HUMAN FACTORS TASK PLAN
FOR THE
ANNUNCIATOR SYSTEM REVIEW

The

Essex Corporation
333 North Fairfax Street
Alexandria, Virginia 22314

(703) 548-4500

Approved for Use: _____ _____
(Signature) (Date)

_____
(Printed Name and Title)

RECORD OF REVISIONS

Rev. No.	Rev. Date	Description

TABLE OF CONTENTS

APPENDICES

ANNUNCIATOR SYSTEM

1.0 OBJECTIVES

a. To assess to what degree the annunciator system conforms to the criteria in NUREG-0700.

b. To identify and document any features in the annunciator system design that do not conform to the criteria in NUREG-0700.

2.0 REVIEW TEAM SELECTION AND RESPONSIBILITIES

a. A human factors specialist to conduct the data collection and analysis and to prepare the task report.

b. A client nuclear operations specialist to supply plant systems information concerning alarm parameters and alarm response procedures.

c. A client plant I&C engineer to assist in identifying relevant plant systems information.

3.0 CRITERIA

The criteria are from NUREG-0700; paragraphs 6.3.1.1; 6.3.1.2a through d(2); 6.3.1.3a through d; 6.3.1.4a and b; 6.3.1.5a through b(3); 6.3.2.1a through f; 6.3.3.1a through b(2); 6.3.2.2a and b; 6.3.3.1a through c(3); 6.3.3.2a through f(2); 6.3.3.3a through f; 6.3.3.4a through d; 6.3.3.5a through d(6); 6.3.4.1a through d(2); 6.3.4.2a through c; 6.3.4.3a and b; 6.5.1.6a through c(2) and e(1) through 3(3);and 6.6.6.2a, b, and c (see Appendix A).

4.0 PROCEDURES

4.1 General Instructions

4.1.1 Preparation and Conduct of Procedures

a. Prior to conduct of this task, ensure that all required data forms, plant documentation, engineering drawings, equipment, and materials are available. Ensure that permission has been obtained for all required access to the control room or other plant areas.

b. Record all exceptions, deviations, or changes to these procedures in Section 9.0 of this Task Plan. Number each entry sequentially, starting with 1. Include an explanation (technical justification) as to why the exception, deviation, or change was made.

4.1.2 Task Plan Critique

Upon completion of this task, fill out the Task Plan Critique contained in Appendix D. Submit the completed critique to your supervisor or project manager.

4.2 Data Collection

a. Data are collected using various methods and procedures consisting of measurements, observations, interviews and questionnaires, and document reviews. Appendix C illustrates the distribution of the criteria for the various methods.

b. Measurements and observations should be made for all items contained on the Measurements data forms and Observations checklists contained in Appendix B.

c. The operator questionnaire (Appendix B) should be administered to at least 50 percent of the licensed reactor operators for the plant. Administration may be conducted singly or in a group, but should be proctored or monitored.

d. The results of the System Function and Task Analysis tasks should be reviewed for annunciator-relevant data in reference to 6.3.3.1; 6.3.1.4a; 6.3.3b and d(2); 6.3.3.4a and c; 6.3.4.3a; and 6.6.6.2a(1), (2), and (3).

e. In addition to the review results from d, above, plant documentation should be reviewed to verify the items listed in the Document Review Checklist in Appendix B. The required plant documents include:

1. Annunciator Response Procedures
2. Administrative Procedures relevant to annunciators.

4.3 Analysis

a. All deviations from the criteria shall be recorded on Human Engineering Discrepancy (HED) reports (Appendix B). Recorded information shall include the instrument or instruments involved (e.g., auditory alarm horns, specific light tiles, etc.), a description of the problem including the 0700 paragraph number of the criteria, and a recommended solution.

b. Data collection method(s) shall also be recorded on the HED form (see Appendix B). Where data from two or more sources are contradictory, resolution of the conflict through data review and client interview shall be made.

c. Use the analysis aids from Appendix B for all data reduction and analysis. Upon completion of all analyses, ensure that the criteria in Appendix A are properly annotated (as specified in the analysis aids).

d. Submit the completed task plan to your immediate supervisor for review. Upon project management approval, initiate Task Report 3.1.

5.0 EQUIPMENT AND FACILITY REQUIREMENTS

a. Access to the control room.
b. Sound level meter.
c. Protractor and tape measure.
d. Flash comparator.

6.0 INPUTS AND DATA FORMS

a. Annunciator Response Procedures
b. Annunciator Administrative Procedures
c. Completed Task Reports for:
    1. System Function and Task Analysis
    2. Labels and Location Aids
    3. Maintainability
d. Criteria List (Appendix A)
e. The following from Appendix B:
    1. Measurements Data Forms
    2. Questionnaire
    3. Observations Checklist
    4. Documentation Review Checklist
    5. Analysis Aids
    6. HED Report Forms
f. Criteria Matrix (Appendix C)
g. Task Plan Critique Form (Appendix D)

7.0 OUTPUTS AND RESULTS

a. Completed HEDs
b. Completed Task Report.

8.0 FIGURES AND TABLES

None.

9.0 PROCEDURE EXCEPTIONS

The following exceptions, deviations, and changes were made to these procedures during conduct of the task (include a statement of justification on each item):

APPENDIX A
CRITERIA

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.1.1 GENERAL SYSTEM DESIGN

Annunciator warning systems are the primary control room interface to immediately alert the operator to out-of-tolerance changes in plant condition. Annunciator warning systems consist of three major subsystems: (a) an auditory alert subsystem, (b) a visual alarm subystem, and (c) an operator response subsystem (see Exhibit 6.3-1). Together, these three subsystems should be designed to provide a preferred operational sequence for annunciator warnings as indicated in Exhibit 6.3.2

6.3.1.2 ALARM PARAMETER SELECTION

a. SET POINTS — The limits or set points for initiating the annunciator warning system should be established to meet the following goals:

(1) Alarms should not occur so frequently as to be considered a nuisance by the operators.

(2) However, set points should be established to give operators adequate time to respond to the warning condition before a serious problem develops.

b. GENERAL ALARMS —

(1) Alarms that require the control room operator to direct an auxiliary operator to a given plant location for specific information should be avoided.

(2) If general alarms must be used, they should only be used for conditions that allow adequate time for auxiliary operator action and subsequent control room operator action.

N/A	YES	NO	COMMENTS

6.3.1.2 (Cont'd)

c. MULTICHANNEL OR SHARED ALARMS —

(1) Annunciators with inputs from more than one plant parameter set point should be avoided. Multi-input alarms that summarize single-input annunciators elsewhere in the control room are an exception.

(2) Where multi-input annunciators must be used, an alarm printout capability should be provided. The specifics of the alarm should be printed on an alarm typer with sufficient speed and buffer storage to capture all alarm data.

(3) A reflash capability should be provided to allow subsequent alarms to activate the auditory alert mechanism and reflash the visual tile even though the first alarm may not have been cleared.

d. MULTI-UNIT ALARMS —

(1) Alarms for any shared plant systems should be duplicated in all control rooms.

(2) When an item of shared equipment is being operated from one control room a status display or signal should be provided in all other control rooms which could potentially control this equipment.

6.3.1.3 FIRST OUT ANNUNCIATORS

a. REACTOR SYSTEM —

(1) A separate first out panel should be provided for the reactor system.

N/A	YES	NO	COMMENTS

6.3.1.3a (Cont'd)

(2) The first out panel should consist of separate annunciator tiles for each of the automatic reactor trip functions.

(3) In the event of a reactor trip, the tile associated with the event should illuminate, and no other.

b. TURBINE-GENERATOR SYSTEM — A separate first out panel, similar in function to the reactor system panel, is recommended.

c. POSITION — First out panels should be located directly above the main control work station for the system.

d. APPLICATION — First out annunciators should conform to the general auditory, visual, and operator response guidelines of this section.

6.3.1.4 PRIORITIZATION

A. LEVELS OF PRIORITY —

(1) Prioritization should be accomplished using a relatively small (2-4) number of priority levels.

(2) Prioritization should be based on a continuum of importance, severity, or need for operator action in one or more dimensions, e.g., likelihood of reactor trip, release of radiation. Exhibit 6.3-3 provides an example of prioritization based on three levels of prioritization..

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.1.4 (Cont'd)

b. PRIORITY CODING —

(1) Some method for coding the visual signals for the various priority levels should be employed. Acceptable methods for priority coding include color, position, shape, or symbolic coding.

(2) Auditory signal coding for priority level is also appropriate. See Guideline 6.2.2.3 for recommended coding techniques.

6.3.1.5 CLEARED ALARMS

a. AUDITORY SIGNAL — Cleared alarms should have a dedicated, distinctive audible signal which should be of finite duration.

b. VISUAL SIGNAL — The individual tile should have one of the following:

(1) A special flash rate (twice or one-half the normal flash rate is preferred, to allow discrimination), or

(2) Reduced brightness, or

(3) A special color, consistent with the overall control room color coding scheme, produced by a differently colored bulb behind the tile.

6.3.2.1 SIGNAL DETECTION

a. INTENSITY — The signal should be such that operators can reliably discern the signal above the ambient control room noise. A nominal value of 10 dB(A) above average ambient noise is generally adequate.

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.2.1 (Cont'd)

b. CONTROL — Signal intensity, if adjustable, should be controlled by administrative procedure.

c. LIMITS — The signal should capture the operator's attention but should not cause irritation or a startled reaction.

d. DETECTION — Each auditory signal should be adjusted to result in approximately equal detection levels at normal operator work stations in the primary operating area.

e. RESET — The annunciator auditory alert mechanism should automatically reset when it has been silenced.

f. IDENTIFICATION — The operator should be able to identify the work station or the system where the auditory alert signal originated. Separate auditory signals at each work station within the primary operating area are recommended.

6.3.2.2 AUDITORY CODING

a. LOCALIZATION

(1) Auditory coding techniques should be used when the operator work station associated with the alarm is not in the primary operating area.

(2) Coded signals from a single audio source should not be used to identify individual work stations within the primary operating area.

b. PRIORITIZATION — Coding may be used to indicate alarm priority. (See Guideline 6.3.1.4.)

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.3.1 VISUAL ANNUNCIATOR PANELS

a. LOCATION — Visual alarm panels should be located above the related controls and displays which are required

6.3.3.1a (Cont'd)

for corrective or diagnostic action in response to the alarm. (See Exhibit 6.3-4.)

b. LABELING—

(1) Each panel should be identified by a label above the panel.

(2) Panel identification label height should be consistent with a subtended visual angle of a least 15 minutes when viewed from a central position within the primary operating area.

6.3.3.2 VISUAL ALARM RECOG AND IDENT

a. FLASHING — The specific tile(s) on an annunciator panel should use flashing illumination to indicate an alarm condition.

b. FLASH RATE — Flash rates should be from three to five flashes per second with approximately equal on and off times.

c. FLASHER FAILURE — In case of flasher failure of an alarmed tile, the tile light should illuminate and burn steadily.

d. CONTRAST DETECTABILITY — There should be high enough contrast between alarming and steady-on tiles, and between illuminated and nonilluminated tiles, so that operators in a normally illuminated control room have no problem discriminating alarming, steady-on, and steady-off visual tiles.

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.3.2 (Cont'd)

e. "DARK" ANNUNCIATOR PANELS — A "dark" annunciator panel concept should be used. This means that under normal operating conditions no annunciators would be illuminated; all of the visual tiles of the annunciator panels would be "dark."

f. EXTENDED DURATION ILLUMINATION — If an annunciator tile must be "ON" for an extended period during normal operations (e.g., during equipment repair or replacement), it should be:

(1) Distinctively coded for positive recognition during this period, and

(2) Controlled by administravie procedures.

6.3.3.3 ARRANGEMENT OF VISUAL ALARM TILES

a. MATRIX ORGANIZATION — Visual alarms should be organized as a matrix of visual alarm tiles within each annunciator panel.

b. FUNCTIONAL GROUPING — Visual alarm tiles should be grouped by function or system within each annunciator panel. For example area radiation alarms should be grouped on one panel, not spread throughout the control room.

c. LABELING OR AXES —

(1) The vertical and horizontal axes of annunciator panels should be labeled with alphanumerics for ready coordinate designation of a particular visual tile.

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.3.3 (Cont'd)

(2) Coordinate designation is preferred on the left and top sides of the annunciator panel.

(3) Letter height for coordinate designation should be consistent with a subtended visual angle of at least 15 minutes as viewed from a central position within the primary operating area.

d. PATTERN RECOGNITION —

(1) The number of alarm tiles and the matrix density should be kept low (a maximum of 50 tiles per matrix is suggested).

(2) Tiles within an annunciator panel matrix should be grouped by subsystem, function, or other logical organization.

e. OUT-OF-SERVICE ALARMS — Cues for prompt recognition of an out-of-service annunciator should be designed into the system.

f. BLANK TILES — Blank or unused annunciator tiles should not be illuminated (except during annunciator testing)

6.3.3.4 VISUAL TILE LEGENDS

a. UNAMBIGUOUS — Annunciator visual tile legends should be specific and unambiguous. Wording should be in concise, short messages.

b. SINGULARITY — Alarms which refer the operator to another, more detailed annunciator panel located outside the primary operating area should be minimized.

N/A	YES	NO	COMMENTS

6.3.3.4 (Cont'd)

c. SPECIFICITY — Tile legends should address specific conditions; for example, do not use one alarm for HIGH-LOW, TEMPERATURE-PRESSURE.

6.3.3.5 VISUAL TILE READABILITY

a. DISTANCE — The operator should be able to read all the annunciator tiles from the position at the work station where the annunciator acknowledge control is located.

(1) Letter height should subtend a minimum visual angle of 15 minutes, or .004 x viewing distance. The preferred visual angle is 20 minutes, or .006 x viewing distance.

(2) Letter height should be identical for all tiles, based on the maximum viewing distance. Separate calculations should be made for stand-up and sit-down work stations.

b. TYPE STYLE — The size and style of lettering should meet the following:

(1) Type styles should be simple.

(2) Type styles should be consistent on all visual tiles.

(3) Only upper-case type should be used on visual tiles.

c. LEGEND CONTRAST — Legends should provide high contrast with the tile background.

(1) Legends should be engraved.

(2) Legends should be dark lettering on a light background.

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.3.5 (Cont'd)

d. LETTER DIMENSIONS AND SPACING —

(1) Stroke-width-to-character-height ratio should be between 1:6 and 1:8.

(2) Letter width-to-height ratio should be between 1:1 and 3:5.

(3) Numeral width-to-height ratio should be 3:5.

(4) Minimum space between characters should be one stroke width.

(5) Minimum space between words should be the width of one character.

(6) Minimum space between lines should be one-half the character height.

6.3.4.1 CONTROLS (See Exhibit 6.3-5.)

a. SILENCE —

(1) Each set of operator response controls should include a silence control.

(2) It should be possible to silence an auditory alert signal from any set of annunciator response controls in the primary operting area.

b. ACKNOWLEDGE

(1) A control should be provided to terminate the flashing of a visual tile and have it continue at steady illumination until the alarm is cleared.

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.4.1 (Cont'd)

(2) Acknowledgement should be possible only at the work station where the alarm originated.

c. RESET

(1) If an automatic cleared alarm feature is not provided, a control should be provided to reset the system after an alarm has cleared.

(2) The reset control should silence any audible signal indicating clearance and should extinguish tile illumination.

(3) The reset control should be effective only at the work station for the annunciator panel where the alarm initiated.

d. TEST

(1) A control to test the auditory signal and flashing illumination of all tiles in a panel should be provided.

(2) Periodic testing of annunciators should be required and controlled by administrative procedure.

6.3.4.2 CONTROL SET DESIGN

a. POSITIONING OF REPETITIVE GROUPS — Repetitive groups of annunciator controls should have the same arrangement and relative location at different work stations. This is to facilitate "blind" reaching.

b. CONTROL CODING — Annunciator response controls should be coded for easy recognition using techniques such as:

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.3.4.2b. (Cont'd)

(1) Color coding;

(2) color shading the group of annunciator controls;

(3) demarcating the group of annunciator controls; or

(4) shape coding, particularly the silence control. (See Exhibit 6.3-5, Example 2.)

c. NONDEFEATABLE CONTROLS — Annunciator control designs should not allow the operator to defeat the control. For example, some pushbuttons used for annunciator silencing and acknowledgement can be held down by inserting a coin in the ring around the pushbutton. This undesirable design feature should be eliminated.

6.3.4.3 ANNNUCIATOR RESPONSE PROCEDURES

a. AVAILABILITY — Annunciator response procedures should be available in the control room.

b. INDEXING — Annunciator response procedures should be indexed by panel indentification and annunciator tile coordinates.

6.5.1.6 COLOR CODING

a. REDUNDANCY — In all applications of color coding, color should provide redundant information. That is, the pertinent information should be available from some other cue in addition to color.

N/A	YES	NO	COMMENTS

6.5.1.6 (Cont'd)

b. NUMBER OF COLORS —

(1) The number of colors used for coding should be kept to the minimum needed for providing sufficient information.

(2) The number of colors used for coding should not exceed 11.

c. MEANING OF COLORS —

(1) The meaning attached to a particular color should be narrowly defined.

(2) Red, green, and amber (yellow) should be reserved for the following uses:
Red: unsafe, danger, immediate operator action required, or an indication that a critical parameter is out of tolarance.
Green: safe, no operator action required, or an indication that a parameter is within tolerance.
Amber (yellow): hazard (potentially unsafe), caution, attention required, or an indication that a marginal value or parameter exists.

d. PRINCIPLES OF COLOR SELECTION

(1) The primary principle which should be applied in selecting colors for coding purposes which do not have the immediate safety implications of red, green, and amber is to ensure that each color is recognized as different from any other. Exhibit 6.5-7 lists 22 colors of maximum contrast. Each successive color has been selected so that it will contrast maximally with the color just preceding it and satisfactorily

APPENDIX A
CRITERIA

N/A	YES	NO	COMMENTS

6.5.1.6d(1) (Cont'd)

with earlier colors in the list. The first 9 colors have been selected so as to yield satisfactory contrast for red-green-deficient as well as color-normal observers. The remaining 13 colors are useful only for color-normal observers.

(2) Colors selected for coding should contrast well with the background on which they appear.

(3) Ambient lighting in the area in which color coding is used will

6.6.6.2d(3) (Continued)

influence the apparent color of the coded element (especially for surface colors). Each color selected for coding should be evaluated under all illumination conditions under which it is used.

6.6.6.2 DEMARCATION

a. USE — Lines of demarcation can be used to:

(1) Enclose functionally related displays.

(2) Enclose functionally related controls

(3) Group related controls and displays.

b. CONTRAST — Lines of demarcation should be visually distinctive from the panel background.

c. PERMANENCE — Lines of demarcation should be permanently attached.

APPENDIX A
CRITERIA

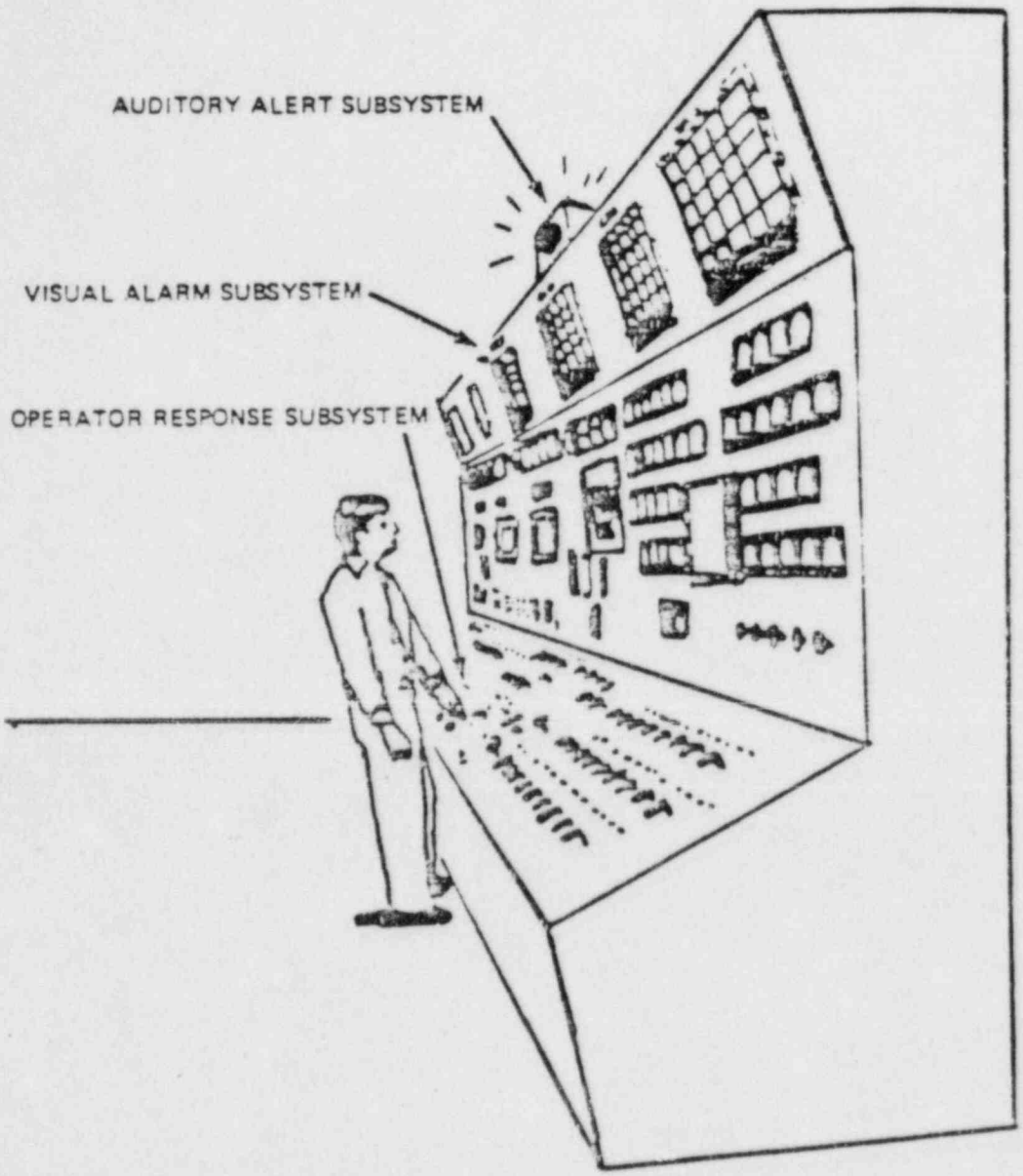

Exhibit 8.3-1. Annunciator warning system.

APPENDIX A
CRITERIA

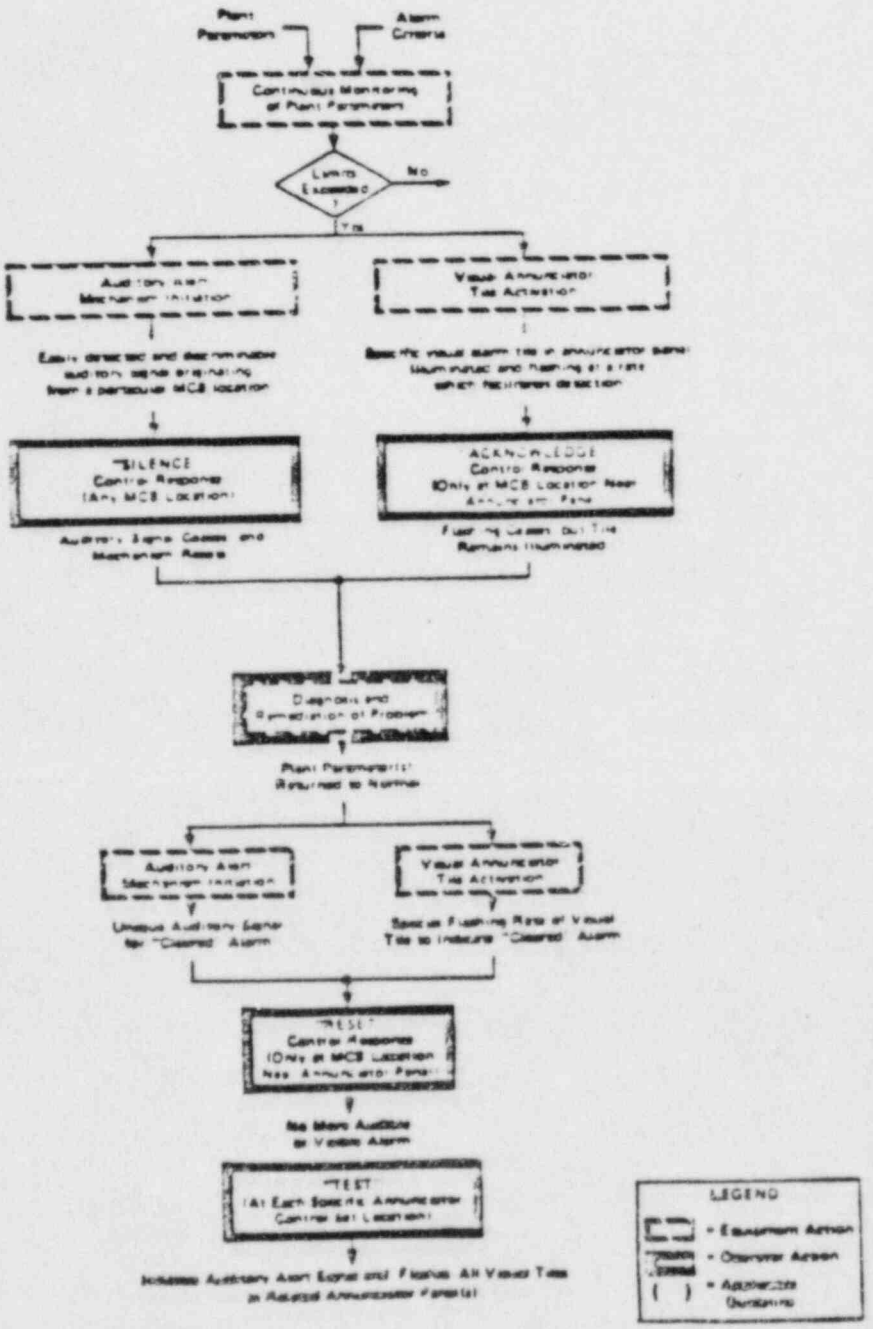

Exhibit 6.3-2. Annunciator system preferred operational sequence.

APPENDIX A
CRITERIA

FIRST PRIORITY ALARMS

- Plant shut down (reactor trip, turbine trip)
- Radiation release
- Plant conditions which, if not corrected immediately, will result in automatic plant shutdown or radiation release, or will require manual plant shutdown.

SECOND PRIORITY ALARMS

- Technical specification violations which if not corrected will require plant shutdown
- Plant conditions which, if not corrected, may lead to plant shut down or radiation releases

THIRD PRIORITY ALARMS

- Plant conditions representing problems (e.g., system degradation) which affect plant operability but which should not lead to plant shutdown, radiation release, or violation of technical specifications

Exhibit 6.3.3. Three-level annunciator prioritization example.

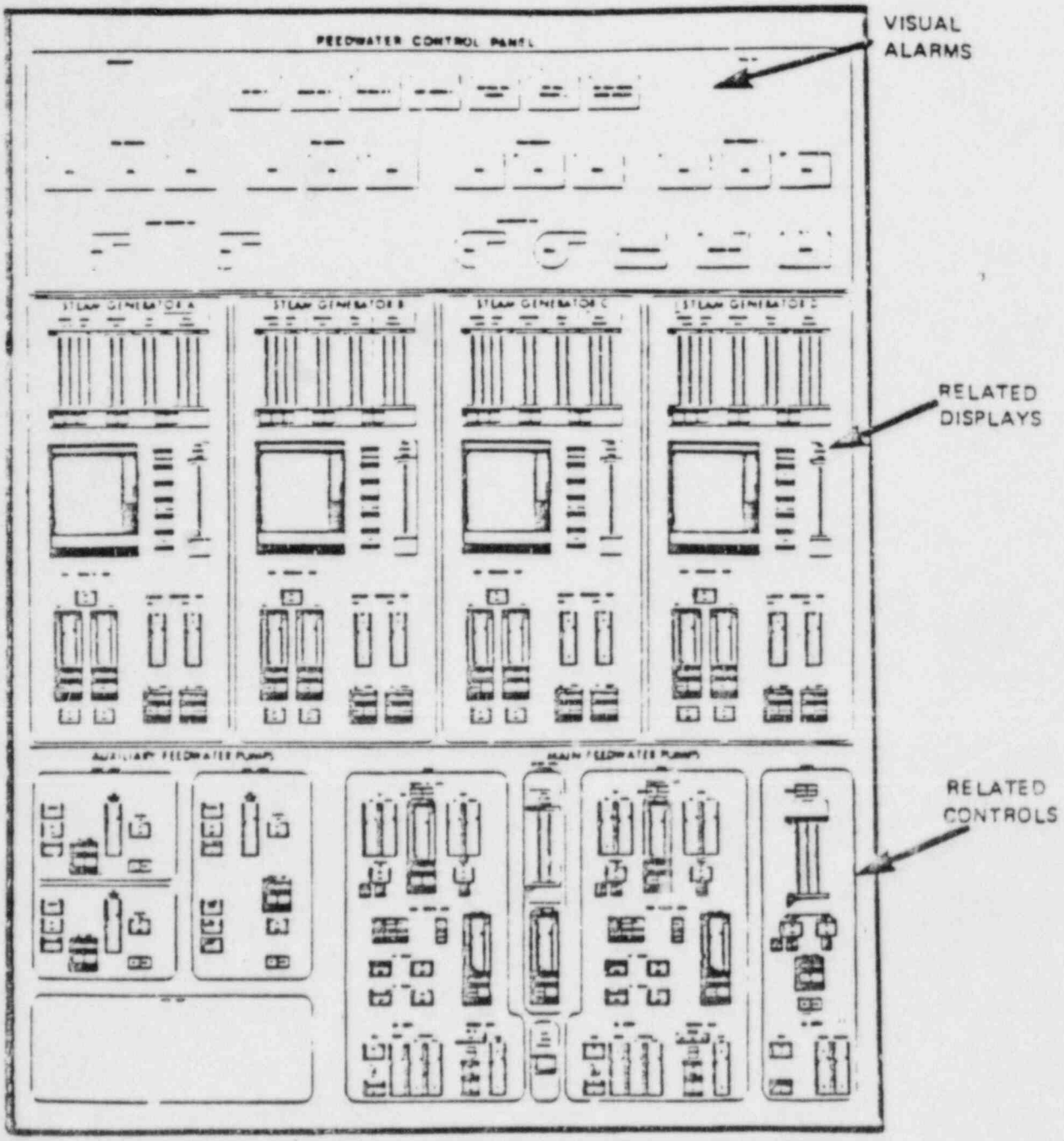

Exhibit 8.3-4. Visual alarms located above the related controls and displays. (From Seminara et al., 1979).

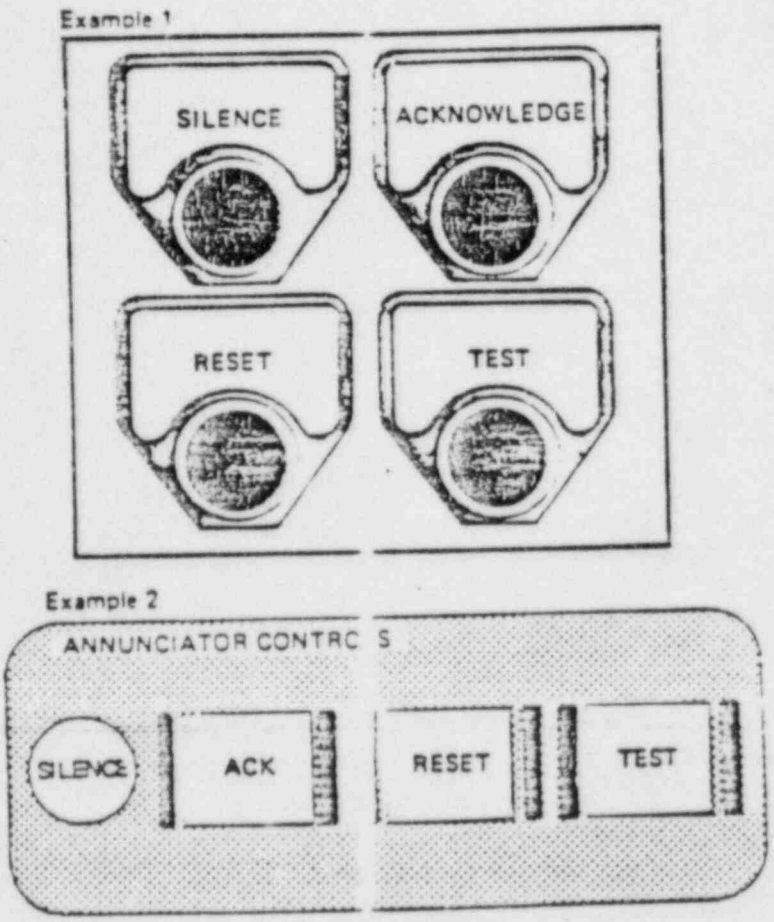

Exhibit 6.3-5. Annunciator response controls.

APPENDIX A
CRITERIA

Color Serial or selection number	General color name	ISCC-NBS centroid number	ISCC-NBS color-name (abbreviation)	Munsell renotation of ISCC-NBS Centroid Color
1	white	263	white	2.5PB 9.5/0.2
2	black	267	black	N 0.8/
3	yellow	82	v.Y	3.3Y 8.0/14.3
4	purple	218	s.P	8.5P 4.3/9.2
5	orange	48	v.O	4.1YR 6.5/15.0
6	light blue	180	v.l.B	2.7PB 7.9/6.0
7	red	11	v.R	5.0R 3.9/15.4
8	buff	90	gy.Y	4.4Y 7.2/3.8
9	gray	265	med Gy	3.3GY 5.4/0.1
10	green	139	v.G	3.2G 4.9/11.1
11	purplish pink	247	s.pPk	5.6RP 6.8/9.0
12	blue	178	s.B	2.9PB 4.1/10.4
13	yellowish pink	26	s.yPk	8.4R 7.0/9.5
14	violet	207	s.V	0.2P 3.7/10.1
15	orange yellow	66	v.OY	8.6YR 7.3/15.2
16	purplish red	255	s.pR	7.3RP 4.4/11.4
17	greenish yellow	97	v.gY	9.1Y 8.2/12.0
18	reddish brown	40	s.rBr	0.3YR 3.1/9.9
19	yellow green	115	v.YG	5.4GY 6.8/11.2
20	yellowish brown	75	deep yBr	8.8YR 3.1/5.0
21	reddish orange	34	v.rO	9.8R 5.4/14.5
22	olive green	126	d.OlG	8.0GY 2.2/3.6

Exhibit 6.5-7. Twenty-two colors of maximum contrast (from Kelly, 1965).

APPENDIX B
DATA FORMS

TABLE OF CONTENTS

APPENDIX B
DATA FORMS

ANNUNCIATOR SYSTEM

APPENDIX B1.1
MEASUREMENTS DATA

1. LINEAR MEASUREMENTS (LABELING)

1.1 Annunciator Light Box (ALB) Summary Labels - 6.3.3.1b(2).

a. If there are no summary labels, check here: _____

b. If there are summary labels, measure and record in Table 1.1b the following information:

ITEM NO.	ITEM DESCRIPTION
1)	Character height
2)	Character width and/or numeral width
3)	Character strokewidth
4)	Character spacing
5)	Word spacing
6)	Line spacing

TABLE 1.1b

Item	ALB-___	ALB-___	ALB-___	ALB-___	ALB-___	ALB-___
1.						
2.						
3.						
4.						
5.						
6.						

APPENDIX B1.1
MEASUREMENTS DATA

1.2 Tile Labeling - 6.3 1) and a(2), and 6.3.5.5d(1) through d(6).

a. Measure and record in Table 1.2a the character height(s) used in the tiles. If more than one size character is used, record the height for all of the represented heights. Also measure and record the farthest left and farthest right tile from its associated acknowledge station for each of the represented character heights (start at the left most acknowledge station and number the stations going clockwise around the MCB).

TABLE 1.2a

	Sta 1		Sta 2		Sta 3		Sta 4		Sta 5	
Char Ht	Lt	Rt	Lt	RT	Lt	Rt	Lt	Rt	Lt	Rt
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___
___	___	___	___	___	___	___	___	___	___	___

APPENDIX B1.1
MEASUREMENTS DATA

1.2 (Cont.)

b. For each akcnowledge station in the table above, measure and record in Table 1.2b the height from the floor for the farthest left and farthest right tile from this same table.

TABLE 1.2b

	Tile Height from Floor				
Char Hgt	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5
____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____
____	_____	_____	_____	_____	_____

APPENDIX B1.1
MEASUREMENTS DATA

1.2 (Cont.)

c. Measure and record the following for each of the different character heights from a, above:

TABLE 1.2c

	Ht (ref)	Char/Num Width	Stroke Width	Char Spacing	Word Spacing	Line Spacing
1.						
2.						
3.						
4.						
5.						
6.						

1.3 Data Reduction and Analysis.

For data reduction and analysis, obtain the appropriate analysis aids from Appendix B5 (ref. B5.1).

ANNUNCIATOR SYSTEM

APPENDIX B1.2
MEASUREMENTS DATA

2. SOUND MEASUREMENTS (AUDIBLE SIGNALS)

2.1 Annunciator Audible Alarms - 6.3.2.1a.

Measure the sound level in dB(A) for each annunciator audible alarm at each of the following operator positions:

TABLE 2

	MCB						
	Safety Systems						
Alarm Loc	Pos 1	Pos 2	Reac Cont	Turb Gen	Elec Dist	Rad Mon Console	Op's Desk
1.							
2.							
3.							
4.							
5.							

2.2 Data Reduction and Analysis.

For data reduction and analysis, obtain the appropriate analysis aids from Appendix B5 (ref. B5.2).

APPENDIX B1.3
MEASUREMENTS DATA

3. LIGHT MEASUREMENTS (TILE FLASH CHARACTERISTICS) - 6.3.5b(1) and 6.3.3.2b

3.1 Using the Flash Comparator, measure the flash rate of tiles in alarm and in clear. Record the rates.

Alarm Flash Rate: _____

Cleared Flash Rate: _____

3.2 Using the Flash Comparator, measure the on-off ratio for the alrarm flash rate and cleared flash rate.

On-Off Ratio (Alarm): _____

On-Off Ratio (Cleared): _____

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

INSTRUCTIONS

1. The following are questions concerning the general layout, functional organization, and operational considerations in your 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 ask the monitor for clarification.

4. Please answer all of the questions as completely as possible.

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

6. Take as much time as you need to complete the questionnaire.

7. All of your answers and your biographical information will be kept in the strictest confidence and will be used to aid in the performance of the detailed control room design review.

PLEASE BEGIN

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

BIOGRAPHICAL DATA:

Name: _____ Age: _____

Sex: _____ Height: _____ Weight: _____

Current Position/Title: _____

1. Do you have a current reactor operator's license? YES _____ NO _____

2. Amount of licensed experience at this plant: _____

3. Total amount licensed experience: _____

4. Related experience and amount (example: operator-trainee, Hodge NPP Unit 1, 1 yr.):

5. Education:

   a. Highest level attained: _____

   b. Specialized Schools or courses (list):

6. Military experience:

ANNUNCIATOR SYSTEM

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

1. Do you have a first out annunciator panel where only the tile associated with the reactor trip event illuminates and all subsequent alarms on that panel are "locked out"? YES NO

2. Do you know of any automatic reactor trip functions that do not have a separate annunciator tile on the first out panel (either missing or shared with other functions)? YES NO

3. Are the annunciator panels in the control room identified by a label above each panel? YES NO

4. From your primary operating area, can you read all annunciator panel labels with a minimum of effort? YES NO

5. Is the annunciator system priority coded by color, position, shape, or symbolic coding of the tiles? YES NO

6. If color coding is used, are there more than eleven colors used for coding the panels? YES NO

7. If color coding is used, is the meaning redundant, as an example, if priority coding uses color, does it also use tile position? YES NO

ANNUNCIATOR SYSTEM

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

13. Are auditory signals priority coded by pulse, frequency change (warbling), intensity, or different frequencies for different signals? YES NO

14. If you have separate alarm horns, can you easily identify the work station or system where the auditory signal originated? YES NO

15. Do you have different alarm horns for work areas not at the main control board? YES NO

16. If the auditory alarm signal has only one source, is the sound coded to direct you to different work areas? YES NO

17. Do any of the alarm horns startle or irritate you? YES NO

18. If you have different alarm horns, do any of them sound too loud or too soft in comparison to the others at your normal work station? YES NO

19. Do you have a silence control with each set of response controls in your primary operating are? YES NO

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

8. Is there only one meaning attached to each color used for coding the tiles? YES NO

9. Are all meanings attached to any color coded tiles standard to those color meanings throughout your control room? YES NO

10. For color coded tiles is:

a. red always used for unsafe, danger, immediate operator action required, or as an indication that a critical parameter is out of tolerance? YES NO

b. green always used for safe, no operator action required, or as an indication that a parameter is within tolerance? YES NO

c. amber (yellow always used for hazard (potentially unsafe), caution, attention required, or as an indication that a marginal value or parameter exists? YES NO

11. Do you know of any unnecssary color coding on the annunciator tiles or panels? YES NO

12. For colors used in tile coding, are any difficult to tell apart? YES NO

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

20.	Is a control provided which terminates a flashing visual tile, but allows a steady illumination until the alarm is cleared?	YES	NO
21.	Can you acknowledge an alarm from more than one response control area?	YES	NO
22.	If cleared alarms do not reset automatically, do you have a control to reset them yourself?	YES	NO
23.	Does the reset control silence the auditory signal as well as extinguish the illumination?	YES	NO
24.	Does the reset control operate from more than one response control area?	YES	NO
25.	Can you defeat any of the annunciator controls, such as locking out the audible alarm or locking down the acknowledge control?	YES	NO
26.	Can you test the auditory and flashing illumination signals of all tiles for each panel?	YES	NO

ANNUNCIATOR SYSTEM

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

27. Is there an administrative procedure that controls the periodic testing of all annunciators? YES NO

28. Are all tiles dark on annunciator panels when no alarm is indicated? YES NO

29. Can you easily tell if a tile is normally on for an extended duration during normal operating conditions? YES NO

30. Are you immediately aware if an annunciator tile is out of service? YES NO

31. Can you immediately determine when the flasher of an alarm tile fails? YES NO

32. Do you know of any alarms that occur so frequently that you consider them a nuisance? YES NO

33. Do you know of any alarms that do not give you ample time to respond to a warning condition? YES NO

ANNUNCIATOR SYSTEM

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

34.	When responding to an alarm tile, can you readily locate the controls and displays required for corrective or diagnostic action?	YES	NO
35.	Do you have access to annunciator response procedures in the control room?	YES	NO
36.	Do you know of any alarms which require you to obtain additional information from a source outside the control room area?	YES	NO
37.	Are there too many alarms which require additional information from panels outside your operating area?	YES	NO
38.	If alarms are used that require information outside the control room, do they allow you ample time to respond?	YES	NO
39.	Are alarms provided for shared equipment in all control rooms?	YES	NO
40.	Is there a status display or signal provided for shared equipment in all control rooms which indicates that the equipment is currently being operated?	YES	NO

APPENDIX B2
OPERATOR INTERVIEW/QUESTIONNAIRE

41. Do you have any tiles with dual messages such as HIGH-LOW? YES NO

42. Does the multi-input alarm have a reflash capability that reflashes the visual tile after an auditory alert even if the first alarm has not been cleared? YES NO

43. Do multi-input annunciators provide you with an alarm printout? YES NO

44. Does the multi-input alarm typer have sufficient speed to print the alarm data fast enough for your needs? YES NO

45. Does the alarm typer ever skip or loose information, or garble (mix up) the printing? YES NO

APPENDIX B3
OBSERVATIONS CHECKLIST

INSTRUCTIONS

1. Using the attached checklist, make all the noted observations.
2. Record all necessary information in the comments column to justify an N/A check and to detail a NO check.
3. Ensure that all comments for NO checks include component, instrument, panel, equipment, etc., identification and location information.
4. Initiate HED reports on all NO checks per the directions contained in the checklist analysis aids.

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
1. A separate first out panel should be provided for the reactor system - 6.3.1.3a(1).				
2. A separate first out panel is recommended for the turbine-generator system that is functionally similar to the reactor system panel - 6.3.1.3b.				
3. First out panels should be located above their main work stations - 6.3.1.3c.				
4. All first out panels should conform to the general auditory and visual items in the rest of this checklist - 6.3.1.3d.				
5. A small number (2-4) of levels of priority coding are used - 6.3.1.4a(1).				
6. Priority coding of color, position, shape, or symbol is used for visual signals - 6.3.1.4b(1).				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
7. Any color used on tiles are on ALB panels should contrast with the control board color - 6.5.1.6e(1)				
8. Any color used for tile coding should be recognizable from all other tile code colors for all illumination conditions - 6.5.1.6e(3).				
9. Auditory signal priority coding may be used - 6.3.1.4b(2).				
10. If more than one, each auditory signal should sound at approximately equal loudness at normal work stations in the primary operating area - 6.3.2.1d.				
11. An auditory signal should capture the operator's attention but should not irritate or cause a startled reaction - 6.3.2.1c.				
12. Separate auditory signals at each work station within the primary operating area are recommended - 6.3.2.1f.				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
13. The operator should be able to identify the work station or area where the auditory alert originated - 6.3.2.1f.				
14. The auditory signal should automatically reset when silenced - 6.3.2.1e.				
15. When an alarm clears (or is cleared) there should be a dedicated, distinct audible signal with a finite duration - 6.3.1.5a.				
16. Auditory alert signal(s), if adjustable, should be controlled by administrative procedure - 6.3.2.1b.				
17. The specific title(s) in an ALB should visually flash to indicate an alarm condition - 6.3.3.2a.				
18. In case of flasher failure, an alarming tile should illuminate and burn steadily - 6.3.3.2c.				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
19. Contrast between tiles should present no problem discriminating between alarming, steady-on, and steady-off conditions - 6.3.3.2d.				
20. Under normal (nonalarmed) conditions no annunciator tiles should be illuminated - 6.3.3.2e.				
21. If a tile must be on for an extended period during normal operations it should be distinctively coded for positive recognition during this period (see also 6.3.3.2f(2), item 2c on the Document Review Checklist) - 6.3.3.2f(1).				
22. Cleared tiles should have either a special flash rate, a reduced brightness, or a special color - 6.3.1.5b(1) through b(3).				
23. All tiles associated with a given acknowledge control should be readable when operating that control - 6.3.3.5a.				
24. Character style on all tiles should be simple - 6.3.3.5b(1).				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
25. Character style should be consistent on all tiles - 6.3.3.5b(2).				
26. Character style should be uppercase on all tiles - 6.3.3.5b(3).				
27. Tile legends should have high contrast with the tile background - 6.3.3.5c.				
28. Tile legends should be engraved - 6.3.3.5c(1).				
29. Tile legends should be dark and opaque on a light and translucent background - 6.3.3.5c(2).				
30. Tile legends should be specific, unambiguous, concise, and short - 6.3.3.4a.				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
31. Tile legends should address specific conditions, HIGH TEMP, or LOW PRESS, not HIGH-LOW TEMP-PRESS - 6.3.3.4c.				
32. Tiles should be organized as a matrix within each ALB - 6.3.3.3a.				
33. The vertical and horizontal axes of the ALBs should be alpha-numerically labeled for tile designation coordinates - 6.3.3.3c(1).				
34. Coordinate designators are preferred at the left and top sides of the ALBs.				
35. Character height for the coordinate labels should be the same height as those used in tile legends - 6.3.3.3c(3).				
36. The number of tiles in an ALB should be kept low, with a maximum of 50 tiles per ALB suggested - 6.3.3.3d(1).				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
37. Cues for prompt recognition of an out-of-service annunciator should be designed into the system - 6.3.3.3e.				
38. Blank or unused tiles should not be illuminated except during annunciator testing - 6.3.3.3f.				
39. Demarcation lines may be used to enclose functionally related titles - 6.6.6.2a(1).				
40. Demarcation lines may be used to group tiles with their related controls and/or displays - 6.6.6.2a(1) through a(3).				
41. If used, demarcation lines should be visually distinctive from the panel background - 6.6.6.2b.				
42. If used, demarcation lines should be permanently attached - 6.6.6.2c.				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
43. ALBs should be located above the controls and displays required for corrective or diagnostic action when they alarm - 6.3.3.1a.				
44. Each ALB should be identified by a label directly above it - 6.3.3.1b(1).				
45. Each set of annunciator controls should include a silence control - 6.3.4.1a(1).				
45. An acknowledge control should be provided that terminates the flashing and causes the tile to continuously illuminate until it has cleared - 6.3.4.1b(1).				
47. If an automatic cleared alarm feature is not provided, a control should be provided to reset the system after an alarm has cleared - 6.3.4.1c(1).				
48. A control to test the auditory alarm and the flashing illumination of all tiles in a panel (i.e., in one or more ALBs) should be provided - 6.3.4.1d(1).				

APPENDIX B3
OBSERVATIONS CHECKLIST

	N/A	YES	NO	COMMENTS
49. Repetitive groups of annunciator controls should have the same arrangement and relative location at different work stations - 6.3.4.2a.				
50. Annunciator controls should be coded differently than other panel controls either by color, demarcation, or shape - 6.3.4.2b(1) through b(4).				
51. Shape coding is preferred for the silence control - 6.3.4.2b(4).				
52. Annunciator control designs should not allow the operator to defeat the control operation such as inserting a coin into a control guard ring - 6.3.4.2c.				
53. Annunciator response procedures should be available in the control room - 6.3.4.3a.				

APPENDIX B4
DOCUMENTATION REVIEW CHECKLIST

INSTRUCTIONS

Collect the following documents and review themn for the information contained in the attached checklist:

1. Administrative Procedures concerning annunciators
2. Annunciator Response Procedures
3. Results from the following task reports:
   a. Convention Survey
   b. System Function Task Analysis
   c. Labeling Survey
4. Ensure that all comments for NO checks include component, instrument, panel, equipment, etc., identification and location information.
5. Intitiate HED reports on all NO checks per the directions contained in the checklist analysis aids.

APPENDIX B4
DOCUMENTATION REVIEW CHECKLIST

	N/A	YES	NO	COMMENTS
1. ANNUNCIATOR RESPONSE PROCEDURES				
a. Response procedures should be indexed by panel I.D. and tile coordinates - 6.3.4.3b				
b. Annunciators with inputs from more than one plant parameter set point should be avoided (multi-input alarms that summarize single-input alarms elsewhere in the control room are an exception) - 6.3.1.2c(1)				
2. PLANT ADMINISTRATIVE PROCEDURES				
a. Periodic testing of annunciators should be required and controlled by administrative procedures - 6.3.4.1d(2).				
b. If audible alarm intensity is operator-adjustable, it should be controlled by administrative procedures - 6.3.2.1b.				
c. When annunciator tiles must be on for an extended period during normal operations, it should be controlled by administrative procedures (see also 6.3.3.2f(1), item 19 on the Observations Checklist) - 6.3.3.2f(2).				

APPENDIX B4
DOCUMENTATION REVIEW CHECKLIST

3. SFTA REVIEW REPORT	N/A	YES	NO	COMMENTS
a. The annunciator warning system should be designed as the primary alerting interface with the operator for out-of-tolerance conditions. It should consist of three major subsystems: auditory alert, visual alarm, and operator response. These three subsystems should function to provide a prefered operational sequence for annunciator warnings - 6.3.1.1.				
b. Visual alarm tiles should be grouped by function, system, subsystem, or other logical organization within ALBs - 6.3.3.3b and d(2).				
c. Prioritization of annunciators should be based on a continum of importance, severity, or need for operator action in one or more dimensions such as, the likelihood of a reactor trip or the likelihood of a release of radiation - 6.3.1.4a(2).				
d. Tile legends should address specific conditions rather than a range of conditions and/or parameters. As an example, separate tiles should be used to indicate temperature-low, temperature-high, pressure-low, and pressure-high, rather than a single tile with the legend HIGH-LOW TEMP-PRESS - 6.3.3.4c.				
e. If used, demarcation lines enclose functionally related groups of tiles either separately or with their related controls and displays — 6.6.6.2a(1), a(2), and a(3).				

APPENDIX B5.1
MEASUREMENTS ANALYSIS

1. LINEAR MEASUREMENTS (LABELING)

1.1 ALB Summary Labels - 6.3.3.1.b(2)

a. If there are no summary labels, check N/A for criterion 6.3.3.1.b(2) in Appendix A.

b. If there are summary labels, calculate the visual angels for each label for the operator positions listed in Table 1.1b.

TABLE 1.1b

		MCB						
		Safety Systems						
	ALB Ident	Pos 1	Pos 2	Reac Cont	Turb Gen	Elec Dist	Rad Mon Console	Op's Desk
1.	_____	_____	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____	_____	_____	_____
6.	_____	_____	_____	_____	_____	_____	_____	_____
7.	_____	_____	_____	_____	_____	_____	_____	_____

Calculations (use extra sheets, as needed):

APPENDIX B5.1
MEASUREMENTS ANALYSIS

c. If all visual angles in Table 1.1b are 15 minutes of arc or greater, check YES for criterion 6.3.3.1b(2) in Appendix A.

d. If there are visual angles in Table 1.1b less than 15 minutes or arc, record on an HED report form the position(s) and label(s) where this is so. Include the code number TP-3.1B5.1.1 in data collection description. For criterion 6.3.3.1b(2) in Appendix A, check the NO column and record the HED report number and the code number, TP-3.1B5.1.1. in the COMMENTS column.

1.2 Tile Labels - 6.3.3.51(1) and d(1) through d(6).

a. Calculate the visual angles for each character height at its farthest left and farthest right location for each work station in Table 1.2a; below.

TABLE 1.2a

ALB NO/ Char Ht	Sta 1		Sta 2		Sta 3		Sta 4		Sta 5	
	Lt	Rt	Lt	RT	Lt	Rt	Lt	Rt	Lt	Rt
____	____	____	____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____	____	____	____
____	____	____	____	____	____	____	____	____	____	____

Calculations (use extra sheets, as required):

APPENDIX B5.1
MEASUREMENTS ANALYSIS

b. If all visual angles in Table 1.2a are 15 minutes of arc or greater, check YES for criterion 6.3.3.5a(1) in Appendix A.

c. If any visual angles in Table 1.2a are less than 15 minutes of arc, record on an HED report form the position(s) and tile legend(s) where this is so. Include the code number TP-3.1B5.1.2 in the data collection description. For criterion 6.3.3.5a(1) in Appendix A, check the NO column and record the HED report number and the code number, TP-3.1B5.1.2, in the COMMENTS column.

d. Compare the character dimensions and legend measurements for each character height recorded with criteria 6.3.3.5d(1) through d(6).

e. If all character heights and legends meet the criteria, check the YES column for these criteria in Appendix A.

f. If all character dimensions or legend measurements fail to meet the criteria, record on an HED report from the tile coordinates, character height implicated, and a description of the failure. Include the code number TP-3.1B5.1.2 in the data collection description. For criteria 6.3.3.5d(1) through d(6) in Appendix A, check the NO column and record the HED report number and the code number TP-3.1B5.1.2, in the COMMENTS column.

APPENDIX B5.2
MEASUREMENTS ANALYSIS

2. SOUND MEASUREMENTS (AUDIBLE SIGNALS)

2.1 Annunciator Audible Alarms - 6.3.2.1a.

a. Obtain the average ambient noise level in db(A) from the Ambient Noise Survey Task Report (TR-1.6) and record below:

Average noise level: _____ db(A)

b. Based upon the below adjustment factors, reduce each measured annunciator alarm level and record in Table 2.1b.

Absolute Difference Between Measured Level (Lm) And Average Noise Level (Ln)	Subtract This Amount From Measured Level (Lm) And and record in Table 2.1b
4	2.2
5	1.7
6	1.3
7	1.0
8	.8
9	.6
10	.4
11	.3
12	.3
13	.2
14	.2
15	.1

TABLE 2.1b

		MCB						
	Alarm Loc	Safety Systems Pos 1	Safety Systems Pos 2	Reac Cont	Turb Gen	Elec Dist	Rad Mon Console	Op's Desk
1.	_____	_____	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____	_____	_____	_____

APPENDIX B5.2
MEASUREMENTS ANALYSIS

c. Compare all adjusted dB(A) levels in Table 2.1b to the average noise level.

d. If all adjusted audible alarm levels are at least 10 dB(A) above the average noise level check the YES column for criterion 6.3.2.1a in Appendix A.

e. If any adjusted alarm levels are less than 10 dB(A) above the average noise level, record each occurance on an HED report form. Include the code number TP3.1B5.2.1 in the data collection description. For criterion 6.3.2.1a in Appendix A, check the NO column and record the HED report number and the code number, TP3.1B5.2.1 in the COMMENTS column.

APPENDIX B5.3
MEASUREMENTS ANALYSIS

3. LIGHT MEASUREMENTS (TILE FLASH CHARACTERISTICS)

3.1 Alarmed Flash Characteristics - 6.3.3.2b.

a. From the recorded data, determine if the alarmed flash rate is between 3 to 5 flashes per second and that the on-off ratio is approximatley 1:1.

b. If both parameters meet the criteria, check the YES column for criterion 6.3.3.2b in Appendix A.

c. If either parameter fails to meet the criteria, record the discrepancy on an HED report form. Include the code number TP-3.1B5.3.1 in the data collection description. For criterion 6.3.3.2b in Appendix A check the NO column and record the HED number and the code number, TP-3.1B5.3.1, in the COMMENTS column.

3.2 Cleared Flash Rate - 6.3.1.5b(1).

a. From the recorded data, determine if the cleared flash rate is approximately double or 1/2 the alarmed flash rate.

b. If the cleared flash rate passes the criterion, check the YES column for criteria 6.3.1.5b(1) in Appendix A.

c. If the cleared flash rate fails to meet the criterion, record the discrepancy on a HED report from. Include the code number TP-3.1B5.3.2 in the data collection description. For citerion 6.3.1.5b(1) in Appendix A, check the NO column and record the HED number and the code number, TP-3.1B5.3.2, in the COMMENTS column.

APPENDIX B.6
OPERATOR INTERVIEW/QUESTIONNAIRE ANALYSIS

1. GENERAL

   a. Review all questionnaires for completeness of biographical information and question responses.

   b. Delete incomplete and unusable questionnaires from the data base. If required by contract, reschedule these questionnaires for correction/completeness.

   c. When data base assembly is complete perform the analysis, below.

2. BIOGRAPHICAL DATA

   a. Assemble biographical data and determine ranges and distributions for all relevant dimensions.

   b. Using appropriate statistics, determine the distribution (or its approximation) for this data.

3. RESPONSE DATA

   a. Summarize all responses and determine percent frequency response for each negative answer.

   b. Obtain the control copy of Appendix A - Criteria from the Conventions Task Plan (TP-8.1) for use in the next steps.

   c. For each positive answer, check the YES column for that criteria in Appendix A of this task plan. Do the same in the Conventions Task Plan Appendix A for criteria 6.5.1.6b(2) and c(2).

   d. Also add the data collection code number, TP 3.1B6n (with n the question number), in the REMARKS column of the Conventions Task Plan Appendix A.

   e. For each negative answer, initiate Preliminary HEDs (PHEDs) for discrepancy review. Record response frequency data, 0700 criteria number, and data collection code number on each PHED.

   f. The 0700 criteria numbers are contained in List 3b.

   g. For each negative answer, check the NO column and record the data collection code number and PHED number in the REMARKS column for the appropriate criteria in Appendix A of this task plan. Do the same for the Conventions Task Plan Appendix A for the criteria listed in c, above.

   h. Submit all PHEDs to your immediate supervisor.

   i. Subsequent verification, validation, and disposition of all PHEDs will be conducted per TP-10.1 (HED Review Procedure).

APPENDIX B6
OPERATOR INTEVIEW/QUESTIONNAIRE ANALYSIS

LIST 3b

1. 6.3.1.3a(3)
2. 6.3.1.3a(2)
3. 6.3.3.1b(1)
4. 6.3.3.1b(2
5. 6.3.1.4b(1)
6. 6.5.1.6b(2) & e(1)
7. 6.5.1.6a
8. 6.5.1.6c(1)
9. 6.5.1.6c(2)
10. 6.5.1.6c(2)
11. 6.5.1.6b(1)
12. 6.5.1.6e(1)
13. 6.3.1.4b(2) & 6.3.2.2b
14. 6.3.2.1f
15. 6.3.2.2a(1)
16. 6.3.2.2a(2)
17. 6.3.2.1c
18. 6.3.2.1d
19. 6.3.4.1a(1) & (2)
20. 6.3.4.1b(1)
21. 6.3.4.1b(2)
22. 6.3.4.1c(1)
23. 6.3.4.1c(2)
24. 6.3.4.1c(3)
25. 6.3.4.2c
26. 6.3.4.1d(1)
27. 6.3.4.1d(2)
28. 6.3.3.2e
29. 6.3.3.2f
30. 6.3.3.3e
31. 6.3.3.2c
32. 6.3.1.2a(1)
33. 6.3.1.2a(2)
34. 6.3.3.1a
35. 6.3.4.3a
36. 6.3.1.2b(1)
37. 6.3.3.4b
38. 6.3.1.2b(2)
39. 6.3.1.2d(1)
40. 6.3.1.2d(2)
41. 6.3.3.4c
42. 6.3.1.2c(3)
43. 6.3.1.2c(2)
44. 6.3.1.2c(2)
45. 6.3.1.2c(2)

APPENDIX B7
OBSERVATIONS ANALYSIS

1. For each checklist item checked YES, also check the YES column for that criteria in Appendix A and enter the date collection code number, TP-4.1B3.n (where n is the checklist item number) in the COMMENTS column.

2. For each checklist item checked NO, initiate an HED report. Enter the HED report number in the COMMENTS column of the checklist for that item. Include all necessary information on the HED report concerning identification of the discrepancy and the criteria (checklist item) not met.

3. Find the appropriate criterion or criteria in Appendix A from the reference number in the checklist item. Check the NO column and enter the HED number and the data collection code number in the COMMENTS column for that criterion or criteria.

APPENDIX B8
DOCUMENTATION REVIEW ANALYSIS

1. For each checklist item checked YES, also check the YES column for the appropriate criteria in Appendix A. Enter the data collection code number TP4.1B4.m (n is the checklist item number) in the COMMENTS column.

2. For each checklist item checked NO, initiate an HED report. Enter the HED report number in the COMMENTS column of the checklist for that item. Include all necessary information on the HED report concerning identification of the discrepancy and the criteria (checklist item) not met.

3. Find the appropriate criterion or criteria in Appendix A from the reference number in the checklist item. Check the NO column and enter the HED number and the data collection code number in the COMMENTS column for that criterion or criteria.

4. When reviewing task report data, do not initiate duplicate HED reports. When an HED report has already been initiated for a specific discrepancy during the conduct of another task, update that HED report with the relevant information from this task data. Also update and cross-reference the criteria lists in Appendix A of both sets of task documentation.

ANNUNCIATOR SYSTEM

APPENDIX B9
HUMAN ENGINEERING DISCREPANCY (HED) REPORT

_____
PLANT/UNIT

ORIGINATOR: _____ HED NO.: _____

VALIDATED BY: _____ DATE: _____

a) HED TITLE: _____

_____

b) ITEMS INVOLVED:

c) PROBLEM DESCRIPTION AND 0700 PARA. NUMBER:

d) DATA COLLECTION DESCRIPTION AND CODE NUMBER:

e) SPECIFIC HUMAN ERROR(s):

ANNUNCIATOR SYSTEM

APPENDIX B9
HED REPORT (CONTINUED)

HED NO.: _____

_____
PLANT/UNIT

f) SUGGESTED BACKFIT:

REVIEW AND DISPOSITION:

APPENDIX C
CRITERIA MATRIX

APPENDIX C
CRITERIA MATRIX

Criteria Distributed Across Data Collection Methods

Notes:

1. The following codes apply to the matrix columns:

   M - Measurement (instruments and/or measuring devices required)

   O - Observations (observation notes taken)

   I - Interview/Questionnaire (generally a structured interview unless otherwise specified)

   D - Document Review (documentation review to include engineering drawings, CWDs, etc.)

   A - Auditory Criteria

   V - Visual Criteria

   C - Controls Criteria (physical characteristics)

   L - Location/Arrangement

   P - General Physical

   F - Functional Criteria (usually requires some operational data for verification)

Data sources listed are suggested. Alternatives should be used when those listed are not available or are not adequate.

APPENDIX C
CRITERIA MATRIX

CRITERIA NUREG-0700 para number	Crit type	DATA COLLECTION METHODS M	O	I	D	SUGGESTED DATA SOURCES	REMARKS
6.3.1.1	F				X	SFTA Rpt	also in RP 9.0 (SFTA)
6.3.1.2 a(1)	F			X		Ops	
a(2)	F			X		Ops	
b(1)	F			X		Ops	
b(2)	F			X		Ops	
c(1)	F				X	Ann Resp Procs	
c(2)	F			X		Ops	
c(3)	F			X		Ops	
d 1)	F			X		Ops	
6.3.1.3 a(1)	PF		X			Pnl	
a(2)	PF			X		Ops	
a(3)	PF			X		Ops	
b	PF		X			Pnl	
c	PF		X			Pnl	
d	PF		N/A			All	see text para. 4.2a
6.3.1.4 a(1)	PF		X			Pnl	
a(2)	PF			X		SFTA Rpt	also in RP-9.0 (SFTA)
b(1)	F		X	X		Pnl	
b(2)	F		X			Pnl	
	F		X			Pnl	
	F	X	X			Pnl	
	F		X			Pnl	
b(3)	F		X			Pnl	
6.3.2.1 a	F	X				CR	
b	F		X		X	CR, Admin Procs	
c	F		X	X		CR, Ops	
d	F		X	X		CR, Ops	
e	F		X			CR	
f	F		X	X		CR, Ops	
6.3.2.2 a(1)	PF			X		Ops	
a(2)	F			X		Ops	
b	F			X		Ops	
6.3.3.1 a	P		X			Pnl	
b(1)	P		X			Pnl	
b(2)	P	X				CR	

APPENDIX C
CRITERIA MATRIX

CRITERIA		DATA COLLECTION METHODS				SUGGESTED	
NUREG-0700 para number	Crit type	M	O	I	D	DATA SOURCES	REMARKS
	c(1)	P	N/A				in TP-1.8 (Maint)
	c(2)	P	N/A				in TP-1.8 (Maint)
	c(3)	P	N/A				in TP-1.8 (Maint)
6.3.3.2	a	F	X			Pnl	
	b	F	X			Pnl, Comp Spec	
	c	F	X			Pnl	
	d	P	X			Pnl	
	e	PF	X	X		Pnl, Ops	
	f(1)	PF	X	X		Pnl, Ops	
	f(2)	PF			X	Admin Proces	
6.3.3.3	a	P	X			Pnl	
	b	PF			X	SFTA Rpt	also in RP-9.0 (SFTA)
	c(1)	P	X			Pnl	
	c(2)	P	X			Pnl	
	c(3)	P	X			Pnl	also in TP-6.1 (Labels)
	d(1)	P	X			Pnl	
	d(2)	PF			X	SFTA Rpt	also in TP-9.1 (SFTA)
	e	F		X		Ops	
	f	F	X			Pnl	
4	a	P	X		X	Pnl, SFTA	also in RP-9.0 (SFTA)
	b	PF		X		Ops	
	c	PF	X	X	X	Pnl, Ops, SFTA Rpt	also in RP-9.0 (SFTA)
	d	P	N/A				in TP-8.1 (Conv)
6.3.3.5	a	P	X			Pnl	
	a(1)	P	X			Pnl	
	a(2)	P	X			Pnl	
	b(1)	P	X			Pnl	
	b(2)	P	X			Pnl	
	b(3)	P	X			Pnl	
	c	P	X			Pnl	
	c(1)	P	X			Pnl	
	c(2)	P	X			Pnl	
	d(1)	P	X			Pnl	
	d(2)	P	X			Pnl	
	d(3)	P	X			Pnl	
	d(4)	P	X			Pnl	
	d(5)	P	X			Pnl	

APPENDIX C
CRITERIA MATRIX

CRITERIA NUREG-0700 para number	Crit type	DATA COLLECTION METHODS M	O	I	D	SUGGESTED DATA SOURCES	REMARKS
d(6)	P	X				Pnl	
6.3.4.1 a(1)	P		X	X		Pnl, Ops	
a(2)	PF			X		Ops	
b(1)	F		X	X		Pnl, Ops	
b(2)	F			X		Ops	
c(1)	F		X	X		Pnl, Ops	
c(2)	F			X		Ops	
c(3)	F			X		Ops	
d(1)	F			X	X	Pnl, Ops	
d(2)	F			X	X	Ops, Admin Procs	
6.3.4.2 a	P		X			Pnl	
b(1)	P		X			Pnl	
b(2)	P		X			Pnl	
b(3)	P		X			Pnl	
b(4)	P		X			Pnl	
c	P		X	X		Pnl, Ops	
6.3.4.3 a	P		X	X	X	CR, Ops, SFTA Rpt	also in RP-9.0 (SFTA)
6.5.1.6 a	F			X		Ops	(see Note 1)
b(1)	P			X		Ops	(see Note 1)
b(2)	P			X		Ops	(see Notes 1 and 2)
c(1)	F			X		Ops	(see Note 1)
c(2)	F			X		Ops	(see Notes 1 and 2)
6.5.1.6 d(1)	P		N/A				in TP-8.1 (Conv)
d(2)	P		N/A				in TP-8.1 (Conv)
d(3)	F		N/A				in TP-8.1 (Conv)
e(1)	P		X			Ops	(see Note 1)
e(2)	P	X				Pnl	(see Note 1)
e(3)	P	X				Pnl	(see Note 1)
6.6.6.2 a(1)	F		X		X	Pnl, SFTA Rpt	also in RP-9.0 (SFTA)
a(2)	F		X		X	Pnl, SFTA Rpt	also in RP-9.0 (SFTA)
a(3)	F		X		X	Pnl, SFTA Rpt	also in RP-9.0 (SFTA)
b	VC		X			Pnl	also in TP-6.1 (Labels)
c	P		X			Pnl	also in TP-6.1 (Labels)

APPENDIX C
CRITERIA MATRIX

NOTES:

1. These criteria also in the following task plans:

   TP-4.1 Controls Survey
   TP-5.1 Displays Survey
   TP-6.1 Labels Survey
   TP-7.1 Computers System Review
   RP-9.0 SFTA (in TP-9.9, CR Function Validation).

2. These criteria also in TP-8.1, Conventions.

ANNUNCIATOR SYSTEM

APPENDIX D
TASK PLAN CRITIQUE

APPENDIX D
TASK PLAN CRITIQUE

INSTRUCTIONS

1. Attach a copy of Section 4.0.
2. Fill in the required information and answer all questions.
3. Explain all NO answers in detail.
4. When complete, turn in to your immediate supervisor.

1. Name of Respondent: _____

   Name of Plant: _____

3. Date of Survey: _____

4. Were all of the criteria correct and appropriate for this task (do not explain criteria that were N/A because System/CR did not have that design feature)? YES NO

5. Did the task plan instructions present the easiest and best methodology for performing the assessment? YES NO

6. Were the data collection forms adequate? YES NO

Enclosure 8

to SERIAL: NLS-84-506

UNIT 1

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
A1 - RPV Pressure	82-269 - Replacement and Recalibration of C32-PT-N005 A, B Pressure Transmitters (Major Equipment Procured)	Complete	RF4
A2 - RPV Water Level	82-271 - Replacement of Level Transmitters B21-LITS-N026 A and B and Addition of Redundant Power Supply	Complete	RF4
	83-113 - Additional Flood Up RPV Level Instrumentation B21-LT-N027 B	01/85	RF5
	83-249 - Recalibration of XMTRS B21-LT-N036, N037 RPV Level	Complete	RF5
	84-170 - Replacement of RPV Level XMTR B21-LT-N027 (Major Equipment Procured)	Complete	RF4
A3 - Suppression Pool Water Temperature	81-251 - Additional Suppression Pool Temperature Monitoring System and Divisionalization of Instruments (Major Equipment Procured)	12/84	RF4
A6 - Drywell Temperature	See PM 81-251	12/84	RF4
A7 - Suppression Pool Pressure	82-257 - Replacment of Pressure XMTR CAC-PT-1257-2	Complete	RF4
	83-109 - Additional Suppression Pool Pressure Indication CAC-PT-1257-2B (Major Equipment Procured)	01/85	RF5

(927MAT/ccc)

UNIT 1

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
A8 - DW and SP H_2/O_2 Concentration	80-033 - CAC - H_2/O_2 Monitoring Replacement and Upgrade	Complete	Installed
B10 - Primary Containment Isolation Valve Position	80-033 - See Variable A8		
	80-133 - CAD TMI Changes - Dedicated Hydrogen Control	01/85	RF4
	82-287 - Non Interruptible Instr. Air System Upgrade - Rip Valve Replacement	01/85 for entire package	RF4
D4 - Drywell Pressure Narrow Range	83-131 - Additional DW Pressure Narrow Range Instrumentation CAC-PT-5113 (Major Equipment Procured)	02/85	RF5
D10 - Primary System SRV Position	84-180 - Replacement of Sensor Assembly and Connectors	Complete	RF4
D13 - RCIC Flow Control	84-154 - Replacement of RCIC Turbine Control Flow XMTR E51-FT-N003 (Major Equipment Procured)	Complete	RF4
D14 - HPCI Flow	82-263 - Replacement of HPCI Flow XMTR E41-FT-N008 and Flow Switch E41-FS-N006 (Major Equipment Procured)	Complete	RF4

(927MAT/ccc)

UNIT 1

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
D15 - Core Spray System	84-191 - CS Pump "A" Flow XMTR E21-FT-N003A Replacement	Complete	RF4
	84-192 - CS Pump "B" Flow XMTR E21-F2-N003B Replacement (Major Equipment Procured)	Complete	RF4
D19 - RHR System Flow	83-320 - RHR Loop "A" Flow XMTR E11-FT-N015A Replacement	Complete	RF4
	83-321 - RHR Loop "B" Flow XMTR E11-FT-N015B Replacement (Major Equipment Procured)	Complete	RF4
D20 - RHR Heat Exchanger Outlet Temperature	83-320 - RHR Loop "A" Temperature Element E11-TE-N027A Replacement	Complete	RF4
	83-321 - RHR Loop "B" Temperature Element E11-TE-N027B Replacement (Major Equipment Procured)	Complete	RF4
D22 - Cooling Water Flow to ESF Components	83-143 - Instrumentation to Monitor Cooling Water Flow to ESF Components (SW-FT-5114, 5115) (Equipment Still Being Evaluated)	09/85	RF5
	84-171 - Replacement of RHR Heat Exchanger "A" SW Flow XMTR E11-FT-N007A	Complete	RF4
	84-172 - Replacement of RHR Heat Exchanger "B" SW Flow XMTR E11-FT-N007B	Complete	RF4

(927MAT/ccc)

UNIT 1

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
D25 - Status of Standby Power (Pneumatic)	84-195 - Nitrogen Backup System	03/85	RF4
E10 - Wind Direction E11 - Wind Speed E12 - Estimation of Atmospheric Stability	System Installed in 1983 Meets RC 1.97, Rev. 2 and RG 1.23, Rev. 0. System will by modified to provide multiple-user access to data base.		

(927MAT/ccc)

UNIT 2

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
A1 - RPV Pressure	82-270 - Replacement and Recalibration of C32-PT-N005 A and B Pressure Transmitters (Major Equipment Procured)	Complete	RF6
A2 - RPV Water Level	82-272 - Replacement of Level Transmitters B21-LITS-N026 A and B and Addition of Redundant Power Supply	Complete	RF6
	83-112 - Additional Flood Up RPV Level Instrumentation B21-LT-N027B	02-85	RF6
	83-248 - Recalibration of XMTRS B21-LT-N036, N037 RPV Level	Complete	RF6
	83-251 - Replacement of RPV Level XMTR B21-LT-N027 (Major Equipment Procured)	Complete	RF6
A3 - Suppression Pool	81-252 - Additional Suppression Pool Temperature Monitoring System and Divisionalization of Instruments (Major Equipment Procured)	Complete	Installed
A6 - Drywell Temperature	See PM 81-252	Complete	Installed
A7 - Suppression Pool Pressure	82-256 - Replacement of Pressure XMTR CAC-PT-1257-2	Complete	RF6
	83-110 - Additional Suppression Pool Pressure Indication CAC-PT-1257-2B (Major Equipment Procured)	02-85	RF6

(927MAT/ccc)

UNIT 2

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
A8 - DW and SP H_2/O_2 Concentration	80-032 - CAC - H_2/O_2 Monitoring Replacement and Upgrade	Complete	Installed
B10 - Primary Containment Isolation Valve Position	80-032 - See Variable A8		
	80-134 - CAD TMI Changes - Dedicated Hydrogen Control	Engineering Start 03/85	RF6
	82-288 - Non-Interruptible Instru. Air System Upgrade - RIP Valve Replacement	11/85 for Entire Package	RF6
D4 - Drywell Pressure Narrow Range	83-130 - Additional DW Pressure Narrow Range Instrumentation CAC-PT-5113 (Major Equipment Procured)	03/85	RF6
D10 - Primary System SRV Position	83-176 - Replacement of Sensor Assembly and Connectors	Complete	RF6
D13 - RCIC Flow Control	83-252 - Replacement of RCIC Turbine Control Flow XMTR E51-FT-N003 (Major Equipment Procured)	Complete	RF6
D14 - HPCI Flow	82-264 - Replacement of HPCI Flow XMTR E41-FT-N008 and Flow Switch E41-FS-N006 (Major Equipment Procured)	Complete	RF6
D15 - Core Spray System Flow	83-253 - CS Pump "A" Flow XMTR E21-FT-N003A Replacement	Complete	RF6

(927MAT/ccc)

UNIT 2

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
D15 - Core Spray System Flow (Continued)	83-254 - CS Pump "B" Flow XMTR E21-FT-N003B Replacement (Major Equipment Procured)	Complete	RF6
D19 - RHR System Flow	83-255 - RHR Loop "A" Flow XMTR E11-FT-N015A Replacement	Complete	RF6
	83-256 - RHR Loop "B" Flow XMTR E11-FT-N015B Replacement (Major Equipment Procured)	Complete	RF6
D20 - RHR Heat Exchanger Outlet Temperature	82-255 - RHR Loop "A" Temperature Element E11-TE-N027A Replacement	Complete	RF6
	83-256 - RHR Loop "B" Temperature Element E11-TE-N027B Replacement (Major Equipment Procured)	Complete	RF6
D22 - Cooling Water Flow to ESF Components	83-142 - Instrumentation to Monitor Cooling Water Flow to ESF Components (SW-FT-5114, 5115) (Equipment Still Being Evaluated)	11/85	RF6
	83-257 - Replacement of RHR Heat Exchanger "A" SW Flow XMTR E11-FT-N007A	Complete	RF6
	83-258 - Replacement of RHR Heat Exchanger "B" SW Flow XMTR E11-FT-N007B	Complete	RF6
D25 - Status of Standby Power (Pneumatic)	84-196 - Nitrogen Backup System	02/86	RF6

(927MAT/ccc)

UNIT 2

RG 1.97 VARIABLE	PLANT MODIFICATIONS NOS. AND TITLES	ENGINEERING COMPLETION DATE	INSTALLATION SCHEDULE
E10 - Wind Direction E11 - Wind Speed E12 - Atmospheric Stability	System Installed in 1983 Meets RG 1.97, Rev. 2 and RG 1.23, Rev. 0. System will be modified to provide multiple-user access to data base.		

(927MAT/ccc)

Enclosure 9

to SERIAL: NLS-84-506

GENERAL ELECTRIC

NUCLEAR ENERGY BUSINESS OPERATIONS
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CALIFORNIA 95125

KBO-146-4-037
December 20, 1984

cc: WS Hogan
PH Tope
BR White

Mr. R. L. Sanders
Carolina Power & Light Company
P. O. Box 1551
Raleigh, North Carolina 27602

Subject: Brunswick ERFIS Safety Analysis Report Affidavit

Dear Mr. Sanders:

Enclosed is the affidavit for the Brunswick ERFIS Safety Analysis Report (SAR) which CP&L should transmit to NRC with the General Electric Proprietary (red cover) SAR. This affidavit states that the information furnished in the SAR is proprietary and is of the type which General Electric maintains in confidence and withholds from public disclosure. Please state in your transmittal letter to the NRC that the SAR has been handled and classified as proprietary by General Electric as indicated in the attached affidavit and that General Electric requests that it be withheld from public disclosure in accordance with the provisions of 10CFR2.790.

Very truly yours,

J. K. Maruyama
ERFIS Project Manager
(408) 925-3667

JKM:es

Encl.

GENERAL ELECTRIC COMPANY

AFFIDAVIT

I, Joseph F. Quirk, being duly sworn, depose and state as follows:

1. I am Manager, BWR Systems Licensing, Nuclear Safety & Licensing Operation, General Electric Company, and have been delegated the function of reviewing the information described in paragraph 2 which is sought to be withheld and have been authorized to apply for its withholding.

2. The information sought to be withheld is contained in the attached Safety Analysis Report for the Safety Parameter Display System (SPDS), Brunswick Steam Electric Plant Emergency Response Facilities Information System.

3. In designating material as proprietary, General Electric utilizes the definition of proprietary information and trade secrets set forth in the American Law Institute's Restatement Of Torts, Section 757. This definition provides:

> "A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business and which gives him an opportunity to obtain an advantage over competitors who do not know or use it.... A substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring information.... Some factors to be considered in determining whether given information is one's trade secret are: (1) the extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and to his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others."

4. Some examples of categories of information which fit into the definition of proprietary information are:

   a. Information that discloses a process, method or apparatus where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

   b. Information consisting of supporting data and analyses, including test data, relative to a process, method or apparatus, the application of which provide a competitive economic advantage, e.g., by optimization or improved marketability;

c. Information which if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality or licensing of a similar product;

d. Information which reveals cost or price information, production capacities, budget levels or commercial strategies of General Electric, its customers or suppliers;

e. Information which reveals aspects of past, present or future General Electric customer-funded development plans and programs of potential commercial value to General Electric;

f. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection;

g. Information which General Electric must treat as proprietary according to agreements with other parties.

5. In addition to proprietary treatment given to material meeting the standards enumerated above, General Electric customarily maintains in confidence preliminary and draft material which has not been subject to complete proprietary, technical and editorial review. This practice is based on the fact that draft documents often do not appropriately reflect all aspects of a problem, may contain tentative conclusions and may contain errors that can be corrected during normal review and approval procedures. Also, until the final document is completed it may not be possible to make any definitive determination as to its proprietary nature. General Electric is not generally willing to release such a document to the general public in such a preliminary form. Such documents are, however, on occasion furnished to the NRC staff on a confidential basis because it is General Electric's belief that it is in the public interest for the staff to be promptly furnished with significant or potentially significant information. Furnishing the document on a confidential basis pending completion of General Electric's internal review permits early acquaintance of the staff with the information while protecting General Electric's potential proprietary position and permitting General Electric to insure the public documents are technically accurate and correct.

6. Initial approval of proprietary treatment of a document is made by the Subsection Manager of the originating component, the man most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within the Company is limited on a "need to know" basis and such documents at all times are clearly identified as proprietary.

7. The procedure for approval of external release of such a document is reviewed by the Section Manager, Project Manager, Principal Scientist or other equivalent authority, by the Section Manager of the cognizant Marketing function (or his delegate) and by the Legal

Operation for technical content, competitive effect and determination of the accuracy of the proprietary designation in accordance with the standards enumerated above. Disclosures outside General Electric are generally limited to regulatory bodies, customers and potential customers and their agents, suppliers and licensees only in accordance with appropriate regulatory provisions or proprietary agreements.

8. The document mentioned in paragraph 2 above has been evaluated in accordance with the above criteria and procedures and has been found to contain information which is proprietary and which is customarily held in confidence by General Electric.

9. The information mentioned in paragraph 2 provides informaiton ont he Brunswick Steam Electric Plant Emergency Response Facilities Information System which has been designed by General Electric in response to the NRC requirement for a Safety Parameter Display System.

10. The information to the best of my knowledge and belief, has consistently been held in confidence by the General Electric Company, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties have been made pursuant to regulatory provisions of proprietary agreements which provide for maintenance of the information in confidence.

11. Public disclosure of the information sought to be withheld is likely to cause substantial harm to the competitive position of the General Electric Company and deprive or reduce the availability of profit-making opportunities because:

    a. It is part of a program which was developed with the expenditure of resources exceeding $17,000,000.

    b. Public availability of this information would deprive General Electric of the ability to seek reimbursement, would permit competitors to utilize this information to General Electric's detriment, and would impair General Electric's ability to maintain licensing agreements to the substantial financial and competitive disadvantage of General Electric.

    c. Public availability of the information would allow foreign competitors, including competing BWR suppliers, to obtain information at no cost which General Electric developed at substantial cost. Use of this information by foreign competitors would give them a competitive advantage over General Electric by allowing foreign competitors to develop an Emergency Response Facilities Information System methodology at lower cost than General Electric.

STATE OF CALIFORNIA)
COUNTY OF SANTA CLARA) ss:

Joseph F. Quirk, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 19 day of DECEMBER, 1984.

Joseph F Quirk

Joseph F. Quirk
General Electric Company

Subscribed and sworn before me this 19 day of DECEMBER 1984.

OFFICIAL SEAL
KAREN S. VOGELHUBER
NOTARY PUBLIC - CALIFORNIA
SANTA CLARA COUNTY
My Commission Expires Dec. 21, 1984

Karen S. Vogelhuber
NOTARY PUBLIC, STATE OF CALIFORNIA