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OPERATIONS DEPARTMENT CONTROL INSTRUCTION

WRITER'S GUIDE FOR PREPARATION OF EMERGENCY OPERATING PROCEDURES

October 19, 1984

DUANE ARNOLD ENERGY CENTER
UNIT NO. 1
IOWA ELECTRIC LIGHT AND POWER COMPANY

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LIST OF EFFECTIVE PAGE REVISIONS

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1.0 PURPOSE AND SCOPE

This document provides specific administrative guidelines for preparing Duane Arnold Energy Center (DAEC) Emergency Operating Procedures.

2.0 GUIDELINES FOR PROCEDURE PREPARATION

2.1 PROCEDURE REVISIONS

(1) Revisions to this Writer's Guide shall be made in accordance with DAEC Administrative Control Procedures 1406.2 and 1406.3.

(2) Revisions to Emergency Operating Procedures shall be made in accordance with this writer's guide.

(3) Emergency Operating Procedures will not employ individual page revisions. When a change is made to an EOP, all pages of the procedure will take on the new revision number.

2.2 GENERAL WRITING GUIDELINES

(1) Procedure steps should deal with only one idea.

(2) Sentence length should not exceed 20 words.

(3) User instructions should be written in the form of a command.

(4) Objectives or operator actions should be specifically stated.

(5) Limits should be expressed quantitatively whenever possible. Tolerances should be expressed by indicating the entire range (e.g., use 10" to 20" rather than 15"±5").

(6) Human engineering and ALARA factors should be incorporated into the Emergency Operating Procedures.

(7) All emergency procedures shall reference the Emergency Plan Implementing Procedures (EPIPs) for assessing the appropriate Emergency Action Level (EAL).

2.3 EOP LAYOUT AND STYLE

(1) The EOPs are to be copied on two sides, so that even numbered pages appear on the left and odd numbered pages appear on the right.

(2) Even numbered pages are to be used for the following (given in the order of appearance from top to bottom).

(a) Conditional Statements (exclusively on left page)

(b) Cautions (If space is not available on right hand page)

(c) Calculations (Wherever practical)

(d) Graphs (Placed to use available space on either page)

(e) Information and tables used for information (Wherever practical)

(3) The odd numbered (right) pages should be used for the following:

(a) All procedure steps (excluding conditional statements) shall appear exclusively on the right page.

(b) Notes and cautions should appear prior to the step or steps to which they apply wherever practical.

(c) Tables when used as part of a step.

(d) Graphs will be placed to use available space.

(4) The right page step format is broken into two types, logic statement steps and instructional action statement steps.

(5) When an action is based on a plant condition, the step should appear as a logic statement which breaks the step into a two column format.

Example:

Logic Statement	Associated Action Statement
RC/F-5	
IF RPV water level can be determined by redundant level instrumentation **AND** drywell temperature is below RPV Saturation Temperature (Graph 4)	**THEN** flood the RPV as follows

(6) Subordinate logic statements should be included to make the logic structure clearer to the operator.

Example:

IF RPV Flooding is required,
OR
RPV water level CANNOT be determined

THEN control injection into the RPV to maintain reactor power above 8% BUT as low as practical.

WHEN reactor power CANNOT be maintained above **8%**
OR
reactor power CANNOT be determined

THEN RPV FLOODING IS REQUIRED. Go to Step RC/F (Tab 10 Page 51).

(7) Action statements should be structured so that the operator is given explicit actions to perform.

Example:

RC/P-2
Confirm open OR open CV-4371A. (Drywell N2 Inlet Isolation).

(8) When required, the operator shall be explicitly instructed to perform actions in several sections concurrently. (See Section 11.0.)

(9) The term CONDITIONAL STATEMENT is used in this Guide to refer to actions that are not expected, but may be required. (See Section 9.2.)

2.4 PUNCTUATION

Punctuation should be used only as necessary to aid reading and prevent misunderstanding. Word order should be selected to minimize punctuation. If extensive punctuation is necessary for clarity, the sentence should be rewritten or broken down into several sentences. Punctuation should be in accordance with the following rules:

(1) Use a colon to introduce a list of items with no established priority.

(2) Limit the number of commas to ensure that the instruction is not too complex or awkwardly constructed.

(3) Use a period to indicate decimal places in numbers and abbreviations.

(4) Use brackets to indicate redundant items in an Emergency Operating Procedure; e.g., initiate MSIV_LCS Loop A [B, C, and D] by placing Keylock Initiate Switch HS_8401A [B, C, and D] on Panel 1C14 in the OPERATE position.

(5) Use parentheses to set off referenced figures, tables, appendices, attachments, Tab-Page Number combinations, etc.

2.5 VOCABULARY

Words used in procedures should convey precise meaning to the trained person. The following rules apply:

(1) Use short, common words of few syllables.

(2) Use common usage if it makes the procedure easier to understand.

(3) Minimize the use of articles (a, an, and the) unless they are needed for clarity.

(4) Avoid specialized or abstract words for which substitute words may be used.

(5) Use action verbs in instructional steps to denote a particular action that the operator must perform. Common action verbs and their applications are provided in the Glossary (Appendix 1).

(6) To standardize those applications in which specific terminology should be used, the following guidelines apply:

Application	Terminology
Power Driven Equipment	START/STOP
Valves	OPEN/THROTTLE/CLOSE
Control Switches	NORMAL(AFTER START)
	NORMAL(AFTER STOP)
Indicating Lights	ON/OFF
Annunciators	Activate/Reset
Circuit Breakers or Switches	CLOSE(ON)/OPEN(OFF)
Plant Parameters	RAISE/LOWER (When used as a command)
	INCREASE/DECREASE (When describing changes in a parameter)

(7) For control circuitry that executes an entire function upon actuation of the control switch, the action verb appropriate to the component suffices without further amplification of how to manipulate the control device (e.g., Close MO-4601, A Recirc. PUMP SUCTION valve on Panel 1C04).

(8) See Section 4.5 for use of logic terms.

2.6 NUMERICAL VALUES

(1) Arabic numerals should be used.

(2) For numbers between zero and one, the decimal point should be preceded by a zero (e.g., 0.1).

(3) For numbers less than zero, a minus sign should precede the number (e.g., -1.2).

(4) The number of significant digits should be equal to the number of significant digits available. The operator should not be required to read an indicator to greater accuracy than that displayed.

(5) Engineering units should be specified for process variables and the same as those on the panel displays (e.g., psig instead of psi).

(6) Units of measure should be given numerical values that represent observed or measured data and calculated results. A virgule (/) should be used instead of "per" (e.g., ft/sec and lbs/hr).

(7) Numerical values that define an action level should be emphasized or in bold print.

Example: **IF** reactor power is above **5%**

2.7 COMPONENT IDENTIFICATION

(1) Equipment and controls shall be identified by the hand switch number, piping and instrument diagram component identification number, panel

number upon which the control switch is located, and the placard description if provided on the panel (e.g., start 1P-209A[B], CRD FEEDWATER PUMP, by placing Hand Switch HS-1807A[B] on Panel 1C05 to the START position).

(2) Annunciators shall be identified by quoting the annunciator window verbatim followed by the panel number and grid coordinates of the window enclosed in parentheses [e.g., REACTOR BLDG HI RADIATION (1C04B, A-6)].

(3) When referencing specific engraved names and numbers on panel placards and alarm windows, the engraving should be quoted verbatim and emphasized by using all capitals [e.g., verify that IRM A UPSCALE TRIP OR INOPERATIVE (1C05A, A-4) annunciator is reset].

(4) The names of plant systems are emphasized by capitalizing the first letter of each word in the title.

2.8 CALCULATIONS

(1) Where practical, space for calculations should be provided on even numbered (left) pages with any conversion factors necessary to obtain the answer in correct units.

(2) Calculation instructions shall identify the necessary instruments and panel.

(3) All calculations required to be used in the EOPs will appear in EOP C Calculations Section.

2.9 ABBREVIATIONS AND ACRONYMS

(1) Appendices 2 and 3, respectively, list the abbreviations and acronyms approved for use at DAEC.

(2) See Section 3.7 for EOP section designations.

2.10 SPELLING

Spelling should be consistent with modern usage as specified in a dictionary.

2.11 CAPITALIZATION

(1) Capitalize the first letter of specific systems or system components.

(2) Capitalize all letters of engraved names and numbers on panel placards and annunciator windows.

(3) Capitalize all letters of first-level and second-level section headings.

(4) Capitalize the first letter of each word in third-level headings.

(5) Circuit breaker positions, equipment running light indications, etc., should be emphasized by capitalization.

(6) Capitalize key terms as specified in Section 2.5(6).

(7) Capitalize logic statement terms as specified in Section 10.2.

3.0 TYPING FORMAT

3.1 GENERAL REQUIREMENTS

(1) Paper should be white bond and sized 8 1/2" x 11" with no foldouts or oversized pages.

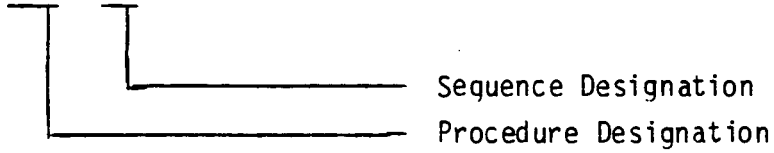
(2) For typing the following, see specific sections:

Figures and Graphs
Tables
Cautions
Notes
Conditional Statements
Logic Statements

3.2 EOP DESIGNATION AND NUMBERING

Emergency Operating Procedures shall be assigned a designation following the prefix EOP as follows:

Example: EOP 2



EOP-C – Emergency Operating Procedures – Cautions

EOP 1 – Reactor Pressure Vessel (RPV) Control

EOP 2 – Primary Containment Control

EOP 3 - Secondary Containment Control (to be issued at a later date)

EOP 4 - Radioactive Release Control (to be issued at a later date)

EOP 5 - Title reserved (to be issued at a later date)

EOP 6 - Title reserved (to be issued at a later date)

3.3 COVER SHEET

(1) The first page of every DAEC EOP shall be a Cover Sheet (Appendix 4) that specifies the procedure purpose and entry conditions.

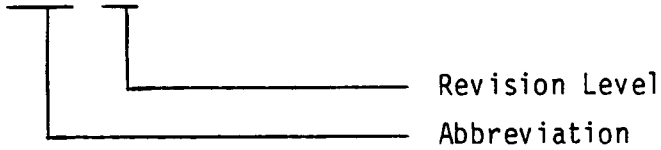
(2) The Cover Sheet shall include the EOP title, as shown in Appendix 4.

3.4 APPROVAL SHEET

(1) The last page of every DAEC EOP shall be an Approval Sheet (Appendix 8) that identifies the procedure and includes plant management approval signoffs.

(2) A number following the abbreviation "Rev." shall be used to designate the revision level of the procedure.

Example: Rev. 1



3.5 PAGE IDENTIFICATION AND NUMBERING

(1) Each page of the Emergency Operating Procedure shall be identified by:

(a) Emergency Operating Procedure designator and number (EOP __)

(b) Section Designation, (e.g., RC/L)

(c) Revision number, as specified by the Approval Sheet.

(d) Page number

(e) Date of revision

Example:

EOP 1 RC	PAGE 1 OF 80	Rev. 0 10-15-84

(2) Each page of the Emergency Operating Procedure shall indicate the total number of pages in the procedure, (e.g., Page 1 of __). This information shall be located at the bottom of the page as shown in Appendix 5.

(3) Subnumbering of pages will not be used (e.g., Page 7A of 53). Procedures will be repaginated when required.

3.6 PAGE ARRANGEMENT AND PARAGRAPH IDENTIFICATION

(1) Page margins are specified in Appendix 5.

(2) Page identification information is described in Section 3.5 and arranged as shown in Appendix 5.

(3) When practical, start a new page to allow a Caution to appear on the same page as the step to which it applies. (Additional caution statements may appear on facing pages.)

(4) Action statements should only appear on odd numbered (right) pages.

(5) Conditional information statements (IF while performing) statements should only appear on even numbered (left) pages.

(6) Each section and contingency procedure should start on a new page.

3.7 SECTION DESIGNATION

(1) Emergency Operating Procedures developed from the Emergency Procedure Guidelines (EPGs) shall have a prefix to the Step Number as follows:

(a) The first letter(s) indicates the area of control as follows:

RC = RPV Control
T = Torus
DW = Drywell
PC = Primary Containment
SC = Secondary Containment
RR = Radioactivity Release Control

(b) The last letter indicates the parameter to be controlled as follows:

L = Level
P = Pressure
Q = Power
T = Temperature
R = Radiation
H = Hydrogen
F = Flooding (contingency procedure)

(c) A virgule (slant line) should separate the area of control and the parameter (e.g., T/T and RC/F).

(2) Arabic numerals shall be used for numbering steps and substeps in the following decimal format:

RC/L-1	(First-level Step Number)
RC/L-2	(First-level Step Number)
RC/L-2.1	(Second-level Step Number - Substep)
RC/L-2.2	(Second-level Step Number - Substep)
RC/L-2.2.1	(Third-level Step Number - Substep)
RC/L-2.2.1(1)	(Fourth-level Step Number - Substep)
RC/L-3	(First-level Step Number)

(3) Lines of hyphens will be used to separate first and second level numbered steps and conditional (IF while performing) statements.

(4) Contingency procedures shall be designated by the contingency name and number, in addition to the step number.

3.8 SPACING

(1) Two line spaces shall be allowed between paragraphs.

(2) Text will be typed using single line spacing.

(3) Two line spaces shall be allowed between headings and the respective text.

(4) Two line spacing shall be allowed between a paragraph and itemized lists.

(5) Single or double spacing shall be allowed between items in a list. Only one type of spacing will be used within a list between items.

(6) Double spacing shall be used where necessary in logic statements to enhance clarity.

4.0 EMERGENCY PROCEDURE ORGANIZATION

4.1 PROCEDURE CONTENT

(1) EOP-C (Operator Cautions) shall include the following sections:

PURPOSE

EOP TABLE OF CONTENTS

GENERAL CAUTIONS

SPECIFIC CAUTIONS

CALCULATION PROCEDURES

GRAPHS

(2) All other Emergency Procedures shall include the following sections:

PURPOSE

ENTRY CONDITIONS

OPERATOR ACTIONS

4.2 DESCRIPTION OF SECTION CONTENT

(1) The Purpose is a brief statement describing the objective(s) of the procedure.

(2) Entry Conditions shall include only those alarms, indications, operating conditions, automatic system actions, or other unique symptoms that the operator will use to decide to enter the procedure.

(3) Operator actions are divided into sections to control a particular parameter (e.g., level, pressure, power) that give direction to the operator to mitigate degradation of plant performance and to restore plant conditions to normal.

(4) The Calculation Procedures Section of EOP-C shall repeat all EOP calculations.

(5) The Graphs Sections of EOP-C provides full-sized copies of all EOP graphs.

5.0 FIGURES AND GRAPHS

The following guidelines apply to graphs, drawings, and illustrations:

5.1 FIGURES AND GRAPH FORMAT

(1) The figure title and number should be placed above the figure field.

(2) The essential message should be clear; simple presentations are preferred.

(3) Grid lines of graphs should be at least 1/8 inch apart.

(4) The figure field should be of sufficient size to offer good readability.

(5) Items within the figure should be labeled with arrows pointing to the associated items.

(6) The items within the figure should be oriented naturally. For example, height should be along the vertical axis.

(7) Instrument range limitations should be indicated on the appropriate axes.

(8) Break points along an axis should be clearly indicated. Break points displayed may be at a greater accuracy than the operator can observe.

(9) In general, items within the figure should be labeled. Labels should be in capital letters at least 1/8 inch high.

(10) When practical, the restricted operation region should clearly be identified by slanted parallel lines and the area marked:

DO NOT OPERATE IN THIS AREA.

5.2 USE OF FIGURES AND GRAPHS

(1) When information is presented using graphs, charts, and figures, these aids must be self-explanatory, legible, and within the instrument accuracy available to the operator.

(2) Figures applicable to a page of text should be presented on the even numbered (left) page where it is availabe while reading the text.

(3) If space is not available on the even numbered (left) page, the last page on which the figure appears should be given.

(4) Capitalization should be used when referencing figures with text material (e.g., maintain pump discharge flow in accordance with NPSH Requirements for Core Spray Pump (GRAPH 7)).

(5) Sequential arabic numbers shall be assigned to Graph and Figures as they appear in EOP-C. The abbreviation "No." and symbol # are unnecessary and should not be used.

(6) Figure and table identification shall include the figure or table number and the figure or table title.

(7) All EOP graphs are reproduced in EOP-C.

6.0 TABLES

The following guidelines apply to tables:

6.1 TABLE FORMAT

(1) Type style and size should be the same as that for the rest of the procedure.

(2) The table number and title should be capitalized and located above the table field, below the preceding text.

(3) A heading should be entered for each column and centered within the column. The first letter of words in the column headings should be capitalized.

(4) Horizontal dashed lines should be placed above and below the column headings; vertical dash lines are also required.

(5) Tabular headings should be aligned as follows:

(a) Horizontally by related entries.

(b) Vertically by decimal point for numerical entries.

(c) Vertically by first letter for word entries, with continuation lines indented three spaces.

(6) Double line spacing between horizontal entries is sufficient to separate such entries, although horizontal lines may also be used.

(7) Vacant cells in any table shall be labeled "N/A" to indicate "not applicable".

(8) Asterisks (*) are used in tables to denote separate items with no order of priority.

(9) Tables should be enclosed in a box of hyphens when needed for clarity.

6.2 USE OF TABLES

(1) When information is presented using tables, these aids must be legible and self-explanatory.

(2) Tables applicable to a step in the text should be presented on the odd numbered (right) page as part of the text step to which it applies.

(3) Tables applicable to a page of text as information can appear on the even numbered (left) page where it will be available while reading the text.

(4) If space is not available on the even numbered (left) pages, the last preceding page the table appeared should be given.

(5) Example Table:

Number of Open SRVs	Minimum Alternate RPV Flooding Pressure (psig)
4 or more	120
3	160
2	245
1	505

7.0 CAUTIONS

7.1 CAUTION FORMAT

(1) The heading CAUTION should be capitalized, centered, placed below the preceding text, and either emphasized or in bold print. The word CAUTION should be followed by the caution number.

(2) Cautions shall be highlighted by enclosing them in a box of asterisks on the heading line and two spaces below the last line of the text.

(3) The text of the Caution should be block format and single spaced. The Caution text shall begin two spaces from the left margin so that the vertical line of the box lines up with the left printed margin and begins two line spaces below the heading. The right margin of the text of the Caution should be two spaces to the left of the right printed margin so the vertical line of the box appears at the right printed margin.

(4) If possible, Cautions should be placed on odd numbered (right) pages.

(5) Cautions should be numbered in separate series with General Cautions preceding Specific Cautions. The abbreviation "No." and symbol # are unnecessary and should not be used.

(6) All cautions shall be listed in EOP-C in single column (full page) format.

7.2 USE OF CAUTIONS

(1) Cautionary information and plant operating limitations are included to alert operating personnel of possible danger to plant equipment or personnel.

(2) Cautions shall not be used in lieu of instructional steps. Rather, they are intended to highlight potential hazards to equipment or personnel associated with particular steps.

(3) Cautions should be located prior to the step to which it applies.

(4) General Cautions are applicable at all times.

(5) Specific Cautions are repeated in the EOP where they apply.

(6) If a caution applies to a conditional statement and does not appear on the same page, the caution number shall appear in the conditional statement box with a border of asterisks as shown below:

```
******
* 13 *
******
```

(7) Example Caution:

```
************************* CAUTION 16 ****************************
*                                                                 *
* IF continuous LPCI operation of any RHR pump is required to     *
* assure adequate core cooling, DO NOT divert that RHR pump from  *
* LPCI mode.                                                      *
*                                                                 *
*******************************************************************
```

8.0 NOTES

8.1 NOTE FORMAT

(1) Notes shall be highlighted by a horizontal row of hyphens above and below the NOTE.

(2) The heading NOTE should be capitalized, centered, and placed within the top row of hyphens.

(3) The text of the Note should be block format and single spaced.

8.2 USE OF NOTES

(1) A Note is used to present additional information that may aid the operator in performance of a specific instructional step.

(2) A Note should present information only (not instructions) and should be located prior to the step to which it applies.

(3) Information may also be listed at the base of the even numbered (left) page under the heading INFORMATION.

(4) Example Note or Information Statement:

NOTE

Refer to EPIP 1.1 for EAL Assessment.

INFORMATION

CRD	0-1050 psig OI-55/56	COND/FEED	0-1110 psig OI-44/45
HPCI	100-1120 psig OI-52	LPCI	0-230 psig OI-49
RCIC	100-1120 psig OI-50	CS	0-330 psig OI-51

9 0 CONDITIONAL STATEMENTS (IF WHILE PERFORMING)

9.1 CONDITIONAL STATEMENT FORMAT

(1) The first time a conditional statement appears it should be emphasized by a dark border and appear at the top of the page.

(2) Conditional statements will appear on even numbered (left) pages with the heading CONDITIONAL STATEMENTS in bold print centered within a line of hyphens.

(3) Conditional statements should be written so that the description of the condition appears in the column on the left, with the action instruction in the column on the right.

(4) The conditional statement shall begin with IF, WHEN, or BEFORE, in emphasized or bold print.

(5) Conditional statements shall be separated by lines of hyphens.

(6) Conditional actions should be placed on the page facing the applicable steps.

9.2 USE OF CONDITIONAL STATEMENTS

(1) Conditional statements (IF while performing) involve operator actions that should be taken in the event a stated condition, event, or task does not represent or achieve the expected result.

(2) Conditional actions shall be specified for each circumstance in which the expected results or actions might not be achieved.

(3) When necessary the conditional actions should include directions to override automatic controls and to manually backup an automatic action.

(4) Example Conditional Statement:

CONDITIONAL STATEMENTS

IF while performing steps on Page 5:

IF Boron Injection is required **OR** boron has been injected into the RPV	**THEN** go to Step RC/L-5, (Tab 4 Page 19).
IF RPV Flooding is required **OR** RPV water level CANNOT be determined	**THEN** RPV FLOODING IS REQUIRED Go to Step RC/F (Tab 10 Page 51).

10.0 LOGIC STATEMENTS

10.1 LOGIC STATEMENT FORMAT

(1) A logic condition and its associated action statement(s) shall appear in block format in left and right columns.

(2) Action and logic condition terms (IF, THEN, etc.) shall appear one space to the left of their respective statements.

(3) All action statements (excluding conditional action statements) shall appear on odd numbered (right) pages.

10.2 USE OF LOGIC STATEMENTS

(1) In logic statements:

(a) AND identifies a conjunction of terms (e.g., all terms must be satisfied).

(b) BEFORE identifies an action to be taken prior to reaching a specified action level (e.g., if the parameter is approaching its action level rapidly, action should be taken sooner than if the parameter were changing slowly).

(c) IF designates a possible condition that exists when the associated step is reached. IF is not meant to include future events.

(d) OR identifies a disjunction of terms (e.g., only one of the associated conditions must be satisfied).

(e) THEN identifies the action statement associated with a given logic condition.

(f) WHEN identifies an expected condition (e.g., the operator should monitor or wait for the expected condition).

(2) The terms AND, OR, NOT, IF, IF NOT, WHEN, BUT, ALL, and ANY shall be either emphasized or in bold print except:

(a) When contained within a caution or note.

(b) When conditions appear in a hierarchy (e.g., A and either B or C). In this case, the subordinate logic terms will not be emphasized or broken out from the text.

(3) All letters of the terms AND, NOT, CANNOT, OR, BUT, ALL, ANY, AT LEAST, and ONLY shall be capitalized except where they appear between two acronyms, (i.e., HPCI and RCIC) or two limit values (e.g., 6 ft and 10 ft).

(4) Logic statements shall be written so that the description of the condition appears in the column on the left, with the action instruction in the column on the right.

(a) The logic condition shall begin with IF, WHEN, or BEFORE, in emphasized or bold print.

(b) The use of AND and OR within the same logic statement should be avoided.

(c) Subordinate logic statements shall be indented to make the logic structure clear to the operator.

(5) When joining sets of logic conditions:

(a) The word AND shall be centered between the condition description in bold or emphasized print.

(b) The word AND shall not be used to join more than three conditions. If four or more conditions need to be joined, a list format shall be used.

(c) The conditions should not be numbered or lettered.

(6) When addressing alternate combinations of conditions, the word OR shall be used, centered between the condition description and in emphasized or bold print.

(7) The word THEN shall only be used prior to an action statement and shall be emphasized or in bold print.

(8) The word AND may be broken out from the text of an action statement and centered to emphasize a second action to be performed. More than three actions should be emphasized by use of a list format.

(9) When necessary, the word NO should be capitalized.

(10) The logic statement format is shown in Appendix 6.

11.0 USE OF REFERENCING AND BRANCHING TO OTHER PROCEDURES OR STEPS

(1) Referencing implies that an additional procedure or additional steps should be used to supplement the procedure presently being used. Referencing other steps within the procedure being used, either future steps or completed steps, should be minimized. When a few steps are involved in the reference, the steps should be repeated.

(2) When an instructional step calls for the operator to refer to another procedure, document, etc., a direct reference should be made.

(3) When another procedure or other steps are to be performed in parallel, the calling procedure shall specify that the operations are to be done CONCURRENTLY.

(4) To minimize operator confusion, branching shall be used when the operator is to leave one procedure or step to use another procedure or step.

(a) The word ENTER should be used when branching to another procedure.

(b) The term CONTINUE should be used when branching forward to another part of the procedure in use.

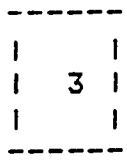
(c) The term RETURN should be used when branching back to another part of the procedure in use.

(5) Following the procedure number, the procedure title shall be enclosed in parentheses to emphasize the title of the referenced or branched procedure. For example: Enter EOP-1 (RPV Control) at (TAB 9 Page 39).

(6) When the actions to be taken are located in a specific section of the branched procedure, that section shall be stated rather than the procedure number and title alone. (e.g.: Enter OI-51 (Core Spray) at Section 4.0.)

(7) When sections of a procedure that are separated by several pages are to be executed concurrently, referenced sections should be tabbed to assist the operator. Tabbing should also be used when the operator is instructed to a step in the procedure that is several pages out of numerical sequence.

(8) The working copy of the EOPs will be tabbed to identify major referenced sections. These tabs will also be identified by the associated page number so the referenced section may be located on non-working copies. The tab number shall be typed in the right page margin and enclosed in a box as follows:



(a) Tabs will be located on transparent pages, in numerical order as they appear in the procedure, and in numerical series from top to bottom.

(b) Tabs will include the tab number and title as listed in Appendix 9 (e.g., 11 RC/Q).

12.0 EOP FLOW CHART

12.1 EOP FLOW CHART FORMAT

(1) Action paths are designated by the following:

(a) Solid lines, for the primary action path.

(b) Dashed lines, for alternate paths or changes in plant status.

(2) EOP Entry and Exit points are designated by the following:

(a) Trapezoids, for EOP Entry, EOP Exit to contingency procedure, and contingency procedure exit to another contingency procedure.

(b) Trapezoids, for contingency procedure entry.

(3) Steps are designated by the following:

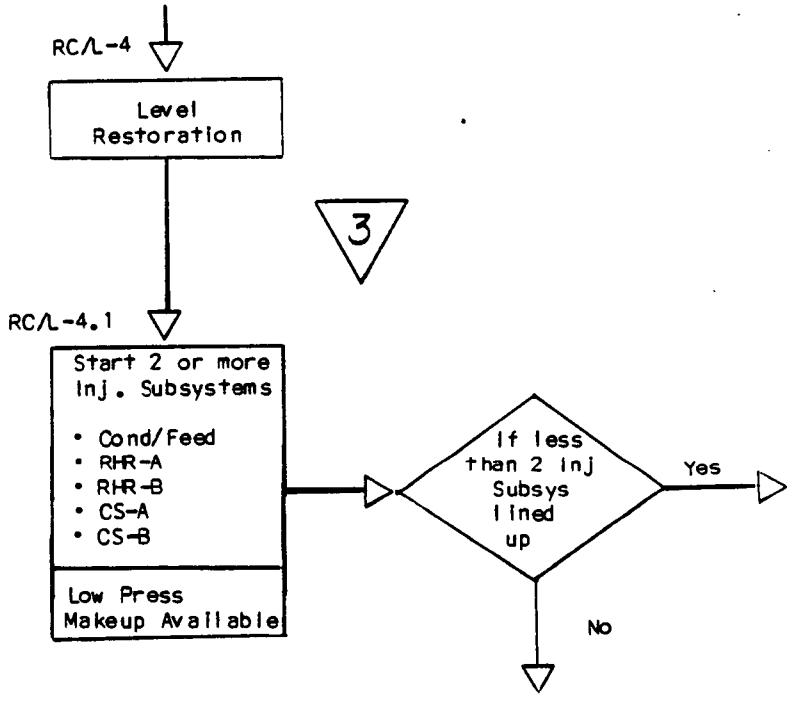
(a) Diamonds, for decision steps.

(b) Rectangles, for action steps.

(4) Triangles are used to designate associated EOP or Contingency Tab step numbers.

(5) Parallelograms are used to designate Caution numbers.

Example:



12.2 USE OF EOP FLOW CHARTS

(1) EOP Flow Charts illustrate all operator actions within the Emergency Operating Procedures.

(2) EOP Flow Charts are used in training to instruct the operator in the use of the EOPs.

13.0 REFERENCES

(1) Updated Final Safety Analysis Report, Duane Arnold Energy Center, Chapter 1

(2) ANSI N18.7, American National Standard Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants

(3) Administrative Control Procedures, Duane Arnold Energy Center Sections 1406.2 and 1406.3

(4) Emergency Operating Procedures Writing Guidelines, INPO Document 82-017, July 1982

(5) NUREG-0899, Guidelines for the Preparation of Emergency Operating Procedures, Rev. 5, June 4, 1982

APPENDIX 1

GLOSSARY

Word	Application
Activate	Formally institute special activity/function. To place into operation.
Align	Place systems or components (e.g., valves and breakers) in proper positions for accomplishing specified function.
Allow	To permit a stated condition to be achieved prior to proceeding (e.g., "allow discharge pressure to stabilize").
Approach	To come close to an action level in such a manner that, in the operator's judgment, meeting or exceeding the action level is imminent.
Check	To determine the present status of a plant parameter or component.
Close	Mechanically: To change the physical position of a mechanical device so that it prevents physical access or fluid flow (e.g., Close "V-17-16"). Electrically: To change the physical position of an electrical circuit breaker to permit passage of electrical current (e.g., "close circuit breaker B-43-31").

Word	Application
Complete	To accomplish specified procedural requirements (e.g., "complete valve checklist A", "complete data report QA—", "complete Steps 7 through 9 of OI 51").
Comparison	A comparing or being compared.
Concurrent	To perform at the same time.
Confirm	To observe an expected condition or characteristic without being specific as to the method (e.g., "confirm . . . pump operation").
Decrease	Do not use in oral communciation; use "lower" in lieu of decrease. Decrease may be used when describing changes in a parameter.
Deenergize	Remove power supply. Should not be used; use Open.
Depress	Refers to pushbutton operation.
Discrepancy	Disagreement or inconsistency.
Energize	Supply power. Should not be used; use Close.
Ensure	Take necessary/appropriate actions to guarantee component, reading, etc., as specified.

Word	Application
Establish	To make arrangements for a stated condition (e.g., "established communication with control room").
Execute	To do or perform the instructed action or steps.
Implement	Commence a required program or series of procedures.
Increase	Do not use in oral communciation; use "raise" in lieu of increase. Increase may be used in the procedure when describing changes in a parameter.
Initiate	Take actions to begin a process.
Inspect	To measure, observe, or evaluate a feature or characteristic for comparison with specified limits; method of inspection should be included (e.g., "visually inspect for leaks").
Isolate	Remove from service by closing-off the flow path.
Local	Take action outside the control room at equipment or local operating station.
Limitation	Specific parameter not to be exceeded (violated).
Maintain	Take appropriate actions to prevent fluctuation/changing.

Word	Application
Manual Initation	Operator action which activates a function which is normally initiated automatically due to plant conditions.
Manual Trip	Operator action to activate a Reactor Trip or stop an operating piece of equipment such as a pump.
May	Possibility, permission, or contingency.
Monitor	To observe a stated parameter or function for significant changes. This does not mean an operator continuously watches the parameter, but be aware of changes to keep the operation under control.
Notify	Inform specified personnel.
Open	Mechanically: To change the physical position of an mechanical device, such as a valve, or door to unobstructed position that permits a fluid flow or access. Electrically: To change the physical position of an electrical circuit breaker to prevent the passage of electrical current.
Per	As specified in or by named procedure. Implies referencing the document is optional.
Place	Physically position a switch to the specified location. n.

Word	Application
Qualified	All station personnel who maintain an active Senior Reactor Operator (SRO) or Reactor Operator (RO) License issued by the NRC or who by virtue of job classification and training have demonstrated proficiency on plant equipment/systems which they operate.
Rack In	Place an electrical circuit breaker in place by physically connecting it to its associated power source.
Rack Out	Disconnect an electrical breaker by physically removing it from its associated electrical cubicle.
Record	To document specified condition or characteristic (e.g., "record discharge pressure").
Refer	Use as a supplement. Perform applicable actions of cited procedure and return to the controlling procedure.
Regulate	Control or restrict.
Restore and Maintain	To bring a specified parameter back under control or within specified limits and keep it within those limits.
Rotate	Turn a rotary multi-position switch to the required position. In reference to pumps, hand rotate before energizing.

Word	Application
Secure	Remove from service. Take appropriate action to prevent return to service.
Set	To physically adjust to a specified value an adjustable feature (e.g., "set diesel speed to . . . rpm").
Shall	Infers mandatory requirement.
Shift	Specifies changing mode of operation.
Should	Infers nonmandatory, preferred, or desired method.
Shut	To move so as to close. Do not use.
Stabilize	To bring a specified parameter under control with any fluctuations controlled.
Start	To originate motion of an electric or mechanical device directly or by remote control (e.g., "start . . . pump").
Stop	To terminate operation (e.g., "stop . . . pump").
Terminate Injection	To stop flow to a specified location. This allows redirecting flow to another location without tripping the pump.

Word	Application
Throttle	To operate a valve in an intermediate position to obtain a certain flow rate (e.g., "throttle valve V-17-61 to . . .")
Trip	Do not use except when the circuit breaker opens automatically. Use "open" in lieu of "trip" when possible.
Vent	To permit a gas or liquid confined under pressure to escape at a vent (e.g., "vent . . . pump").
Verify	To determine if in proper condition/status and place in proper condition/status if not found in proper condition/status.

APPENDIX 2

APPROVED ABBREVIATIONS

Abbreviation	Abbreviated Word or Phase
abs	absolute
Btu	British Thermal Unit
C	Centrigrade
cc	cubic centimeter
deg.	degrees
dP	differential pressure
dT	differential temperature
equip.	equipment
F	Fahrenheit
ft	foot
gal	gallon
gpm	gallons per minute
gpmd	gallons per minute differential
Hg	mercury
hp	horse power
hr	hour
in.	inch
kW	kilowatt
lb	pound
min	minute
mR	millirem
MW	megawatt
MWT	megawatt thermal
N	Normal
press.	pressure
psia	pounds per square inch (absolute)
psig	pounds per square inch (gauge)

APPENDIX 2
(continued)

Abbreviation	Abbreviated Word or Phase
rad.	radiation
recirc.	recirculation
rpm	revolutions per minute
sec	second
W	recirc. loop flow as a percentage of full loop flow
WG	water (gauge)

APPENDIX 3

APPROVED ACRONYMS

Acronym	Definition
AB	Administration Building
ADS	Automatic Depressurization System
AOP	Abnormal Operating Procedure
APRM	Average Power Range Monitor
CB	Control Building
COND/FEED	Condensate/Feedwater System
CONT	Containment
CRD	Control Rod Drive
CS	Core Spray
CSCS	Core Standby Cooling System
CT	Cooling Towers
D/W	Drywell
EAL	Emergency Action Level
ECCS	Emergency Core Cooling System
EHC	Electrohydraulic Control
EOP	Emergency Operating Procedure
EPC	Emergency Operating Procedures - Cautions
EPG	Emergency Procedure Guidelines
EPIP	Emergency Plan Implementing Procedure
ESW	Emergency Service Water
F/D	Filter/Demineralizer
FP	Fuel Pool
GSW	General Service Water
GY	General Yard
HCU	Hydraulic Control Unit
HPCI	High Pressure Coolant Injection
H/V	Heating, Ventilating, and Air Conditioning

APPENDIX 3
(Continued)

Acronym	Definition
HX	Heat Exchanger
IPOI	Integrated Plant Operating Instruction
IRM	Intermediate Range Monitor
IS	Intake Structure
LC	Load Center
LCO	Limiting Condition for Operation
LLS	Low Low Set
LOCA	Loss-of-Coolant Accident
LOOP	Loss of Off-site Power
LPCI	Low Pressure Coolant Injection
LPRM	Local Power Range Monitor
MCC	Motor Control Center
MSIV	Main Steamline Isolation Valve
MSIV-LCS	Main Steamline Isolation Valve - Leakage Control System
MSL	Main Steam Line
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
OI	Operating Instruction
OR	Offgas/Recombiner Building
OS	Offgas Stack
OSS	Operations Shift Supervisor
PH	Pumphouse
RB	Reactor Building
RBCCW	Reactor Building Closed Cooling Water
RCIC	Reactor Core Isolation Cooling
RMCS	Reactor Manual Control System

Acronym	Definition
RPS	Reactor Protective System
RPV	Reactor Pressure Vessel
RSCS	Rod Sequence Control System
RT	Retention Building
RW	Radwaste
RWCU	Reactor Water Cleanup
RWM	Rod Worth Minimizer
RWS	River Water Supply
Rx	Reactor
SBDG	Standby Diesel Generator
SBFU	Standby Filter Unit
SBGT	Standby Gas Treament
SBLC	Standby Liquid Control
SDV	Scram Discharge Volume
SRM	Source Range Monitor
SRV	Safety/Relief Valve
ST	Steam Tunnel
TAF	Top of Active Fuel (344.5" above vessel bottom)
TB	Turbine Building
TIP	Transversing In-core Probe

(See Bechtel Drawing No. 7884-M-102 for instrument identification acronyms.)

APPENDIX 4
COVER SHEET

EOP 1

DUANE ARNOLD ENERGY CENTER

EMERGENCY OPERATING PROCEDURE 1

RPV CONTROL

(RC)

PURPOSE

RC/L - Maintain adequate core cooling,

RC/P - Control RPV pressure and cool down the RPV to cold shutdown conditions if warranted, and

RC/Q - Shut down the reactor.

ENTRY CONDITIONS

ANY of the followins:

* RPV water level below **+170** in.
* RPV pressure above **1035** psig
* Drywell pressure above **2.0** psig
* An isolation which requires OR initiates reactor scram
* A condition which requires a reactor scram
  AND
  reactor power remains above **5%** OR CANNOT be determined.

EOP 1 RC PAGE 1 OF 80 Rev. 0 10-15-84

.5" | .5" | 1 1/4"

CONDITIONAL STATEMENTS

IF while performing steps on Page 79:	
IF the reactor scram can be reset **AND** control rods moved inward following the last scram	**THEN** open V-17-24 (Charging Water Header Isolation) **AND** return to Step RC/Q-5.2 (Page 75)
IF ALL control rods are inserted to OR beyond position **02**	**THEN** terminate Boron injection **AND** enter Reactor Scram IPOI (Vol. C-1.0 Section III)
IF the reactor is shutdown and NO Boron has been injected into the RPV	**THEN** enter Reactor Scram IPOI (Vol. C-1.0, Section III)
IF the reactor CANNOT be shutdown with control rods before torus water temperature reaches **110** deg. F	**THEN** return to and perform Step RC/Q-4 (Tab 11 Page 67) concurrently with this step.

7/8"

1¼" .5" .5"

CAUTION 22

The effluent vented may be very hot water or steam

RC/Q-5.5.5

IF ANY control rods CANNOT be inserted to OR beyond position **02**	**THEN** individually direct the effluent from CRD withdraw line vent valve V-18-1364 (CRD **-**) to a contained radwaste drain **AND** open V-18-1364 (CRD **-**) for that CRD until it is NOT moving inward.

RC/Q-5.5.6

WHEN a control rod is NOT moving inward	**THEN** close V-18-1364 (CRD **-**) **AND** disconnect the vent rig

---

RC/Q-5.6

WHEN ALL control rods are inserted to OR beyond position **02**	**THEN** open V-17-24 (Charging Water Header Isolation) **AND** enter Reactor Scram IPOI (Vol. C-1.0 Section III)

APPENDIX 7
PAGE FORMAT WITH LA-120 PRINTER CONTROL CHARACTERS

```
<CR><LF>
<ESC>C4wT/T<ESC>C1w<CR>
<ESC>C4wT/T<ESC>C1w<CR>
<ESC>C4wT/T<ESC>C1w<CR><LF>
<CR><LF>
                                                                    ------<CR><LF>
<ESC>C4w MONITOR AND CONTROL TORUS TEMPERATURE<ESC>C1w <CR>
<ESC>C4w MONITOR AND CONTROL TORUS TEMPERATURE<ESC>C1w <CR>
<ESC>C4w MONITOR AND CONTROL TORUS TEMPERATURE<ESC>C1w <CR>
                                                                    |   ' |<CR><LF>
                                                                    | 12 |<CR><LF>
<ESC>C4wT/T-1<ESC>C1w <CR>
<ESC>C4wT/T-1<ESC>C1w <CR>
<ESC>C4wT/T-1<ESC>C1w <CR>
                                                                    |    |<CR><LF>
                                                                    ------<CR><LF>
  Close all stuck open SRVs.<CR><LF>
<CR><LF>
--------------------------------------------------------------------------------<CR><LF>
<CR><LF>
<ESC>C4wT/T-1.1  <ESC>C1w<CR>
<ESC>C4wT/T-1.1  <ESC>C1w<CR>
<ESC>C4wT/T-1.1  <ESC>C1w<CR><LF>
<CR><LF>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
     any stuck open SRV cannot          scram reactor AND<CR><LF>
     be closed                          carry out immediate<CR><LF>
                                        steps of scram pro-<CR><LF>
                                        cedure (IPOI Vol.<CR><LF>
                                        C-1.0, Section III)<CR><LF>
<CR><LF>
--------------------------------------------------------------------------------<CR><LF>
<CR><LF>
                  <ESC>C7wCAUTION 14<ESC>C1w<CR>
                  <ESC>C7wCAUTION 14<ESC>C1w<CR>
####################<ESC>C7wCAUTION 14<ESC>C1w ##############################<CR><LF>
#                                                                            #<CR><LF>
# IF continuous LPCI operation of any RHR pump is required to               #<CR><LF>
# assure adequate core cooling, DO NOT divert that RHR pump from            #<CR><LF>
# LPCI mode.                                                                #<CR><LF>
#                                                                            #<CR><LF>
##############################################################################<CR><LF>
<CR><LF>
<CR><LF>
<ESC>C4wT/T-2    <ESC>C1w<CR>
<ESC>C4wT/T-2    <ESC>C1w<CR>
<ESC>C4wT/T-2    <ESC>C1w<CR><LF>
<CR><LF>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
     torus water temperature            operate available<CR><LF>
               <ESC>C4w95<ESC>C1w <CR>
               <ESC>C4w95<ESC>C1w <CR>
     approaches <ESC>C4w95<ESC>C1w des. F            torus cooling<CR><LF>
                                        (DI 49, Section 5.2) <CR><LF>
--------------------------------------------------------------------------------<CR><LF>
<CR><LF>
<CR><LF>
<ESC>C4wT/T-3    <ESC>C1w<CR>
<ESC>C4wT/T-3    <ESC>C1w<CR>
<ESC>C4wT/T-3    <ESC>C1w<CR><LF>
<CR><LF>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
<ESC>C7w IF                    THEN<ESC>C1w<CR>
     torus water temperature            scram reactor AND<CR><LF>
               <ESC>C4wi10<ESC>C1w <CR>
               <ESC>C4wi10<ESC>C1w <CR>
     approaches <ESC>C4wi10<ESC>C1w des. F<CR>
                                carry out immediate<CR><LF>
                                        steps of scram pro-<CR><LF>
                                        cedure (IPOI Vol.<CR><LF>
                                        C-1.0, Section III).<CR><LF>
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EOP-2      T/T          Page 5 of 28        Verification <CR><LF><FF>
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APPENDIX 8
APPROVAL SHEET

EOP 1

DUANE ARNOLD ENERGY CENTER

EMERGENCY OPERATING PROCEDURE 1

RPV CONTROL

(RC)

APPROVED BY:_____ DATE:_____
Operations Supervisor

APPROVED BY:_____ DATE:_____
ALARA Coordinator

APPROVED BY:_____ DATE:_____
Operations Committee

APPROVED BY:_____ DATE:_____
Plant Superintendent-Nuclear

APPENDIX 9

TAB LIST

Tab Number	Tab Title
1	RC
2	RC/L
3	RC/L-4
4	RC/L-5
5	RC/P
6	RC/P-5
7	RC/P-7
8	RC/P-8
9	RC/P-9
10	RC/F
11	RC/Q
12	T/T
13	DW/T
14	PC/P
15	T/L