indication of indicator and a need for limit switch adjustments. Has this ever created a problem for you? (82-95)

C. ANNUNCIATORS

21. In the event of flasher failure to an alarmed annunciator tile, is it obvious to the operator? If yes, describe how the flasher malfunction is identified. (EQ-1)

22. How are other failed annunciator lights and indicator lights identified? (EQ-6)

23. For multipoint annunciators, is the alarmed point printed out or otherwise indicated in the CR? (EQ-9) Identify any exceptions that you can think of.

24. After acknowledgement of a multipoint annunciator, will the annunciator respond if another of its setpoints is exceeded? (EQ-10)

    a. Describe how multipoint annunciators work. (EQ-10)

D. MISCELLANEOUS

25. Are there any problems with communications in the CR? (80-122)

D. MISCELLANEOUS (Cont'd)

a. PA System
b. Phones
c. Interoperator Comm
d. During Emergency

26. Compare daytime and other shifts in terms of the following. (81-108, 79-78)

a. Workload
b. Noise
c. Interference/interruptions from other people in CR

27. When the computer printer is being reloaded, are data and information that normally would be printed lost? (OQ-42)

28. Has significant degradation of the computer or plant systems been caused by inadvertent actions at keyboard? (OQ-43)

29 Can you think of any control actions that you must take where you do not have a display indicating the result of your action?

30. What important and frequently used controls and displays can not be seen from in front of the BB's.

APPENDIX D

NUREG-0700, SECTION 6 GUIDELINE/BVPS-2 CONTROL ROOM DESIGN REVIEW FINDING CROSS REFERENCE

APPENDIX D

NUREG-0700, SECTION 6 GUIDELINE/BVPS-2 CONTROL ROOM DESIGN REVIEW FINDING CROSS RFFERENCE

These notes are applicable where referenced in the table that follows.

1. Introductory Section 6 paragraph that does not require a specific guideline check.

2. Section 6 guideline that could not be accomplished due to the construction status of the control room.

3. There are no control device applications requiring shape coding.

4. Legend pushbuttons are distinguishable from legend lights in the BVPS-2 control room.

5. HED's from guidelines 6.5.1.3.c(2) are recorded under guideline 6.5.1.3.c(1) in Table 3.5.

6. The control room complies with guideline 6.8.2.3.a & b.

7. HED's from guideline 6.8.2.2.a are recorded under guideline 6.8.2.2.b in Table 4.5.

:APPENDD

APPENDIX D

NUREG-0700, SECTION 6 GUIDELINE/BVPS-2 CONTROL ROOM DESIGN REVIEW FINDING CROSS REFERENCE

SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1 WORKSPACE	1											
6.1.1	1											
6.1.1.1	1											
6.1.1.1a										△		
6.1.1.1b										△		
6.1.1.2	1											▲
6.1.1.2a												▲
6.1.1.2b												
6.1.1.3	1											
6.1.1.3a	2											
6.1.1.3b	2											
6.1.1.3c	2											
6.1.1.3c(1)	2											
6.1.1.3c(2)	2											
6.1.1.3d	2											
6.1.1.3d(1)	2											
6.1.1.3d(2)	2											
6.1.1.3e	2											
6.1.1.3e(1)	2											
6.1.1.3e(2)	2											
6.1.1.3f	2											
6.1.1.3f(1)	2											
6.1.1.3f(2)	2											
6.1.1.3f(3)	2											
6.1.1.3g	2											
6.1.1.4	1											
6.1.1.4a	2											
6.1.1.4a(1)	2											
6.1.1.4a(2)	2											
6.1.1.4b	2											
6.1.1.4b(1)	2											
6.1.1.4b(2)	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.1.4b(3)	2											
6.1.1.4c	2											
6.1.1.4c(1)	2											
6.1.1.4c(2)	2											
6.1.1.4d	2											
6.1.1.4e	2											
6.1.1.5	1											
6.1.1.5a	2											
6.1.1.5b	2											
6.1.1.5c	2											
6.1.1.5d	2											
6.1.1.5e	2											
6.1.1.5f	2											
6.1.1.6	1											
6.1.1.6a	2											
6.1.1.6b	2											
6.1.1.7	2											
6.1.2	1											
6.1.2.1	1											
6.1.2.2	1		△									
6.1.2.2a												
6.1.2.2b	1											
6.1.2.2b(1)												
6.1.2.2b(2)												
6.1.2.2c												
6.1.2.2d	1											
6.1.2.2d(1)												
6.1.2.2d(2)												
6.1.2.2e	1											
6.1.2.2e(1)	1											
6.1.2.2e(1)(a)												
6.1.2.2e(1)(b)			△									

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.2.2e(2)			△									
6.1.2.2f												
6.1.2.2g												
6.1.2.3	/											
6.1.2.3a	/											
6.1.2.3a(1)												
6.1.2.3a(2)												
6.1.2.3b												
6.1.2.3c												
6.1.2.3d	/											
6.1.2.3d(1)												
6.1.2.3d(2)												
6.1.2.3e	/											
6.1.2.3e(1)												
6.1.2.3e(2)												
6.1.2.3f	/											
6.1.2.3f(1)												
6.1.2.3f(2)												
6.1.2.3g												
6.1.2.3h	/											
6.1.2.3h(1)												
6.1.2.3h(2)												
6.1.2.3h(3)												
6.1.2.4	/											
6.1.2.4a												
6.1.2.4b												
6.1.2.4c												
6.1.2.5	/											
6.1.2.5a	/											
6.1.2.5a(1)												
6.1.2.5a(2)												
6.1.2.5b			△									

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.2.5b(1)			△									
6.1.2.5b(2)			△									
6.1.2.6	2											
6.1.2.7	2											
6.1.2.7a	2											
6.1.2.7b	2											
6.1.2.7c	2											
6.1.2.7d	2											
6.1.2.7d(1)	2											
6.1.2.7d(2)	2											
6.1.2.7d(3)	2											
6.1.2.7d(4)	2											
6.1.2.7d(5)	2											
6.1.2.7d(6)	2											
6.1.2.7d(7)	2											
6.1.2.8	1											
6.1.2.8a	2											
6.1.2.8b	2											
6.1.2.8c	2											
6.1.2.8d	2											
6.1.2.8e	2											
6.1.2.8f	2											
6.1.2.8g	2											
6.1.3	1											
6.1.3.1	1											
6.1.3.1a												△
6.1.3.1b												▲
6.1.3.1c												
6.1.3.1d										△		
6.1.3.1e	1									▲		
6.1.3.1e(1)												
6.1.3.1e(2)												

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.3.1e(3)										↑		
6.1.3.1e(4)										↕		
6.1.3.1e(5)										↓		
6.1.3.2	1											↑
6.1.3.2a												↕
6.1.3.2b												↓
6.1.4	1											
6.1.4.1	1											
6.1.4.1a	2											
6.1.4.1b	2											
6.1.4.1c	2											
6.1.4.1d	2											
6.1.4.1e	2											
6.1.4.1f	2											
6.1.4.1g	2											
6.1.4.1h	2											
6.1.4.1i	2											
6.1.4.2	1											
6.1.4.2a	2											
6.1.4.2b	2											
6.1.4.2c	2											
6.1.4.2d	2											
6.1.4.2e	2											
6.1.4.3	1											
6.1.4.3a	2											
6.1.4.3b	2											
6.1.5	1											
6.1.5.1	1											
6.1.5.1a	2											
6.1.5.1b	2											
6.1.5.2	1											
6.1.5.2a	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.5.2b	2											
6.1.5.3	1											
6.1.5.3a	2											
6.1.5.3b	2											
6.1.5.3c	2											
6.1.5.3d	2											
6.1.5.3e	2											
6.1.5.3e(1)	2											
6.1.5.3e(2)	2											
6.1.5.3f	2											
6.1.5.3g	2											
6.1.5.3h	2											
6.1.5.4	1											
6.1.5.4a	2											
6.1.5.4b	2											
6.1.5.4c	2											
6.1.5.5	1											
6.1.5.5a	2											
6.1.5.5b	2											
6.1.5.5c	2											
6.1.5.5d	2											
6.1.5.5e	2											
6.1.5.6	1											
6.1.5.6a	2											
6.1.5.6b	2											
6.1.5.7	1											
6.1.5.7a	1											
6.1.5.7a(1)	2											
6.1.5.7a(2)	2											
6.1.5.7a(3)	2											
6.1.5.7a(4)	2											
6.1.5.7a(5)	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.1.5.7b												
6.1.5.7b(1)	2											
6.1.5.7b(2)	2											
6.1.5.7b(3)	2											
6.1.5.7c	2											
6.2 COMMUNICAT	1											
6.2.1	1											
6.2.1.1	1											
6.2.1.1a	2											
6.2.1.1b	2											
6.2.1.1c	1											
6.2.1.1c(1)	2											
6.2.1.1c(2)	2											
6.2.1.2	1											
6.2.1.2a	2											
6.2.1.2b	2											
6.2.1.2b(1)	2											
6.2.1.2b(2)	2											
6.2.1.2b(3)	2											
6.2.1.2b(4)	2											
6.2.1.2b(5)	2											
6.2.1.2b(6)	2											
6.2.1.2b(7)	2											
6.2.1.2b(8)	2											
6.2.1.2c	2											
6.2.1.2c(1)	2											
6.2.1.2c(2)	2											
6.2.1.2d	2											
6.2.1.2e	2											
6.2.1.3	1											
6.2.1.3a	2											
6.2.1.3a(1)	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.2.1.3a(2)	2											
6.2.1.3b	2											
6.2.1.3b(1)	2											
6.2.1.3b(2)	2											
6.2.1.3b(3)	2											
6.2.1.3b(4)	2											
6.2.1.3b(5)	2											
6.2.1.3b(6)	2											
6.2.1.3c	2											
6.2.1.3c(1)	2											
6.2.1.3c(2)	2											
6.2.1.3d	2											
6.2.1.3d(1)	2											
6.2.1.3d(2)	2											
6.2.1.3d(3)	2											
6.2.1.3e	2											
6.2.1.3e(1)	2											
6.2.1.3e(2)	2											
6.2.1.3e(3)	2											
6.2.1.4	1											
6.2.1.4a	2											
6.2.1.4a(1)	2											
6.2.1.4a(2)	2											
6.2.1.4b	2											
6.2.1.4b(1)	2											
6.2.1.4b(2)	2											
6.2.1.4c	2											
6.2.1.4c(1)	2											
6.2.1.4c(2)	2											
6.2.1.4c(3)	2											
6.2.1.4d	2											
6.2.1.4e	2											
6.2.1.4e(1)	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.2.1.4e(2)	2											
6.2.1.5	1											
6.2.1.5a	2											
6.2.1.5b	2											
6.2.1.5c	2											
6.2.1.6	1											
6.2.1.6a	2											
6.2.1.6a(1)	2											
6.2.1.6a(2)	2											
6.2.1.6b	2											
6.2.1.6b(1)	2											
6.2.1.6b(2)	2											
6.2.1.6b(3)	2											
6.2.1.6b(4)	2											
6.2.1.6b(5)	2											
6.2.1.6c	2											
6.2.1.6c(1)	2											
6.2.1.6c(2)	2											
6.2.1.6d	2											
6.2.1.6e	2											
6.2.1.6e(1)	2											
6.2.1.6e(2)	2											
6.2.1.6f	2											
6.2.1.7	1											
6.2.1.7a	2											
6.2.1.7b	2											
6.2.1.8	1											
6.2.1.8a	2											
6.2.1.8b	2											
6.2.1.8c	2											
6.2.1.8c(1)	2											
6.2.1.8c(2)	2											
6.2.1.8c(3)	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.2.2	1											
6.2.2.1	1											
6.2.2.1a	2											
6.2.2.1b	2											
6.2.2.1c	2											
6.2.2.1c(1)	2											
6.2.2.1c(2)	2											
6.2.2.2	1											
6.2.2.2a	2											
6.2.2.2b	2											
6.2.2.2c	2											
6.2.2.3	1											
6.2.2.3a	2											
6.2.2.3b	2											
6.2.2.3c	2											
6.2.2.3d	2											
6.2.2.3e	2											
6.2.2.4	1											
6.2.2.4a	2											
6.2.2.4b	2											
6.2.2.5	1											
6.2.2.5a	2											
6.2.2.5b	2											
6.2.2.6	1											
6.2.2.6a	2											
6.2.2.6b	2											
6.2.2.6c	2											
6.2.2.7	1											
6.2.2.7a	2											
6.2.2.7b	2											
6.2.2.7c	2											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.3 ANNUNCIATOR	1											
6.3.1	1											
6.3.1.1	1			△								
6.3.1.2	1											
6.3.1.2a												
6.3.1.2a(1)												
6.3.1.2a(2)												
6.3.1.2b	1											
6.3.1.2b(1)												
6.3.1.2b(2)												
6.3.1.2c	1											
6.3.1.2c(1)												
6.3.1.2c(2)												
6.3.1.2c(3)												
6.3.1.2d	1											
6.3.1.2d(1)												
6.3.1.2d(2)												
6.3.1.3	1											
6.3.1.3a	1											
6.3.1.3a(1)												
6.3.1.3a(2)												
6.3.1.3a(3)												
6.3.1.3b												
6.3.1.3c												
6.3.1.3d												
6.3.1.4												
6.3.1.4a	1											
6.3.1.4a(1)												
6.3.1.4a(2)												
6.3.1.4b	1											
6.3.1.4b(1)												
6.3.1.4b(2)				△								

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.3.1.5	1			▲								
6.3.1.5a												
6.3.1.5b	1											
6.3.1.5b(1)												
6.3.1.5b(2)												
6.3.1.5b(3)												
6.3.2	1											
6.3.2.1	1											
6.3.2.1a												
6.3.2.1b												
6.3.2.1c												
6.3.2.1d												
6.3.2.1e												
6.3.2.1f												
6.3.2.2	1											
6.3.2.2a	1											
6.3.2.2a(1)												
6.3.2.2a(2)												
6.3.2.2b												
6.3.3	1											
6.3.3.1	1											
6.3.3.1a												
6.3.3.1b	1											
6.3.3.1b(1)												
6.3.3.1b(2)				▼								
6.3.3.1c	1											
6.3.3.1c(1)	2											
6.3.3.1c(2)	2											
6.3.3.1c(3)	2											
6.3.3.2	1			▲								
6.3.3.2a												
6.3.3.2b				▼								

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.3.3.2c				△								
6.3.3.2d				↕								
6.3.3.2e				↕								
6.3.3.2f	1			↕								
6.3.3.2f(1)				↕								
6.3.3.2f(2)				▽								
6.3.3.3	1			△								
6.3.3.3a				↕								
6.3.3.3b				↕								
6.3.3.3c	1			↕			△					
6.3.3.3c(1)				↕			↕					
6.3.3.3c(2)				↕			↕					
6.3.3.3c(3)				↕			▽					
6.3.3.3d	1			↕								
6.3.3.3d(1)				↕								
6.3.3.3d(2)				↕								
6.3.3.3e				↕								
6.3.3.3f				▽								
6.3.3.4	1			△								
6.3.3.4a				↕								
6.3.3.4b				↕								
6.3.3.4c				▽								
6.3.3.4d									△			
6.3.3.5	1			△								
6.3.3.5a	1			↕								
6.3.3.5a(1)				↕								
6.3.3.5a(2)				↕								
6.3.3.5b	1			↕								
6.3.3.5b(1)				↕								
6.3.3.5b(2)				↕								
6.3.3.5b(3)				↕								
6.3.3.5c	1			▽								

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.3.3.5c(1)				△								
6.3.3.5c(2)												
6.3.3.5d	1											
6.3.3.5d(1)												
6.3.3.5d(2)												
6.3.3.5d(3)												
6.3.3.5d(4)												
6.3.3.5d(5)												
6.3.3.5d(6)				△								
6.3.4	1											
6.3.4.1	1			△								
6.3.4.1a	1											
6.3.4.1a(1)												
6.3.4.1a(2)												
6.3.4.1b	1											
6.3.4.1b(1)												
6.3.4.1b(2)												
6.3.4.1c	1											
6.3.4.1c(1)												
6.3.4.1c(2)												
6.3.4.1c(3)												
6.3.4.1d	1											
6.3.4.1d(1)												
6.3.4.1d(2)												
6.3.4.2	1											
6.3.4.2a												
6.3.4.2b	1											
6.3.4.2b(1)												
6.3.4.2b(2)												
6.3.4.2b(3)												
6.3.4.2b(4)												
6.3.4.2c												
6.3.4.3				△						△		

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.3.4.3a				△						△		
6.3.4.3b				△						△		
6.4 CONTROLS	1											
6.4.1	1											
6.4.1.1	1				△							
6.4.1.1a	1											
6.4.1.1a(1)												
6.4.1.1a(2)												
6.4.1.1b	1											
6.4.1.1b(1)												
6.4.1.1b(2)												
6.4.1.1b(3)												
6.4.1.1b(4)												
6.4.1.1c	1											
6.4.1.1c(1)												
6.4.1.1c(2)					△							
6.4.1.1d	2											
6.4.1.1d(1)	2											
6.4.1.1d(2)	2											
6.4.1.1e	1				△							
6.4.1.1e(1)												
6.4.1.1e(2)												
6.4.1.1e(3)												
6.4.1.2	1											
6.4.1.2a												
6.4.1.2b	1											
6.4.1.2b(1)												
6.4.1.2b(2)												
6.4.1.2c	1											
6.4.1.2c(1)												
6.4.1.2c(2)												
6.4.1.2c(3)												
6.4.1.2d	1				△							

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.4.1.2d(1)					△							
6.4.1.2d(2)					▲							
6.4.1.2e					▲							
6.4.1.2f					▲							
6.4.1.2g					▲							
6.4.2	1											
6.4.2.1 (a-h)					△							
6.4.2.2	1											
6.4.2.2a									△			
6.4.2.2b									△			
6.4.2.2c					△							
6.4.2.2c(1)					▲							
6.4.2.2c(2)					▲							
6.4.2.2c(3)					▲							
6.4.2.2c(4)					▲							
6.4.2.2d	1											
6.4.2.2d(1)	3											
6.4.2.2d(2)	3											
6.4.2.2e					△							
6.4.2.2f	1								△			
6.4.2.2f(1)					△				▲			
6.4.2.2f(2)					▲				▲			△
6.4.2.2f(3)					▲							
6.4.3	1											
6.4.3.1	1											
6.4.3.1a												△
6.4.3.1b					△							
6.4.3.1c					▲							
6.4.3.2	1											
6.4.3.2a	1											
6.4.3.2a(1)					▲							
6.4.3.2a(2)					▲							

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.4.3.2b					▲							
6.4.3.2c					|							
6.4.3.2d					▲							
6.4.3.3	1											
6.4.3.3a	4											
6.4.3.3b					▲							
6.4.3.3b(1)					|							
6.4.3.3b(2)					|							
6.4.3.3b(3)					|							
6.4.3.3b(4)					|							
6.4.3.3b(5)					▲							
6.4.3.3c	2											
6.4.3.3c(1)	2											
6.4.3.3c(2)	2											
6.4.3.3c(3)	2											
6.4.3.3c(4)	2											
6.4.3.3d	1				▲							
6.4.3.3d(1)					|							
6.4.3.3d(2)					|							
6.4.3.3e	1				|							
6.4.3.3e(1)					|							
6.4.3.3e(2)					|							
6.4.3.3e(3)					|							
6.4.3.3e(4)					|							
6.4.3.3e(5)					▲							
6.4.4	1											
6.4.4.1	1											
6.4.4.1a					▲							
6.4.4.1b												
6.4.4.1c	1											
6.4.4.1c(1)	3											
6.4.4.1c(2)	3											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.4.4.2	/				↑							
6.4.4.2a	/											
6.4.4.2a(1)												
6.4.4.2a(2)												
6.4.4.2b												
6.4.4.3	/											
6.4.4.3a												
6.4.4.3b												
6.4.4.3c												
6.4.4.3d												
6.4.4.3e												
6.4.4.3f												
6.4.4.3g	/											
6.4.4.3g(1)												
6.4.4.3g(2)												
6.4.4.3g(3)												
6.4.4.4	/											
6.4.4.4a												
6.4.4.4b												
6.4.4.4c	/											
6.4.4.4c(1)	/											
6.4.4.4c(1)(a)												
6.4.4.4c(1)(b)												
6.4.4.4c(2)												
6.4.4.4d												
6.4.4.4e	/											
6.4.4.4e(1)												
6.4.4.4e(2)												
6.4.4.4e(3)												
6.4.4.4e(4)												
6.4.4.4e(5)												
6.4.4.5	/											
6.4.4.5a					↓							

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SECTION 6 PARA. NO.	NOTE	SUMMARY REPORT TABLE									
			3.2	3.?		3.6	3.7	3.8	4.3	4.4	4.5
6.4.4.5b	/										
6.4.4.5b(1)											
6.4.4.5b(2)											
6.4.4.5b(3)											
6.4.4.5b(4)											
6.4.4.5c											
6.4.4.5d	/										
6.4.4.5d(1)	/										
6.4.4.5d(1)(a)											
6.4.4.5d(1)(b)											
6.4.4.5d(1)(c)											
6.4.4.5d(2)											
6.4.4.5e	/										
6.4.4.5e(1)											
6.4.4.5e(2)											
6.4.4.5e(3)											
6.4.4.5e(4)											
6.4.4.5e(5)											
6.4.4.5f					△						
6.4.5	/										
6.4.5.1	/				△						
6.4.5.1a											
6.4.5.1b											
6.4.5.1c	/										
6.4.5.1c(1)											
6.4.5.1c(2)											
6.4.5.1c(3)											
6.4.5.1d	/										
6.4.5.1d(1)											
6.4.5.1d(2)	/										
6.4.5.1d(2)(a)											
6.4.5.1d(2)(b)											
6.4.5.1d(2)(c)					△						

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.4.5.1d(2)(d)					▲							
6.4.5.1d(2)(e)												
6.4.5.2	/											
6.4.5.2a												
6.4.5.2b	/											
6.4.5.2b(1)												
6.4.5.2b(2)												
6.4.5.3	/											
6.4.5.3a												
6.4.5.3b												
6.4.5.3c	/											
6.4.5.3c(1)												
6.4.5.3c(2)												
6.4.5.3c(3)												
6.4.5.3c(4)												
6.4.5.3c(5)												
6.4.5.3c(6)												
6.4.5.4	/											
6.4.5.4a	/											
6.4.5.4a(1)												
6.4.5.4a(2)												
6.4.5.4b	/											
6.4.5.4b(1)												
6.4.5.4b(2)												
6.4.5.4c	/											
6.4.5.4c(1)												
6.4.5.4c(2)												
6.4.5.4d												
6.4.5.4e	/											
6.4.5.4e(1)												
6.4.5.4e(2)												
6.4.5.4e(3)					▼							

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.4.5.4e(4)					△							
6.5 VISUAL DISI	1											
6.5.1	1											
6.5.1.1	1											
6.5.1.1a										△	△	
6.5.1.1b												
6.5.1.1c												
6.5.1.1d												
6.5.1.1e	1											
6.5.1.1e(1)												
6.5.1.1e(2)										△		
6.5.1.1f						△					△	
6.5.1.2	1											
6.5.1.2a											△	
6.5.1.2b										△		
6.5.1.2c												
6.5.1.2d	1					△						
6.5.1.2d(1)												
6.5.1.2d(2)												
6.5.1.2d(3)										△		
6.5.1.2e						△					△	
6.5.1.2f											△	
6.5.1.3	1											
6.5.1.3a						△						
6.5.1.3b	1											
6.5.1.3b(1)												
6.5.1.3b(2)												
6.5.1.3b(3)												
6.5.1.3c	1											
6.5.1.3c(1)						△						
6.5.1.3c(2)	5											
6.5.1.3d	1											
6.5.1.3d(1)						△						

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.5.1.3d(2)						△						
6.5.1.3d(3)						↕						
6.5.1.3d(4)						↕						
6.5.1.3d(5)						↕						
6.5.1.3d(6)						△						
6.5.1.3e	2											
6.5.1.4	1					△						
6.5.1.4a	1					↕						
6.5.1.4a(1)						↕						
6.5.1.4a(2)						↕						
6.5.1.4b						↕						
6.5.1.4c						↕						
6.5.1.4d						↕						
6.5.1.4e						↕						
6.5.1.4f						△						
6.5.1.5	1											
6.5.1.5a	1					△						
6.5.1.5a(1)						↕						
6.5.1.5a(2)						↕						
6.5.1.5a(3)						↕						
6.5.1.5b						↕						
6.5.1.5c						△						
6.5.1.5d											△	
6.5.1.5e						△					↕	
6.5.1.5f						△					△	
6.5.1.6	1											
6.5.1.6a				△	△	△	△					
6.5.1.6b				↕	↕	↕	↕					
6.5.1.6b(1)				↕	↕	↕	↕					
6.5.1.6b(2)				↕	↕	↕	↕		△			
6.5.1.6c				↕	↕	↕	↕					
6.5.1.6c(1)				△	△	△	△					

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.5.1.6c(2)				△	△	△	△		△			
6.5.1.6d	/			|					|			
6.5.1.6d(1)												
6.5.1.6d(2)								△				
6.5.1.6d(3)				△			△		△			
6.5.1.6e	/				△	△						
6.5.1.6e(1)												
6.5.1.6e(2)												
6.5.1.6e(3)					△	△	△					
6.5.2	/											
6.5.2.1	/					△						
6.5.2.1a						|					
6.5.2.1b						|					
6.5.2.1c						△						
6.5.2.2	/					△						
6.5.2.2a	/					|						
6.5.2.2a(1)						|					
6.5.2.2a(2)						|					
6.5.2.2b	/					|						
6.5.2.2b(1)						|					
6.5.2.2b(2)						|					
6.5.2.2c						△						
6.5.2.3	/					△						
6.5.2.3a						|					
6.5.2.3b						|					
6.5.2.3c						△						
6.5.2.4	/					△						
6.5.2.4a						|					
6.5.2.4b	/					|						
6.5.2.4b(1)						|					
6.5.2.4b(2)						|					
6.5.2.4c	/					△						

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.5.2.4c(1)						△						
6.5.2.4c(2)						▲						
6.5.2.4c(3)												
6.5.2.5						△						
6.5.3	1											
6.5.3.1	1											
6.5.3.1a	1											
6.5.3.1a(1)	2											
6.5.3.1a(2)	2											
6.5.3.1a(3)	2											
6.5.3.1b						△						
6.5.3.1c	1											
6.5.3.1c(1)						△						
6.5.3.1c(2)	2											
6.5.3.1d						△						
6.5.3.2	1											
6.5.3.2a	1											
6.5.3.2a(1)						△						
6.5.3.2a(2)									△			
6.5.3.2a(3)						△						
6.5.3.2b						△						
6.5.3.3	1											
6.5.3.3a	1					△						
6.5.3.3a(1)						▲						
6.5.3.3a(2)						▲						
6.5.3.3a(3)						▲						
6.5.3.3b	1					▲						
6.5.3.3b(1)						▲						
6.5.3.3b(2)						▲						
6.5.3.3b(3)						▲						
6.5.3.3b(4)						▲						
6.5.3.3b(5)						△						

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.5.3.3b(6)						△						
6.5.3.3b(7)						△						
6.5.3.3c	4											
6.5.3.3d	4											
6.5.4	1											
6.5.4.1	1					△						
6.5.4.1a						▲						
6.5.4.1b						▲						
6.5.4.1c						▲						
6.5.4.1d						▲						
6.5.4.1e	2											
6.5.4.1f	2											
6.5.4.1g						▲						
6.5.4.1h						▲						
6.5.4.1i						▲						
6.5.4.1j						▲						
6.5.4.1k						△						
6.5.4.2	1					△						
6.5.4.2a	1					▲						
6.5.4.2a(1)						▲						
6.5.4.2a(2)						▲						
6.5.4.2b	1					▲						
6.5.4.2b(1)						▲						
6.5.4.2b(2)						▲						
6.5.4.2b(3)						▲						
6.5.4.2b(4)						△						
6.5.5	1											
6.5.5.1	1					△						
6.5.5.1a	1					▲						
6.5.5.1a(1)						▲						
6.5.5.1a(2)						▲						
6.5.5.1a(3)						△						

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.5.5.1a(4)						△						
6.5.5.1a(5)												
6.5.5.1b	|											
6.5.5.1b(1)												
6.5.5.1b(2)												
6.5.5.1b(3)												
6.5.5.1c	|											
6.5.5.1c(1)												
6.5.5.1c(2)						△						
6.5.5.2	|					▲						
6.5.5.2a	|											
6.5.5.2a(1)												
6.5.5.2a(2)												
6.5.5.2a(3)												
6.5.5.2a(4)												
6.5.5.2a(5)												
6.5.5.2b												
6.5.5.2c						△						
6.6 LABELS	|											
6.6.1	|											
6.6.1.1							△					
6.6.1.2	|						△					
6.6.1.2a	|											
6.6.1.2a(1)												
6.6.1.2a(2)												
6.6.1.2a(3)												
6.6.1.2a(4)												
6.6.1.2b	|											
6.6.1.2b(1)												
6.6.1.2b(2)												
6.6.1.2b(3)												
6.6.1.2b(4)							△					

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.6.2	/											
6.6.2.1	/						△					
6.6.2.1a							↕					
6.6.2.1b							↕					
6.6.2.1c							↕					
6.6.2.1d							↕					
6.6.2.1e							↕					
6.6.2.1f							△					
6.6.2.2	/						△					
6.6.2.2a							↕					
6.6.2.2b							△					
6.6.2.3	/						△					
6.6.2.3a	/						↕					
6.6.2.3a(1)							↕					
6.6.2.3a(2)							↕					
6.6.2.3b							△					
6.6.2.4	/						△					
6.6.2.4a							↕					
6.6.2.4b							↕					
6.6.2.4c							↕					
6.6.2.4d							△					
6.6.3	/											
6.6.3.1	/						△					
6.6.3.1a							↕					
6.6.3.1b							↕					
6.6.3.2	/						↕					
6.6.3.2a							↕					
6.6.3.2b							↕					
6.6.3.2c							↕					
6.6.3.2d							↕					
6.6.3.2e							△					

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.6.3.2f							△					
6.6.3.3	1								△			
6.6.3.3a												
6.6.3.3b							△					
6.6.3.3c							△					
6.6.3.4	1						△					
6.6.3.4a							↕					
6.6.3.4b							↕					
6.6.3.4c							↕					
6.6.3.4d							↕					
6.6.3.4e							△					
6.6.3.5							△					
6.6.3.6							△					
6.6.3.7	1						↕					
6.6.3.7a							↕					
6.6.3.7b							△					
6.6.3.8	1						△					
6.6.3.8a							↕					
6.6.3.8b							↕					
6.6.3.8c							△					
6.6.3.9	1						△					
6.6.3.9a							↕					
6.6.3.9b							△					
6.6.4	1											
6.6.4.1	1						△					
6.6.4.1a							↕					
6.6.4.1a(1)							↕					
6.6.4.1a(2)							↕					
6.6.4.1b	1						↕					
6.6.4.1b(1)							↕					
6.6.4.1b(2)							△					

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.6.4.2	/						△					
6.6.4.2a	/											
6.6.4.2a(1)												
6.6.4.2a(2)												
6.6.4.2b	/											
6.6.4.2b(1)												
6.6.4.2b(2)												
6.6.4.2c												
6.6.4.2d	/											
6.6.4.2d(1)												
6.6.4.2d(2)												
6.6.4.2d(3)							▽					
6.6.5	/											
6.6.5.1	/						△					
6.6.5.1a												
6.6.5.1b												
6.6.5.1c												
6.6.5.1d												
6.6.5.1e												
6.6.5.1f												
6.6.5.1g												
6.6.5.1h							▽					
6.6.5.2	/						△					
6.6.5.2a												
6.6.5.2b	/											
6.6.5.2b(1)												
6.6.5.2b(2)												
6.6.5.2b(3)												
6.6.5.2b(4)												
6.6.5.2b(5)												
6.6.5.2b(6)												
6.6.5.2b(7)												
6.6.5.2b(8)							▽					

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.6.5.2b(9)							△					
6.6.6	|											
6.6.6.1	|											
6.6.6.2	|			△			△					
6.6.6.2a	|			|			|				
6.6.6.2a(1)				|			|				
6.6.6.2a(2)				|			|				
6.6.6.2a(3)				|			|				
6.6.6.2b				|			|				
6.6.6.2c				△			△					
6.6.6.3							△					
6.6.6.4	|						△					
6.6.6.4a	|						|					
6.6.6.4a(1)							|					
6.6.6.4a(2)							|					
6.6.6.4a(3)							|					
6.6.6.4a(4)							|					
6.6.6.4a(5)							|					
6.6.6.4b	|						|					
6.6.6.4b(1)							|					
6.6.6.4b(2)							|					
6.6.6.4b(3)							|					
6.6.6.4b(4)							|					
6.6.6.4b(5)							|					
6.6.6.4b(6)							|					
6.6.6.4c	|						|		△			
6.6.6.4c(1)							|		|			
6.6.6.4c(2)							△		△			
6.7 COMPUTERS	|											
6.7.1	|											
6.7.1.1	|							△				
6.7.1.1a								△				

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.1.1b												
6.7.1.1c												
6.7.1.1d												
6.7.1.2												
6.7.1.2a												
6.7.1.2a(1)												
6.7.1.2a(2)												
6.7.1.2a(3)												
6.7.1.2a(4)												
6.7.1.2a(5)												
6.7.1.2a(6)												
6.7.1.2b												
6.7.1.2c												
6.7.1.2c(1)												
6.7.1.2c(2)												
6.7.1.2c(3)												
6.7.1.2d												
6.7.1.3												
6.7.1.3a												
6.7.1.3b												
6.7.1.3c												
6.7.1.3d												
6.7.1.3e												
6.7.1.4												
6.7.1.4a												
6.7.1.4b												
6.7.1.4c												
6.7.1.4d												
6.7.1.4e												
6.7.1.4e(1)												
6.7.1.4e(2)												
6.7.1.4f												
6.7.1.4g												

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.1.4h								△				
6.7.1.4i								△				
6.7.1.5	/							△				
6.7.1.5a												
6.7.1.5b												
6.7.1.5c	/											
6.7.1.5c(1)												
6.7.1.5c(2)												
6.7.1.5d	/											
6.7.1.5d(1)												
6.7.1.5d(2)												
6.7.1.5d(3)												
6.7.1.5d(4)												
6.7.1.5d(5)								△				
6.7.1.6	/							△				
6.7.1.6a												
6.7.1.6b												
6.7.1.6c												
6.7.1.6d								△				
6.7.1.7	/							△				
6.7.1.7a												
6.7.1.7b								△				
6.7.1.8	/							△				
6.7.1.8a	/											
6.7.1.8a(1)												
6.7.1.8a(2)												
6.7.1.8a(3)												
6.7.1.8a(4)	/											
6.7.1.8a(4)(a)												
6.7.1.8a(4)(b)												
6.7.1.8a(4)(c)												
6.7.1.8a(5)	/							△				

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.1.8a(5)(a)								△				
6.7.1.8a(5)(b)												
6.7.1.8b	/											
6.7.1.8b(1)	/											
6.7.1.8b(1)(a)												
6.7.1.8b(1)(b)												
6.7.1.8b(1)(c)												
6.7.1.8b(1)(d)												
6.7.1.8b(2)								△				
6.7.2	/											
6.7.2.1	/							△				
6.7.2.1a												
6.7.2.1b												
6.7.2.1c	/											
6.7.2.1c(1)												
6.7.2.1c(2)												
6.7.2.1c(3)												
6.7.2.1c(4)												
6.7.2.1d	/											
6.7.2.1d(1)												
6.7.2.1d(2)												
6.7.2.1e												
6.7.2.1f	/											
6.7.2.1f(1)												
6.7.2.1f(2)												
6.7.2.1f(3)												
6.7.2.1f(4)												
6.7.2.1g												
6.7.2.1h	/											
6.7.2.1h(1)												
6.7.2.1h(2)								△				
6.7.2.2	/							△				
6.7.2.2a								△				

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.2.2b	/							▲				
6.7.2.2b(1)												
6.7.2.2b(2)												
6.7.2.2c												
6.7.2.2d												
6.7.2.2e												
6.7.2.2f	/											
6.7.2.2f(1)												
6.7.2.2f(2)	/											
6.7.2.2f(2)(a)												
6.7.2.2f(2)(b)												
6.7.2.2f(2)(c)												
6.7.2.2f(2)(d)												
6.7.2.2f(2)(e)												
6.7.2.2f(2)(f)												
6.7.2.2g	/											
6.7.2.2g(1)												
6.7.2.2g(2)												
6.7.2.2g(3)								▲				
6.7.2.3	/		▲					▲				
6.7.2.3a												
6.7.2.3b												
6.7.2.3c	/											
6.7.2.3c(1)	/											
6.7.2.3c(1)(a)												
6.7.2.3c(1)(b)												
6.7.2.3c(2)	/											
6.7.2.3c(2)(a)												
6.7.2.3c(2)(b)												
6.7.2.3d	/											
6.7.2.3d(1)	/											
6.7.2.3d(1)(a)												
6.7.2.3d(1)(b)												
6.7.2.3d(2)	/		▲					▲				

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE									
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.2.3d(2)(a)			△					△				
6.7.2.3d(2)(b)			↕					↕				
6.7.2.3e			↕					↕				
6.7.2.3f			△					△				
6.7.2.4	1							△				
6.7.2.4a	1							↕				
6.7.2.4a(1)								↕				
6.7.2.4a(2)								↕				
6.7.2.4b								↕				
6.7.2.4c	1							↕				
6.7.2.4c(1)								↕				
6.7.2.4c(2)								↕				
6.7.2.4d								↕				
6.7.2.4e	1							↕				
6.7.2.4e(1)								↕				
6.7.2.4e(2)								↕				
6.7.2.4f	1							↕				
6.7.2.4f(1)								↕				
6.7.2.4f(2)								↕				
6.7.2.4f(3)								↕				
6.7.2.4f(4)								↕				
6.7.2.4g	1							↕				
6.7.2.4g(1)								↕				
6.7.2.4g(2)								↕				
6.7.2.4h								↕				
6.7.2.4i								↕				
6.7.2.4j	1							↕				
6.7.2.4j(1)								↕				
6.7.2.4j(2)								↕				
6.7.2.4k								↕				
6.7.2.4l	1							↕				
6.7.2.4l(1)								↕				
6.7.2.4l(2)								↕				
6.7.2.4l(3)								△				

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.2.4m	1											
6.7.2.4m(1)												
6.7.2.4m(2)												
6.7.2.4n												
6.7.2.4o												
6.7.2.4p	1											
6.7.2.4p(1)												
6.7.2.4p(2)												
6.7.2.4q												
6.7.2.5	1											
6.7.2.5a	1											
6.7.2.5a(1)												
6.7.2.5a(2)												
6.7.2.5b												
6.7.2.5c												
6.7.2.5d												
6.7.2.5e												
6.7.2.5f												
6.7.2.5g												
6.7.2.5h												
6.7.2.5i												
6.7.2.5j												
6.7.2.5k	1											
6.7.2.5k(1)												
6.7.2.5k(2)												
6.7.2.5l												
6.7.2.5m												
6.7.2.5n												
6.7.2.6	1											
6.7.2.6a	1											
6.7.2.6a(1)												
6.7.2.6a(2)												
6.7.2.6b												

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.2.6c												
6.7.2.6d												
6.7.2.6e												
6.7.2.6f												
6.7.2.6g												
6.7.2.6h												
6.7.2.6i												
6.7.2.6j												
6.7.2.6k												
6.7.2.6l												
6.7.2.7	/											
6.7.2.7a												
6.7.2.7b	/											
6.7.2.7b(1)												
6.7.2.7b(2)												
6.7.2.7c												
6.7.2.7d												
6.7.2.7e	/											
6.7.2.7e(1)												
6.7.2.7e(2)												
6.7.2.7e(3)												
6.7.2.7e(4)												
6.7.2.7e(5)												
6.7.2.7f												
6.7.2.7g												
6.7.2.7h												
6.7.2.7i												
6.7.2.7j	/											
6.7.2.7j(1)												
6.7.2.7j(2)												
6.7.2.7j(3)												
6.7.2.7j(4)												
6.7.2.7k												

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.2.7k(1)												
6.7.2.7k(2)												
6.7.2.7l	/											
6.7.2.7l(1)												
6.7.2.7l(2)												
6.7.2.7l(3)												
6.7.2.7m	/											
6.7.2.7m(1&2)												
6.7.2.8	/											
6.7.2.8a	/											
6.7.2.8a(1)												
6.7.2.8a(2)												
6.7.2.8b												
6.7.2.8c	/											
6.7.2.8c(1)												
6.7.2.8c(2)												
6.7.2.8d												
6.7.2.8e												
6.7.3	/											
6.7.3.1	/											
6.7.3.1a	/											
6.7.3.1a(1)												
6.7.3.1a(2)												
6.7.3.1b	/											
6.7.3.1b(1)												
6.7.3.1b(2)												
6.7.3.1b(3)												
6.7.3.1c												
6.7.3.1d												
6.7.3.1e	/											
6.7.3.1e(1)												
6.7.3.1e(2)												

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.7.3.1e(3)								△				
6.7.3.1e(4)								|				
6.7.3.1e(5)								|				
6.7.3.1f	1							|				
6.7.3.1f(1)								|				
6.7.3.1f(2)								|				
6.7.3.1f(3)								|				
6.7.3.1f(4)								△				
6.7.3.2	1							△				
6.7.3.2a	1							|				
6.7.3.2a(1)								|				
6.7.3.2a(2)								|				
6.7.3.2b								|				
6.7.3.2c								|				
6.7.3.2d								|				
6.7.3.2e								|				
6.7.3.2f	1							|				
6.7.3.2f(1)								|				
6.7.3.2f(2)								|				
6.7.3.2f(3)								△				
6.7.3.3	1							△				
6.7.3.3a								|				
6.7.3.3b								|				
6.7.3.3c	1							|				
6.7.3.3c(1)								|				
6.7.3.3c(2)								|				
6.7.3.3d	1							|				
6.7.3.3d(1)								|				
6.7.3.3d(2)								|				
6.7.3.3d(3)								△				
6.8 PANEL LAYOUT	1											
6.8.1	1											

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.8.1.1	1											△
6.8.1.1a												|
6.8.1.1b												|
6.8.1.1c												△
6.8.1.2												△
6.8.1.3	1											△
6.8.1.3a												△
6.8.1.3b									△			
6.8.1.3c									△			
6.8.1.3d												
6.8.2	1											
6.8.2.1	1											△
6.8.2.1a	1											|
6.8.2.1a(1)												|
6.8.2.1a(2)												|
6.8.2.1a(3)												|
6.8.2.1b	1											|
6.8.2.1b(1)												|
6.8.2.1b(2)												|
6.8.2.1c	1											|
6.8.2.1c(1)												|
6.8.2.1c(2)												△
6.8.2.2	1											
6.8.2.2a	7											△
6.8.2.2b												
6.8.2.3	1											
6.8.2.3a	6											
6.8.2.3b	6											
6.8.2.4	1											△
6.8.2.4a												|
6.8.2.4b												△

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.8.3	/											
6.8.3.1	/				△							
6.8.3.1a					|							
6.8.3.1b					|							
6.8.3.1c					△							
6.8.3.2	/											
6.8.3.2a												△
6.8.3.2b												|
6.8.3.2c	/											|
6.8.3.2c(1)												|
6.8.3.2c(2)												△
6.8.3.2d	/						△					
6.8.3.2d(1)							|					
6.8.3.2d(2)							△					
6.8.3.3												△
6.9 C/D INT	/											
6.9.1	/											
6.9.1.1	/											△
6.9.1.1a												|
6.9.1.1b												|
6.9.1.1c	/											|
6.9.1.1c(1)												|
6.9.1.1c(2)												|
6.9.1.1c(3)												△
6.9.1.2	/											
6.9.1.2a	/											△
6.9.1.2a(1)												|
6.9.1.2a(2)												|
6.9.1.2a(3)												|
6.9.1.2a(4)												|
6.9.1.2a(5)												|
6.9.1.2a(6)												△

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SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.9.1.2b	1											△
6.9.1.2b(1)												↓
6.9.1.2b(2)												↓
6.9.1.2b(3)												↓
6.9.1.2b(4)												↓
6.9.1.2b(5)												↓
6.9.1.2b(6)												↓
6.9.1.2b(7)												↓
6.9.1.2c	1											↓
6.9.1.2c(1)												↓
6.9.1.2c(2)												↓
6.9.1.2c(3)												△
6.9.1.2c(4)											△	
6.9.2	1											
6.9.2.1	1											△
6.9.2.1a												↓
												↓
												↓
6.9.2.1b	1											↓
6.9.2.1b(1)												↓
6.9.2.1b(2)												↓
6.9.2.1b(3)												△
6.9.2.2	1											△
6.9.2.2a	1											↓
6.9.2.2a(1)												↓
6.9.2.2a(2)												↓
6.9.2.2b	1											↓
6.9.2.2b(1)												↓
6.9.2.2b(2)												↓
6.9.2.2c	1											↓
6.9.2.2c(1)												↓
6.9.2.2c(2)												△

APPENDIX D

NUREG-0700, SECTION 6 GUIDELINE/BVPS-2 CONTROL ROOM DESIGN REVIEW FINDING CROSS REFERENCE

SECTION 6 PARA. NO.	NOTE	FINAL SUMMARY REPORT TABLE										
			3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.3	4.4	4.5
6.9.2.2d												△
6.9.2.2e												△
6.9.2.3	/											△
6.9.2.3a												↕
6.9.2.3b												△
6.9.3	/											
6.9.3.1	/											△
6.9.3.1a	/											↕
6.9.3.1a(1)												↕
6.9.3.1a(2)												↕
6.9.3.1a(3)												↕
6.9.3.1a(4)												↕
6.9.3.1b	/											↕
6.9.3.1b(1)												↕
6.9.3.1b(2)												↕
6.9.3.1b(3)												↕
6.9.3.1c	/											↕
6.9.3.1c(1)												↕
6.9.3.1c(2)												△
6.9.3.2	/										△	
6.9.3.2a											↕	
6.9.3.2b											↕	
6.9.3.2c											↕	
6.9.3.2d											△	

APPENDIX E

NRC CLARIFICATION OF TASK ANALYSIS REQUIREMENTS

APPENDIX E

NRC CLARIFICATION OF TASK ANALYSIS REQUIREMENTS

General

Section 5 (Detailed Control Room Design Review) of Supplement 1 to NUREG-0737 requires the use of function review and task analysis techniques to identify control room operator information and control needs during emergency operations. Section 7 (Upgrade Emergency Operating Procedures) of Supplement 1 to NUREG-0737 states that the reanalysis of transients and accidents required in Item I.C.1 of NUREG-0737 will identify operator information and control needs for emergency operations. In their review of utility procedure generation package (PGP) submittals and CRDR program plan submittals (including the WOG System Review and Task Analysis documentation referenced in a number of program plans), the NRC saw instrumentation and control (equipment) requirements identified but did not see information and control needs identified. This resulted in a number of NRC comments on utility PGPs and program plans in the area of task analysis, requesting the identification of operator information and control needs. To support utilities in addressing these NRC comments on task analysis, the WOG participated in a March 29 meeting with the NRC to clarify this topic and describe how operators information and control needs were addressed in the Emergency Response Guideline Development Program.

At the March 29 meeting, the WOG representatives told the NRC that the operators' needs (information and control) were identified and evaluated as part of the development program for the ERGs. The process for ERG development was a multidisciplined and iterative process wherein operator response strategies and technical guidance were developed to address operator needs in response to emergency transients. The technical guidance (guidelines) defines the actual generic tasks (guideline steps and actions) and generic instrumentation and control requirements necessary to implement these response strategies. Consequently, operator information and control needs are not explicitly identified in the guidelines. Although not specifically required per NUREG-0737, Item I.C.1, these information and control needs that were identified during the development program for the ERGs are contained in the ERG background documentation (the background documentation for the Revision 1 ERGs was subsequently transmitted to the NRC in early May 1984).

To put the ERG SRTA program in perspective, the WOG representatives told the NRC that this program was developed to provide a task analysis methodology and example documentation based on the ERGs (basic version). The program was structured to compile operator tasks and instrumentation and control requirements as an input to the CRDR process. It was not intended to identify operator information and control needs.

Following the WOG presentation and subsequent NRC caucus, the NRC provided the following comments:

1. Based on the presentations by Mr. McKinney and Mr. Surman, it appears that Revision 1 of the ERG and background documents do provide an adequate basis for generically identifying information and control needs.

2. Each licensee and applicant, on a plant-specific basis, must describe the process for using the generic guidelines and background documentation to identify the characteristics of needed instrumentation and controls. For the information of this type that is not available from the ERG and background documentation, licensees and applicants must describe the process to be used to generate this information (e.g., from transient and accident analyses) to derive instrumentation and control characteristics. This process can be described in either the PGP or CRDR Program Plan with appropriate cross-referencing.

3. For potentially safety-significant plant-specific deviations from the ERG instrumentation and controls, each licensee and applicant must provide in the PGP a list of the deviations and their justification. These should be submitted in the plant-specific technical guideline portion of the PGP, along with other technical deviations.

4. For each instrument and control used to implement the emergency operating procedures, there should be an auditable record of how the needed characteristics of the instruments and controls were determined. These needed characteristics should be derived from the information and control needs identified in the background documentation of Revision 1 of the ERG or from plant-specific information.

5. It appears that the basic version of the ERG and background documentation provides an adequate basis for generically deriving information and control needs. However, because of the differences in the organization of the material in the background documents between Basic and Revision 1, it is apparent that it would be easier to extract the needed information from the Revision 1 background documents.

In summary, the March 29 meeting served to clarify the subject of task analysis. The NRC comments identified and discussed above further clarify (at the program level) their requirements. These comments recognized the ERG background documentation as the generic documentation which identifies operator information and control needs. Utilities must develop a process and actual documentation which identifies instrumentation and control characteristics based on the information and control needs identified in the ERG background documentation and other plant-specific documentation. Definition and clarification as to this process and the resultant documentation was not discussed at the March 29 meeting.