

# ***Control Room Design Review***

## ***Annunciator Study Report***

**The South Texas Project**



**HOUSTON LIGHTING & POWER COMPANY**

B404180236 B40412  
PDR ADDCK 05000498  
A PDR



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
	<u>TABLE OF CONTENTS</u>	i
	<u>LIST OF FIGURES</u>	ii
	<u>LIST OF APPENDICES</u>	iii
	<u>ACRONYMS AND ABBREVIATIONS</u>	iv
	<u>PREFACE</u>	vii
	<u>SUMMARY</u>	xi
1.0	<u>INTRODUCTION</u>	1-1
2.0	<u>OBJECTIVE</u>	2-1
3.0	<u>REVIEW</u>	3-1
3.1	PRELIMINARY REVIEW	3-1
3.2	DETAILED REVIEW	3-4
4.0	<u>RECOMMENDATIONS</u>	4-1





HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
P-1	STP CRDR Major Reports	x
3.2-1	Line-of-Sight Orientation	3-7



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDICES

<u>Appendix</u>	<u>Title</u>
A	Annunciator Criteria
B	Computer Criteria
C	Review Checklists
D	Annunciator Review Guide
E	Meeting Minutes
F	Annunciator Layout



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ACRONYMS AND ABBREVIATIONS

AFW	Auxiliary Feedwater
ARO	Auxiliary Reactor Operator
ASSOC	Associated
ASST	Assistant
AUX	Auxiliary
CAT	Category
CLO	Checklist Observation
CONT	Control
CP	Control Panel
CR	Control Room
CRDR	Control Room Design Review
CRT	Cathode Ray Tube
CVCS	Chemical Volume Control System
ECW	Essential Cooling Water
EES	Emergency Event Sequences
EOF	Emergency Operating Facility
EPRI	Electric Power Research Institute
ESF	Engineered Safety Feature(s)
EST	Estimate(d)
EXPER	Experience
FW	Feedwater
HE	Human Engineering
HED	Human Engineering Discrepancy
HHSI	High Head Safety Injection
HL&P	Houston Lighting & Power Company
HPSI	High Pressure Safety Injection
I&C	Instruments and Controls
INPO	Institute of Nuclear Power Operators
INSTR	Instrument



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ACRONYMS AND ABBREVIATIONS (Cont.)

LDR	Leader
LHSI	Low Head Safety Injection
LOCA	Loss of Coolant Accident
LOSP	Loss of Offsite (AC) Power
LPSI	Low Pressure Safety Injection
LR01	Licensed Reactor Operator #1
LR02	Licensed Reactor Operator #2
M/M	Man/Machine
MCP	Main Control Panel
MON	Monitor
MSR	Moisture Separator Reheater
MT	Management Team
MW(e)	Megawatts (electric)
NOS	Numbers
NRC	Nuclear Regulatory Commission
OERT	Operating Experience Review Task Group
OSC	Operational Support Center
PORV	Power Operated Relief Valve
PRT	Project Review Team
PSAR	Preliminary Safety Analysis Report
RAS	Recirculation Actuation Signal
PZR	Pressurizer
RCB	Reactor Containment Building
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RECIRC	Recirculating
REQ'D	Required
RG	Regulatory Guide
RHR	Residual Heat Removal



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ACRONYMS AND ABBREVIATIONS (Cont.)

RO	Reactor Operator
RWST	Refueling Water Storage Tank
RX	Reactor
SBCS	Standby Cooling System
SFTA	System Function and Task Analysis
SG	Steam Generator
SIS	Safety Injection System
SOE	Selected Operational Event(s)
SPDS	Safety Parameter Display System
SRO	Senior Reactor Operator
SS	Subsystem
STAT	Systems Task Analysis Team
STP	South Texas Project
SUPVR	Supervisor
SW	Switch
SYS	System
TMI	Three-Mile Island
TSC	Technical Support Center





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### PREFACE

The control room design review (CRDR) of the South Texas Project (STP) Nuclear Generating Station was started in September 1982. This review is being performed by Torrey Pines Technology for Houston Lighting & Power Company (HL&P) with Bechtel Energy Corporation (Bechtel) acting as agent.

Prior to completion of the CRDR, a decision was made by HL&P to redesign six of the ten main control panels. This redesign effort was required to accommodate design changes resulting from plant design evolution and Reg. Guide 1.97 requirements. Human engineering discrepancies determined in the CRDR have been or are in the process of correction.

The CRDR is described in the Program Plan document. It contains a detailed description of the plans for the majors task elements. Due to the control room redesign effort, a modified approach was required to complete and document the CRDR program. The following changes have been made in the CRDR Program Plan:

- A. The documentation program described in the Program Plan was changed to allow reporting of results on the individual CRDR tasks.
- B. An Implementation Plan Report, was written to describe the background and reasons for the redesign effort. It outlines the approach to be used for implementing panel layout changes.
- C. The tasks described in the Program Plan have been completed for the original design. The SFTA and the control room survey have been updated to validate any design revisions.





The following is a description of the documents covering this CRDR (see figure P-1):

- A. Program Plan - Defines the plan for performing the CRDR.
- B. Criteria Report - Provides the detailed guidelines and basis for the CRDR and describes the interface between the control room and plant systems.
- C. Operating Experience Review (OER) Report - Describes the review process results, conclusions and recommendations of the operating experience review (OER) task defined in the Program Plan.
- D. System Function and Task Analysis (SFTA) Report - Describes the methodology, results, conclusions and recommendations for the SFTA effort defined in the Program Plan.
- E. Control Room Survey (CRS) Report - Describes the review process, results, conclusions and recommendations of the control room survey task defined in the Program Plan. This report also includes the final results and dispositions for the human factor observations obtained from the OER and the SFTA.
- F. Annunciator Report - Describes the review process, results, conclusions and recommendation of the annunciator review task defined in the Program Plan.



HOUSTON  
LIGHTING  
&  
POWER CO.

## **CONTROL ROOM DESIGN REVIEW**

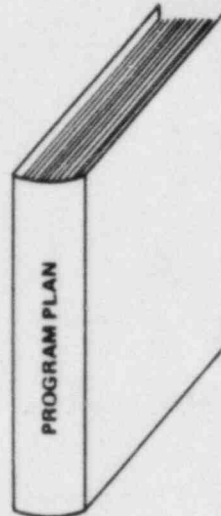
- G. Special Studies Report - Describes details of miscellaneous studies performed as part of the CRDR. This includes the anthropometric study, the hierarchial labeling study and the demarcation study.
- H. Implementation Plan Report - Summarizes the CRDR, the control room design changes, and the proposed methods of implementing the design changes.
- I. SFTA Validation Report - Summarizes the second SFTA review based on relayed out panels and walk-through/talk-through validation.
- J. OER Validation Report - Summarizes the review made by operators to determine if the redesigned panels corrected concerns reported in the OER Report and if any new problems were created.
- K. CRS Validation Report - Summarizes the review made to determine if the category A and representative samples of the Category B HEDS are satisfactorily corrected and if any new problems were created.
- L. Executive Summary - Summarizes the CRDR, results, conclusions and recommendations. Technical details are in the Operating Experience Review Report, the System Function and Task Analysis Report, the Control Room Survey Report, the Special Studies Report, and the Annunciator Report.



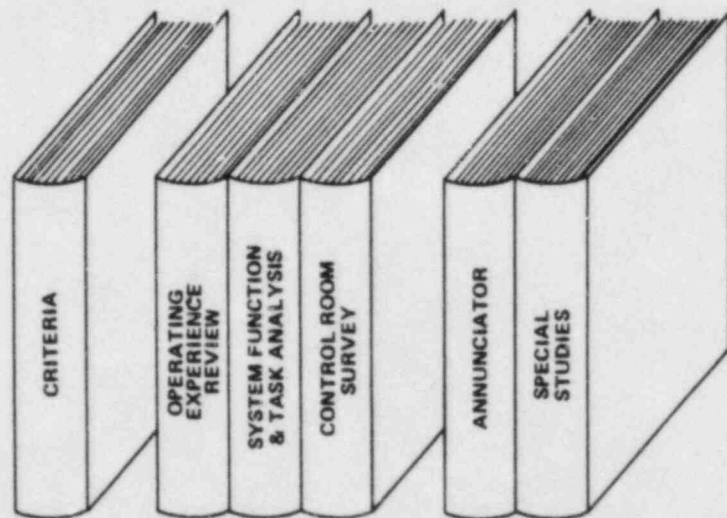
HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### PLANNING



### REVIEW & DESIGN SUPPORT



### ASSESSMENT IMPLEMENTATION EFFECTIVENESS



STP CRDR MAJOR REPORTS  
Figure P-1



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### SUMMARY

The annunciator review was performed as part of the control room design review of the South Texas Project Nuclear Generating Station. The annunciator review includes the plant annunciator, the plant computer alarm functions, and the ESF bypassed and inoperable status system.

The review included a review of design documents, the development of criteria, and the preparation of checklists. The existing annunciator layout was reviewed using the criteria, and a list of observations prepared. The review was then suspended until the control board layout revision was completed, at which time the annunciator study task group (ASTG) examined each window for adequacy. Revisions were made to the tile size, character size and spacing, and message content. Tiles were relocated to be near the appropriate controls, and grouped by function. Three levels of priority were chosen, and each window assigned the proper priority.

The existing design comprised 1055 active alarms. These were reduced, through combining alarms, moving alarms to the computer or to other locations, etc. to approximately 700. There are two first-out window boxes containing the priority one alarms.

The ESF bypassed and inoperable status boxes were revised to include the proper monitoring signals, and windows were added to each for annunciation, at the system level, of the status of each system. The window boxes were lowered, the character size increased, and the messages limited to three lines in order to increase operator comprehension. All observations were addressed and corrected.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 1.0 INTRODUCTION

This report documents the results of the review of the annunciator systems in the control room of the South Texas Project and is part of the Control Room Design Review as described in the program plan. It includes a review of the plant annunciator, the plant computer alarm functions, and the ESF bypassed and inoperable status monitoring systems. The review was performed in two phases on the full scale mockup at Bechtel, Houston offices. The review began in the fourth quarter of 1982. In early spring of 1983, a decision to revise the control board layout was made. The annunciator review was deferred at that time because of the large number of changes projected for the controls. The preliminary phase proceeded thru the preparation of observations concerning the original design. When the control board layout had firmed up, the review resumed, considering each window for appropriateness, desirability, message, priority, and location.





HOUSTON  
LIGHTING  
&  
POWER CO.

## **CONTROL ROOM DESIGN REVIEW**

2.0

### OBJECTIVE

The objectives of the review were to determine the human factors deviations in the STP control room annunciator system, to provide recommended resolutions, and to accomplish a functional integration of all systems that provide annunciation. The review also supplied recommendations that provided human factors engineering guidance in the Bechtel engineering upgrading program.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 3.0 REVIEW

The Program Plan and the Technical Services Contract outline a number of tasks to be performed during the annunciator review. The review was performed in two phases. The first or preliminary phase addressed the items listed below.

- o Design Document Review
- o Criteria Development
- o Checklist Preparation and Performance
- o Recommendations

The final phase consisted of a review of the details of each alarm message and input signal, and recommendations for any revision, relocation, or disposition considered necessary by the Annunciator Study Task Group (ASTG). This group followed the guidelines set out in the Annunciator Study Guide.

### 3.1 PRELIMINARY REVIEW

This phase comprised the review of documents and preparation of criteria and checklists preparatory to the detailed review of each alarm window. This phase prepared a base line upon which to evaluate the existing set of annunciators. The CRDR basic tasks from the control room survey, the system function and task analysis, and the operating experience review provided inputs to the evaluation.

#### 3.1.1 Review of Design Documents and NRC/EPRI Studies

To become familiar with the present design, the design specifications for the annunciator, the ESF monitoring and bistable status monitoring systems, and the plant computer system were reviewed. NUREG-2147 and NUREG/CR-2176, containing annunciation guidelines and recommendations were reviewed. These reviews provided a good working understanding of the various alarm systems and interaction between systems, and facilitated subsequent tasks in the annunciator review.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 3.1.2 Development of Review Criteria

One of the major tasks outlined in the program plan is the preparation of control room design and review criteria. The CRDR Criteria Report includes a description of the systems and human factors features for the annunciator, computer, and ESF monitoring interfaces relative to prioritization, consistency, and overall integration.

Two sections of the CRDR Criteria Report, Section 8 "Control Room Annunciation Features", and Section 12 "Computer", were prepared. Appendices A and B of this document are copies. Section 12 "Computer," has sections of the criteria and four appendices O, P, Q and R to integrate the annunciator and computer systems, and these have been coordinated with the respective Bechtel responsible engineers.

### 3.1.3 Development of Human Factors Checklist

The criteria discussed above provided the guidelines for the preparation of approximately 100 checklists with which to perform the review of the control room annunciator and ESF monitoring systems. The checklists are organized into those associated with annunciation (Checklist 3), and with the computer (Checklist 7). Each checklist is associated with a pertinent paragraph in the Criteria Report in the "Ref. STP" section. If the criteria applies to a specific control panel, the appropriate number and name are entered in the spaces provided. If the criteria applies to all control panels, then "all" appears there. If the criteria applies to the system in general, then "N/A" is the appropriate entry. See Appendix C for copies of the checklists.



3.1.4 Checklist Review Performance

The checklist review involved a detailed comparison of the annunciator and computer systems against the criteria. This review encompassed the details of window size, arrangement, engraving and computer printouts, displays and documents that show planned or actual signal inputs for each window. Also reviewed were such items as abbreviations, colors and location based on human factors principles. Observations were noted in approximately 40% of the items. These are addressed below under recommendations.

Annunciator tile legends were reviewed in detail to determine the adequacy of the following:

- o General Arrangement
- o Tile Grouping
- o Location Near Related Controls
- o Clear Legend Meanings
- o Legend Size and Spacing
- o Necessity of Each Tile

Diagrams of each annunciator lamp box were marked up to indicate preliminary tile groupings. Included are some preliminary alarm changes supplied by the Bechtel Controls Group. A preliminary working list of each alarm, by alarm group, was prepared.

The ESF monitoring lampbox layout was reviewed and found to require readjustments for consistency in location and inscriptions; however, all were found to be difficult to read when standing near the panel.

3.2 DETAILED REVIEW

The necessity of revising the layout of the control panels caused the annunciator study to be completed in two phases. The review could not be completed until after the layout of the main panels was revised.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 3.2.1 Review Guide

In order to establish criteria and methodology for the detailed review, an Annunciator Review Guide was published. This guide set up the Annunciator Study Task Group (ASTG) to review the details of each message including:

- A. Physical Characteristics
- B. Priority
- C. System Used
- D. Where Displayed

The review guide is included in this report as Appendix D.

### 3.2.2 ASTG Reviews

The Annunciator Review Guide provided for the ASTG to perform a detailed review of each annunciated point on the main control boards, the HVAC panels, and the basement operators shelter. The group met two days each week, over a period of 14 weeks.

At each session, the group discussed with the responsible engineer (RE) the annunciator and computer points of each system. These discussions began with the alarms that existed in the original design. After these were covered, the RE went through the appropriate P&ID and logic diagrams, explaining any design changes that concerned the annunciator or computer system.

For each alarm point, the RE explained the necessity for the alarm, the operator action required, and some of the consequences of not acting. The group then discussed the appropriate disposition for the alarm. In some instances, the alarm point was deleted, either because the system had changed, or the operator had no control over the process excursion being alarmed.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

In other instances, the alarmed point was moved from an annunciator window to the appropriate computer, or relocated to the control panel where the control is located. Decisions were made concerning combining points when the action to be taken by the operator was similar. Where multiple alarms were generated, the separate inputs were routed to the computer for further definition of the details of the condition being alarmed. In those situations where inputs are combined into a single alarm, and the operator has available an indicator to define the parameter (eg. Hi/Lo), no input was routed to the computer. The group decisions on combining inputs were made using the guideline criteria that the plant is not to be computer dependent. Priorities were assigned to annunciator and computer alarms and guidance provided to minimize nuisance alarms.

Meeting notes were kept during each session, and are located in Appendix E. Using these notes, a list of changes was made, showing the disposition of every alarm point that was deleted, revised, combined or moved to either the computer, or to another panel. A rough layout of the alarms that remained on a particular panel was made with priorities assigned. The list of changes and the rough layout were distributed to the group at the following meeting for comments.

### 3.2.3 Physical Characteristics

The original annunciator window boxes contained up to 96 windows arranged in an eight window high, by either twelve, or eight window wide matrix. There were twelve boxes containing 96 windows each, and two boxes containing 64 windows each, comprising 1280 available points; 1055 were active, and 225 were spares. The Criteria Report set out a maximum number of windows in any array at 50, and the decision was made to use an array that is six windows high, and eight windows wide, totalling 48 windows maximum. Location aids were assigned, letters A through F vertically and numbers 1 through 8 horizontally. There are 20 arrays on the main control boards, with 936 possible points, and 642 are active. There are 71 active alarm points on the HVAC panels. Appendix F contains the revised window box layouts.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

The window size in the original layout was 1 1/4 in. high by 2 1/2 in. wide, with 3/16 in. characters. This resulted in messages that were difficult to read at the viewing distances involved. The new window size is 2 in. high by 3 in. wide, and the character height is one-quarter inch nominal. Paragraph 3.2.4 is a calculation of the parameters of messages, including stroke width, character width, spacing between characters and between lines. The number of characters per line is between 10 and 13, depending upon the message with three lines maximum, per tile. The abbreviation list from the Criteria Report was used to ensure consistent messages. The operator response controls for the annunciator and computer alarms were combined, and the silence controls have been enhanced by use of a color pad for ease of recognition.

### 3.2.4 Character Parameters

The parameters of the annunciator engravings, such as character, word, and line separation, character height, the number of characters permissible per line and the number of lines per window are all dependent upon the size of window selected, and upon the line-of-sight viewing distance. The viewing distance to be determined is the distance between the alarm and the operator's eye. The position of the operator at the time should be in front of the alarm, within two feet of the edge of the control board.

Using data from the Anthropometry Report, the eye-height of the 5th percentile female is 56.5 inches above the floor, and the angle between the horizontal and the line to the center of the alarm section of the board is 59° (see Figure 3.2-1). The horizontal distance between the center of the annunciator windows and the board edge is 26.25. Solving for h, the vertical height

$$h = 26.25 \tan 59^\circ = 43.7 \text{ in.}$$

Using this calculated value, and positioning the viewer 24 inches back from the front edge of the board, calculate  $\theta$  and then L.O.S.

$$\theta = \tan^{-1} \frac{43.7}{26.25} = 59.4^\circ$$

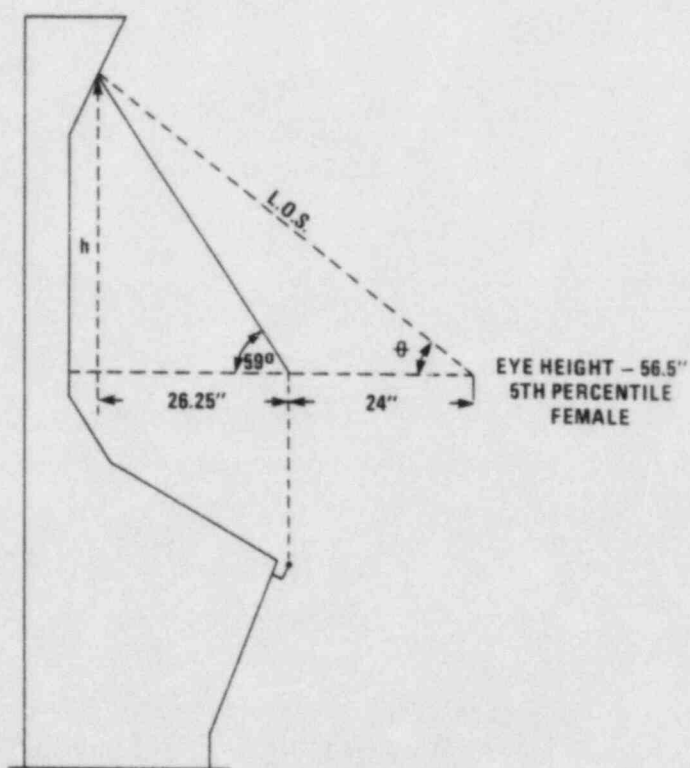
$$\text{L.O.S.} = \frac{46.25}{\sin 59.4^\circ} = 54.3''$$





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW



LINE OF SIGHT ORIENTATION  
FOR ANNUNCIATORS  
Figure 3.2-1



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

Using the NUREG 0700 minimum character height multiplier of 0.004, the minimum character height (H) that can be used is

$$\begin{aligned} H &= 0.004 \times 67.3'' \\ &= 0.269'' \end{aligned}$$

The number selected for H is one-quarter inch nominal. This represents an actual maximum viewing distance (LOS) of 6 feet, 6 inches. The overall character height, from outside edge to outside vertically, is 0.27 in, because of the engraving technique used to achieve the desired stroke width.

NUREG 0700 recommends that the ratio of stroke-width to character height should be between 1:6 to 1:8. Maintaining a character height of 1/4" or 0.25, then the maximum and minimum stroke widths become.

$$\begin{aligned} S_{\max.} &= \frac{0.25}{6} = 0.0416 \text{ inches} & S_{\min.} &= \frac{0.25}{8} = 0.03125 \text{ inches} \end{aligned}$$

Within these limits, the bolder the stroke width, the easier the legend is to read, and a value of 0.04 inches is recommended.

The limits of character width-to-character height ratio specified in NUREG-0700 are between 1:1 and 3:5. Using 0.25 as a character height, the limits of character width (W) become:

$$W_{\max} = 1.1 = 0.25 \text{ inches} \quad W_{\min} = 3.5 = .25 \times 3/5 = 0.15 \text{ inches}$$



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

A narrow character width allows the maximum number of characters per line in a given tile size, so the choice of width should tend toward the smaller value. Use three sixteenths of an inch for W, and one-sixteenth of an inch space between characters. The total width occupied by a character and a space becomes one-quarter inch.

The above selections, with a tile size of three inches wide by two inches high, determines the maximum number of character per line of data. Allowing a margin of one-quarter inch per side, textual messages can occupy two and one-half inches per line, or ten characters. This number is less than the fifteen characters recommended by the criteria report.

The recommended ratio of space between lines-to-character height is one-half, or greater. With a character height of 1/4 inch the minimum allowable spacing between lines becomes 1/8 in. However, for better readability, a larger spacing is more desirable. Using a tile height of two inches, and subtracting one quarter inch each for top and bottom margins; the space available is one and one-half inches for three lines and two spaces. Subtracting three lines of one-quarter each (3/4 in total) leaves three-quarters for the two spaces-maximum. The recommended space between lines is three-sixteenths inch.

### 3.2.5 Priority

The Criteria established for the annunciator and computer systems require that priorities be assigned to each point that is alarmed. The guidelines used during the review followed the criteria. All alarms that signal a reactor or turbine trip were assigned a priority one. Alarms that signal a condition that will lead to a reactor trip or a turbine trip, if not corrected, or that signal a technical specification violation, were assigned a priority two. All other alarms are priority three. These priorities apply to both the annunciator and computer.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 3.2.6 System Used

There are a number of systems in the control room that alert the operator to a parameter that is out of acceptable limits. These are the annunciator, the plant computer, the ERF computer, the Qualified Display Parameter System (QDPS), RMS, and the Bypassed and Inoperable Status system.

The principal method of alerting the operator is the annunciator system, as the urgent alarms are displayed there. The plant computer has audible alarm capabilities, and the operator will expect to find data displayed there to define any multiple input alarm. The QDPS is a Class 1E system, and any safety related alarm will be displayed there. The Bypassed and Inoperable status system provides the plant operators with information concerning the availability of safety equipment. In this system, if a device is out of service, a white lamp indicates this condition, while a red lamp indicates that a device has received a safety signal but has not actuated. These indications are not for alarming out of tolerance conditions, but are for status monitoring of safety equipment.

The ASTG reviewed each alarmed point and determined which system is appropriate for alerting the operator.

### 3.2.7 Where Displayed

The original control board layout has been extensively revised, with many subsystems relocated to different control boards. The HVAC systems were relocated to a new HVAC panel located behind the main control boards. These changes, plus the system revisions due to continuing design efforts, resulted in many alarms being mislocated.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

The ASTG determined the best location for each alarm. The HVAC related alarms were moved to the new HVAC panel (ZCP022). The Local Control and Not in ESF Status Position alarms were relocated to the Bypassed and Inoperable Status panels. Alarms that indicate Reactor or Turbine Trips were moved to two new First-Out window panel, for Reactor Trips, and Turbine Trips respectively. The Reactor Trip first-out alarm panel is located on panel 005, Reactor Control; and the Turbine Trip first-out alarm panel is located on panel 006, Steam Generator control. Other alarms were moved to the locations corresponding to the new positions of the controls.

Within each window box, the alarms associated with each system located in that vertical area of the panel were arranged in a similar sequence. The alarms for a system were grouped together, with high alarms located in the upper portion of the array and low alarms in the lower portion. Left to right orientation attempted to follow the controls layout. Priority was not considered in arranging the layout, as color differences are easier to distinguish when located at random, than when located together in one area.

### 3.2.8 Auditory Alert

Five sources of sound are planned for the control room. These are to be located near the ESF panels (001, 002 and 003); the primary auxiliaries panel (004); the turbine panel (006); the secondary auxiliaries (007 thru 010); and the HVAC panels (022).

### 3.2.9 ESF Bypassed and Inoperable Status

The ESF bypassed and inoperable status window panels in the original layout were found to be hard to read. In the new layout, the status panels were placed lower on the control boards, the character size was increased to 0.14in., and the message was reduced to three lines. The number of tiles was increased to include the proper monitoring points, and the window boxes relocated to correspond to the new system layouts on the control boards. Originally, the annunciator window boxes contained a pair of tiles; one for system bypass/inoperable, and another for system not in ESF safety position.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

These two windows were relocated near the ESF status monitoring panels for each system, and designated as system level alarms. Each monitoring panel is now grouped into two sections. The upper section indicates equipment that is bypassed. Located near this group is a larger system level light indicating that one or more items of equipment in the system is bypassed. A second group of indicators, located below the bypassed section, indicates equipment that has not operated when required to do so by a safety signal. This group of indicators has a larger system level indicator to alarm that some item in the system has not functioned correctly. These two system level alarms function in the same manner as annunciators (i.e. flash, reflash, audible, etc).

Each ESF train had a group of back lighted pushbuttons for indicating that a system has been manually bypassed. These three groups of controls were relocated from the main control boards to the operators console, for ease of access.

The alarms that indicated that a system had been transferred to local control were located with the other annunciators. These have been re-located to the bypassed section of the appropriate ESF status monitoring panel.





4.0

RECOMMENDATIONS

- A. In many instances split alarm tiles are too small to be easily read from the acknowledge button locations. Lettering is too small ( $3/16"$ ) and lines of lettering are too close together ( $1/16"$ ). Current size of an alarm window is one half of a  $2-3/4"$  square tile which is  $1-3/8" \times 2-3/4"$ .

Recommendation: Increase alarm tile size to not less than  $2" \times 3-1/2"$  and lettering size to about  $1/3"$ . Also allow about  $1/6"$  between rows of lettering.

- B. Tile coordinates are not labeled for easy identification.

Recommendation: Label tile rows and columns.

- C. Alarm tiles have no priority indicated.

Recommendation: Prioritize all alarms and install red plastic on highest priority alarm windows.

- D. No first-out capability exists within the annunciation system.

Recommendation: Add first-out capability to the annunciators for a limited set of inputs, or utilize the plant computer digital inputs for this purpose.



- E. There are more than 1000 identified alarm windows. More may need to be added. Some alarms are repeated in more than one light box.

Recommendation: Reduce the number of alarm windows. Put low priority alarms in plant computer. Create more multiple input windows and put detailed alarm points into computer. Eliminate redundant alarm windows.

- F. Annunciator control pushbuttons are all identical.

Recommendation: Differentiate at least the silence control by shape coding.

- G. More than 70 system and functional alarm tile groupings exist; however, many are arranged in such away that that it is not easy to discern which tile belongs to a particular grouping. A few alarms are located on panels that are distant from the related controls and indicators.

Recommendation: There should be more lamp boxes, with fewer tiles each, to aid in rapid identification of plant problems. This would also make it easier to locate alarm windows near related controls and indicators, especially when additional alarm points need to be added.

- H. Tile legend does not use consistent format terminology, and standardized abbreviations (e.g., H and H<sub>2</sub> for hydrogen; Temp Lo and Lo Temp).



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

Recommendation: Restate tile legend to be consistent and use standardized abbreviations.

- I. Similar alarms are located on three different ESF boards in different relative positions within their respective lampboxes.

Recommendation: Move the similar alarms to the same relative position within each lampbox. A better solution is possible if the controls for each train are mounted on the same panel for a given system. Then use of multiple input windows for similar alarms is possible.

- J. Approximately half of the spare annunciator windows are located above CP008 in a large lampbox. The rest of the spares are distributed in a random fashion among all the rest of the annunciator lamp boxes. If additional alarms are added which belong in a group it will be difficult to locate them near the related controls.

Recommendation: Minimize the number of annunciator windows needed and use smaller number of alarm tiles per box. This will increase the flexibility to properly locate additional alarm windows.

- K. The alarm annunciator response conventions for the main plant annunciator system and the plant computer system differs. The alarm function controls for annunciator and computer are



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

different. This requires the operator to respond to two sets of controls in different ways. In some cases it will require a double response where the same alarm goes to both systems.

Recommendation: Arrange to have the computer respond to the annunciator acknowledge control.

- L. Annunciator alarms are not tied in directly to the plant computer.

Recommendation: All priority 1 and 2 annunciator alarms and those priority 3 alarms necessary for post-accident diagnostics should be sent to the plant computer for recording.

- M. Computer keyboards will be difficult to use in high stress situations.

1. Key labeling is unclear in meaning for some keys.
2. Keys are too small to be used in a hurry.
3. There are too many keys.
4. Access methods are too complicated and not obvious with typewriter keyboards.
5. The system can potentially fail because of incorrect operator action at keyboard.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

6. "Conversational" techniques for operator/computer interaction are used which requires cursor use and alphanumeric entries.

Recommendation: Assign dedicated function keys on the present function key bank to enable the operator to select an alarm group (some control panel number) and to select alarm displays sorted by time or priority.

- N. The operator will be required to search through long alarm lists because the computer is not programmed to display alarms by system groups by priority.

Recommendation: Add software to display by system groups with priority recognition and time of occurrence listings. This should not be too difficult because the present alarm processing software would still be used. The new software would sort each alarm to produce a display that is related to its proper system grouping and within this grouping alarms would be listed by time of occurrence and display colors used to indicate priority.

- O. There is only one computer alarm acknowledge key switch. Thus the operator does not have the convenience of silencing the computer audible device from the multiple annunciator horn silence switches.

Recommendation: Tie the computer horn silence feature to the plant annunciator horn silence switches.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- P. There are not enough CRTs distributed around the control panels to provide detailed information on multiple input alarms near the related controls. Also, more CRTs are needed to back up failed display devices if the computer is to be relied upon.

Recommendation: Add more CRTs to the control boards.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX A  
ANNUNCIATOR CRITERIA

(EXTRACTED FROM CRDR CRITERIA REPORT)



8.0 CONTROL ROOM ANNUNCIATION FEATURES

8.1 FUNCTIONAL REQUIREMENTS

- A. Alert the operator to the fact that a system or process deviation exists.
- B. Inform the operators about the nature of the deviation and the urgency (or priority) of any needed action .
- C. Guide the operator's initial response to the deviation.
- D. Confirm whether the operator's response corrected the deviation.

8.2 GENERAL CRITERIA

The annunciator concept shall conform to the following general criteria:

- A. Alert, but not startle the operators.
- B. Intervene, but not disrupt control room activities.
- C. Assist the operators in monitoring the plant, but shall not encourage undue reliance. Quantitative and status information shall be provided by other means.
- D. Minimize nuisance alarms, but provide an adequate amount of valid alarms.
- E. Provide abundant and timely information, but should not increase the workload of the operators.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.3 INTEGRATION OF SUBSYSTEMS INTO A COORDINATED ANNUNCIATION PLAN

The components of an integrated annunciation plan shall consist of certain functions of the following subsystems.

- A. Main Plant Annunciator
- B. Computer Systems
- C. ESF Bypass and Inoperable Status System

These systems shall be coordinated to provide a coherent means of notifying the operator of plant abnormalities, to assess the degree of abnormality, and provide an initial information structure upon which to base corrective action. They shall perform complementary rather than redundant functions.

Desirable features of an annunciation system are parallel presentation of information and a fixed mode of display. These features are available with conventional window box panels. Flexibility to accommodate changes and to examine a wide variety of relationships and trends is available in the computer.

### 8.4 ANNUNCIATION FUNCTIONS

The following are the specific functions and features required of the coordinated annunciation plan.

#### 8.4.1 Auditory Alert

The operators shall be notified of the existence of an alarm by sound and have their attention directed to the appropriate panel or computer display device. Horns and chimes shall be located on the control panels so that the location of the alarm can be determined



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

by the direction of the sound. Auditory alert (alarm) signals may be initiated by any of the subsystems in the coordinated annunciation plan.

### 8.4.2 Visual Alarm

Visual alarm information shall be presented to the operator via annunciator windows and computer driven display devices. The information shall indicate the nature of the deviation and be color coded for priority.

### 8.4.3 Operator Response Capability

Controls for operator response to annunciation functions shall be conveniently located. The following control functions are required:

#### A. Silence Auditory Alert

Controls shall be provided to silence the auditory alert from any silence control in the primary area. Under control of administrative procedures it shall also be possible to adjust the intensity of the auditory alert and to turn off all auditory annunciation.

Auditory annunciation shall be automatically reset when silenced.

#### B. Alarm Acknowledge

Controls shall be provided to acknowledge visual alarms. Acknowledgement shall turn off the flashing windows and cause them to continue with a steady display until reset. Acknowledgement shall be possible only from the work station where the alarm originated.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### C. Alarm Reset

Controls shall be provided to reset alarms after they have been cleared. The reset control shall silence any audible signal and terminate the visual display, indicating clearance. The reset control shall be effective only at the work station where the alarm originated.

### D. Alarm Test

Controls shall be provided to assure that the auditory alert signals and visual annunciation displays are still functional. Test capability shall be provided for both the conventional annunciator and the computer-based hardware.

When a "Test" pushbutton located on a control panel is depressed, all the related annunciator windows shall flash. "Reset" shall terminate the test and all visual displays shall again perform their previous functions. Test of computer alarm functions shall utilize the built in test capabilities of the computer.

Groups of annunciation response controls shall have the same relative arrangement at each location. The controls shall be coded in some way for easy recognition. The design of the coordinated annunciation plan shall be such that the operators shall have little reason to attempt to defeat the controls. Control of both conventional and computer based alarms shall not require redundant actions or separate control hardware.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.4.4 Prioritization

Alarm priority designations shall be used to help direct operator action to where it is most needed. There shall be three priority levels for computer displays and three priority levels for annunciator windows. All priority levels for the annunciator windows and computer driven displays shall be the same.

The coding methods for visual displays shall be color and numeric.

On the annunciator tiles, colors shall indicate priority of the alarms. On the computer driven alarm displays, there shall be a designation of priority. These displays shall also have a special character used for flashing and color coded the same as the applicable annunciator tile. Alarm priority designations to be used shall conform to those shown in Section 6.3.1.4 of NUREG 0700. The priority level criteria shall be:

#### Priority 1 - Red

- Plant shutdown

- Radiation release

- Conditions which must be immediately corrected or will cause plant shutdown or radiation release.

#### Priority 2 - Yellow

- Technical specification violations

- Conditions which must be corrected or may lead to plant shutdown or radiation release.

#### Priority 3 - White

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



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.4.5 First Out

Some method is required to determine which plant shutdown alarm occurred first. The capability to determine the initiating event and the sequence of events shall be available to the operator through the plant computer.

### 8.4.6 Hard Copy

Hard copy records of alarms and the sequence of events shall be available for immediate use and historical analysis.

### 8.4.7 Alarm Screening (Computer)

Alarm screening shall be used in the computers to reduce the number of alarms necessary to be handled in any given situation.

### 8.4.8 Alarm Sort

The capability shall be provided to sort and display alarms by time of occurrence, priority, system, and functional group.

### 8.4.9 Alarm Combination

Alarm conditions shall be combined into multiple input windows where the multi-input alarms summarize single input annunciators or where the operator response would be the same for all. Alarm combinations shall not be capable of being reset until all inputs to the combined alarm have returned to normal. Input descriptions for these alarms shall be available on the computer-driven alarm displays and on the alarm log.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.4.10 Ring Back

When a previously abnormal condition returns to normal it shall be accompanied by a brief auditory signal and slow flashing of the visual indication to provide feedback on the corrective action. The flashing shall terminate after the alarm is reset.

### 8.4.11 Reflash

When two or more process deviations share the same annunciator window and the window is steadily lit, another point going into alarm state shall cause the window to begin flashing again (and to activate the auditory alert) even though a previous alarm may not have been cleared. The window shall not return to normal until all process deviations associated with it have been cleared.

### 8.4.12 Transient Alarm Detection

An alarm shall remain displayed until acknowledged and reset by the operator even if it has already returned to normal. This will allow deviations to be detected which are only momentarily in the alarm state. Further verification of transient alarms shall be available on the printed alarm log.

### 8.4.13 Alarm List Paging

Computer-based alarm lists shall have the capability to display sequential pages of the list by depression of no more than a single pushbutton. The capability to return to the latest page of alarms by a single depression of a pushbutton shall also exist.

### 8.4.14 ESF Status Monitoring

This system shall display only status functions and shall provide alarm inputs to the ERF computer system. The capability shall exist to test all the ESF status lights on a control panel by depressing a pushbutton on that panel. Annunciator tiles shall



not display status monitoring information but shall be reserved for annunciation of plant deviations from normal. Status lights shall indicate only "not in safety position" or "bypassed or inoperable" status.

8.4.15 Local Annunciation

Annunciation of the activation of the auxiliary shutdown panel shall occur in the control room.

8.4.16 Data Movement Within the Annunciation System

Multiple input alarms within the main plant annunciator system shall be sent to the plant or ERF computer. Outputs from the ESF status monitoring system shall be transferred to the ERF computer. A signal from the auxiliary shutdown panel shall be available at the main plant annunciator to indicate activation of the auxiliary panel.

8.5 OPERATOR INTERFACE REQUIREMENTS FOR THE COORDINATED ANNUNCIATION PLAN

8.5.1 Equipment Usage Criteria

8.5.1.1 Main Plant Annunciators

Panels of annunciator windows arranged as matrices of visual alarm tiles shall be located above the related controls and displays at a height where they can be easily observed and read by an operator. Individual tiles shall be organized in system and functional groups. The auditory annunciator sources shall be located near the appropriate panels to help direct the operator by the source of the sound.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.5.1.2 ESF Status Monitoring

Status indicator light panels shall be located on the control panels just below the annunciator windows. Lettering on these shall be large enough to be read by a person standing near the panel. They shall be organized by system or function.

### 8.5.1.3 Auxiliary Shutdown Panel

Visual and auditory annunciation requirements shall be provided by the QDPS displays located on the auxiliary shutdown panel.

### 8.5.1.4 Plant Computers

#### A. Display Devices

- 1 One display device shall be located on the operator console for alarm display. A second utility display device shall be available on that console for annunciation support information, alarm sorts, and as a backup device for the alarm display.
- 2 An adequate number of alarm display devices shall be distributed on the vertical boards around the control room. They shall be mounted recessed and have the face angle adjusted for optimum glare control under existing control room lighting conditions. They should be paired with other display devices for backup. The primary function of these devices is for alarm display related to the controls and other display devices to which they are near. These alarm display devices may also be used by the operator for other functions as desired.



B. Alarm Display Controls

- 1 A function control keyboard shall be available on the main control board near each of the alarm displays. These are to enable the operator to obtain desired alarm details quickly with minimum training required to understand the controls and little effort to utilize them. Function keys shall be available to select alarm or other data displays, to cause alarms to be ordered chronologically or by priority, and for paging control.
- 2 The operator console shall contain the same function control keyboard as is mounted on the main control panels to control the alarm presentation display. In addition, there shall be function keys to select "all alarms" and to select alarms applicable to any specified part of the main control panel. There shall also be the capability to select alarm presentation by system and functional groupings.

The keyboard on CC020 will control the CRTs on that console and ZCP004 CRT, while the keyboard on ZCP007 will control CRTs on ZCP007 and ZCP008. A switch on each keyboard will allow the operator to select the CRT to which the keyboard will be connected.

There shall also be keys for reassignment of alarm displays on the main control panels. A "QWERTY" type keyboard may be included in addition for other functions, but a carefully planned dedicated function keyboard is required for alarm presentation control.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### C. Printers

- 1 One line printer shall be available in the control room to provide a log of all alarms and status changes. The printer shall have the capacity to keep up with incoming alarms.
- 2 A second printer shall serve as a utility printer and to back up the alarm printer. This will supply hard copy to the operator for alarm functions such as alarm sorts by priority or chronology, and by system or functional groups. A list of points out of scan, all ESF equipment bypassed and/or inoperable, and all equipment not in safety position or state shall be available.

### 8.5.2 Functional Criteria for Equipment

#### 8.5.2.1 Annunciator Tiles

The maximum number of tiles per annunciator window box shall be 50. The most important deviations shall have annunciator tiles dedicated to them. Other deviations shall be displayed on multiple input windows whenever this is feasible. These tiles shall be grouped in a logical manner (i.e., by system and function) and located above the appropriate control panel. The objective is to present an acceptable amount of information for the operator to deal with at any moment.

The principal means for reducing the number of alarm tiles are careful organization by system and function, elimination of tiles for status indication, use of carefully selected multiple input tiles, and utilization of the plant and ERF computer alarm functions to a much greater extent for detailed alarm information.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

When an alarm condition occurs, the appropriate tile shall flash until acknowledged by the operator. All flashing windows under control of a given acknowledge control shall cease flashing, but remain lit, when that acknowledge control is depressed. Highest priority alarms shall be lighted in red, both when flashing and when steady. A return to normal shall cause the window to flash slowly (approximately one-half the alarm flash frequency). Reset shall turn off the lights in those windows which have returned to normal. However, a multiple input window shall not be able to be reset until all inputs to it have returned to normal.

### 8.5.2.2 Computer-Driven Display

Selected alarms generated within or going to the main plant annunciator system shall be available to the plant or ERF computer for display purposes. Additional alarms may be generated within the computers and these shall also be available for display.

When one of these selected points goes into alarm, the computer alarm display shall show a line for that point. The point shall be identified and the deviation type and/or numeric value, if applicable, together with the set point and the priority level shall be shown. One special character in the displayed line shall flash until the alarm is acknowledged. Color coding of the flashing character shall be used to supplement the indicated numeric priority. Each computer driven alarm display page shall show the current time, what page of alarms is being displayed, how many alarm pages apply to that display, and how many unacknowledged alarms exist.

All alarms shall be logged on the line printer in the control room.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.5.2.3 Example of Annunciation Operation

The table below provides an example of the operation of a representative coordinated display and auditory alert plan which is intended by these criteria.

<u>Situation</u>	<u>Control</u>	<u>Horn</u>	<u>Annunciator Title</u>	<u>CRT Display</u>		<u>Parameter Value</u>
				<u>Special Character</u>		
Normal	-	-	-	-	-	-
Deviation	-	On	Flashing Red Flashing White Flashing Yellow	Flash Red Flash White		Yellow
Deviation	Silence	Off	Flashing Red Flashing White Flashing Yellow	Flash Red Flash White		Yellow
Deviation	Acknow	Off	Steady Red Steady White Steady Yellow	Steady Red Flash White		Yellow
Return to Normal	-	Chime, Self Terminating	Slow Flash Red Slow Flash White Slow Flash Yellow	Slow Flash Green Slow Flash White		Green
Normal	Reset	Off	Off	Blank		Blank
Normal or Deviation	Test	On	Flashing Red Flashing White Flash Yellow	Flashing Red "Test"		-
Normal or Deviation	Reset after Test	Off Automat- ically	As Before	As Before		As Before





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.6 MISCELLANEOUS CRITERIA

#### 8.6.1 Inapplicable Alarms

Alarms not related to Control Room operations shall be eliminated from the control room (e.g., security alarms should be sent to the security department on the security monitoring system). During plant operations, where alarms are generated, but no true alarm condition exists, (such as low discharge pressure when the associated pump is not required to run), it is desirable that the alarm be prevented.

#### 8.6.2 Device Alternates

All computer-driven display and printer devices shall have alternates and device failures shall cause the alternate to be used automatically. No single failure of a device shall cause lost information.

#### 8.6.3 Expansion Capability

Some expansion capability shall exist in both the annunciator system and in the plant and ERF computers to add additional alarm annunciation.

#### 8.6.4 Response Time

The time from the input to the annunciator and/or computer systems of a plant deviation to the time of the annunciation and display of that deviation shall not be greater than one second.

#### 8.6.5 Consistent Methods

Consistent application of identification techniques, use color and sound, and operator response shall be a requirement for all subsystems within the coordinated annunciation plan.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### 8.6.6 Parallel Inputs

Inputs to the main plant annunciation shall be isolated and directed in parallel to the appropriate computer system for display or logging, as applicable.

### 8.6.7 Window Box Row/Column Labeling

All annunciator window boxes shall have row/column labeling so that each tile can be readily identified.

### 8.6.8 Replacement of Annunciator Lamps

The annunciator window design shall permit rapid replacement of lamps, present no shock hazard during maintenance activities, and include a means to ensure correct tile replacement.

### 8.6.9 Tile Lighting

There shall be good contrast between lit and unlit tiles. Good contrast is also required between flashing and no flash states. A normal tile shall be dark. Blank tiles shall never be lit except for testing. In case of flash failure, the tile shall still light up.

### 8.6.10 Tile Legend

Tile legend shall be unambiguous and address specific conditions. Abbreviations and acronyms shall be consistent with those used elsewhere in the control room. Use of abbreviations shall conform to the guidelines given in Appendix L.



8.6.11 Tiles Readability

Tile lettering should conform to the following criteria:

- A. Character height should subtend a visual angle of 15 minutes as a minimum, or 0.004 viewing distance.
- B. Letter height should be identical for all tiles, based on maximum viewing distance.
- C. Letters should be in Capital Letters, without serifs.
- D. Character width-to-height should be between 1:1 and 3:5.
- E. Stroke width-to-character height ratio should be between 1:6 and 1:8.
- F. Minimum spacing between characters should be one stroke width.
- G. Minimum spacing between words should be one character width.
- H. Minimum spacing between lines should be one-half the character height.
- J. Tiles should be sized to accommodate at least three lines of 15 characters each.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX B  
COMPUTER CRITERIA

(EXTRACTED FROM CRDR CRITERIA REPORT)



12.0 PLANT COMPUTER FEATURES

12.1 FUNCTIONAL REQUIREMENTS

Basic plant computer functions which are required fall into five categories:

- A. General analog and digital input monitoring
- B. Logging of plant operating data, alarms and status changes
- C. Performance and other special calculations
- D. Historical data collection, storage and retrieval
- E. Display of alarms and other plant operation data

The major advantages of computer assisted information processing in the control room are improved quality of information presentation as well as reduced number of indicators necessary for proper identification of the plant status. Potentially, the computer can perform the functions of preliminary analysis and integration of relevant data on the basis of a prespecified plant model implemented in the data base.

12.2 EQUIPMENT REQUIRED

Equipment shall be provided for driving the required displays, accepting inputs and acknowledgements from the operator and providing communication links with other systems.

An operator interface shall be included which provides display devices, display controls, and printers for implementing the operator/plant interface requirements.

Sufficient redundancy shall be provided to satisfy all functional and availability requirements.





12.3 CRITERION FOR INTEGRATION WITH CONTROL ROOM

12.3.1 Location

Displays shall be located in the control room on the main control panels and on a special operator's console. Printers shall also be located in the control room. Dedicated function control keys shall be the primary means for requesting displays on the main control panels. Operator controls for computer displays shall also be located on the operator console. Programming and other controls which could cause system failure, if inadvertently used, shall be locked out or located outside the control room.

12.3.2 Redundancy Requirements

All display and printer devices shall have backups. An adequate number of display devices shall be mounted on the main control boards to supplement operator requirements for detailed alarm and other systems and performance information. At least two display devices shall be located on the operator console and at least two printers shall be located in the control room.

12.3.3 Operator Interface

The plant computer operator interface shall be integrated into the control room in such a manner that it will:

- A. Not interfere with access to the operator interface of any other system;
- B. Be readily observed during normal operational activities;
- C. Impose little or no additional training requirements upon the operating staff (i.e., the displays, indicators and controls should be very nearly self-explanatory).



12.3.4 Plant Computer System Status

Plant computer status indication shall be provided in the control room. Alarm annunciation shall be provided for plant computer failures.

12.3.5 Diagnostics, Testing, and Surveillance Criteria

Provisions shall be made for execution of periodic self-diagnostics at least once per, second without affecting the normal plant computer functions.

Other programs shall be available to be executed upon operator manual request to verify the system operation without removing the system from service.

A set of programs shall be available to support and expedite surveillance testing. These may require temporary removal of the system from service.

12.3.6 Guidelines

Reference the following appendices for additional guidelines applicable to the plant computer.

- A. Appendix O - Process Computer Guidelines
- B. Appendix P - Guidelines Pertaining to Keyboards, Function Controls, Computer Response Times and Access Aids
- C. Appendix Q - Guidelines Specific to CRT Displays
- D. Appendix R - Printers Guidelines



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX O

PROCESS COMPUTER GUIDELINES



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### O.1 FUNCTION

The process computer shall provide the operators with assistance in continuous assessment and evaluation of process and system status information.

### O.2 OPERATOR - COMPUTER INTERFACE

Effectiveness and operator's acceptance of the computer assisted process monitoring depends largely on the quality of man-computer interfaces, i.e., simplicity of procedures required to identify and retrieve necessary data and suitability of formats in which the retrieved information is displayed. Therefore, the basic Human Factors criteria in the design of man-computer interface can be formulated, essentially as a requirement to minimize the number and complexity of computer specific notions and procedures to be learned by the operator, so that he is able to effectively communicate with the system. The following criteria shall be considered in the design of the operator-computer interface:

- A. Command method, documents, procedures and CRT displays designed for the operator's use shall incorporate the operator's point of view, not the programmer's.
- B. The operator shall be provided with a convenient means of major displays without searching through supplementary manuals or memorizing special codes and procedures.
- C. Display formats shall be consistent with information presentation standards adopted in the control room.
- D. Groups of functionally interrelated displays, e.g., those representing plant systems and corresponding subsystems, should be organized into hierarchical sets with simple access from one display to another. The hierarchy of displays shall include a list (menu) of all the display sets available, with numerically



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

designated items. Menus shall be functionally organized into a single multi-level system.

- E. An operator input procedure shall be developed so that the operator is prompted through all of the sequential steps for the input procedure. The system shall provide feedback indicating the mode of system operation, acknowledging operator actions, or indicating the action's outcome and subsequent actions required. Correction of individual errors in the inputted sequence shall not require re-entry of correctly entered data. Error messages generated by the system shall include instructions on required corrective actions.
- F. Displays most frequently requested shall be accessed by a group of dedicated function keys. The function keyboard shall be laid out in the format that corresponds to natural procedural sequence.
- G. Process parameters that indicate an alarm state shall be represented by conspicuous (blinking) alarm messages on corresponding displays.
- H. The alarm function display shall be updated to reflect most current alarm status.
- I. As new alarms are received, the previous messages shall be moved down the screen. After filling the screen, the oldest messages shall be removed, the information shall be fully retained, and the operator shall be provided with the means to recall any alarm page.
- J. The alarm message shall consist of the following:
  - 1. Point identification





2. English legend
  3. An alpha symbol to denote the limit exceeded
  4. The value of the alarm limit
  5. The value of the variable
- K. The operator shall be able to remove alarm messages after the point has returned to normal.
- L. The acknowledge key shall cause the blinking display to return to steady state.
- M. Provisions shall be made such that operation of any of the keys on the main control panels cannot cause loss of valid alarms.
- N. Hard copy reflecting the history of the alarm messages shall be generated.
- O. A structured menu of all interface functions, with their brief explanations, shall be available to the operator. Selectable menu items shall be designated by numbers.
- P. Chronological listing of event messages representing the change of state of any of the inputs designated as sequence of events shall be available at the operator's request, providing a minimum of 200 sequence of event points, with time resolution of the sequence of events not greater than one millisecond.
- Q. All CRT displays shall be conveniently located and provide unobstructed view for the operator at the normal work station. Maximum screen fill time shall be less than one second. Dynamic update time shall be as close as possible to two seconds.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### O.2.1 SOFTWARE SECURITY

(Ref: NUREG-0700, Sec. 6.7.1.1)

Access to the process computer software and data base from the control room shall be closely controlled. The following criteria shall apply to ensure software security:

- A. Provisions shall be made to ensure that only authorized personnel have access to the data base, programs, and other areas in software.
- B. Preferred security method is keylock and password combination for accessing different software levels along with other built-in security deterrents.
- C. The plant data acquisition system shall be protected against overwriting its operating system software due to error or improper instruction in unrelated software or due to unauthorized or inadvertent changes. One copy of the current operating software shall be stored in a specially designated remote location.
- D. Certain data must be preserved through extended power outages. Power backup should be provided for a minimum of two hours.
- E. Any operator action which might result in permanent changes to the existing data, or yield significant consequences to the computer system, shall be executed only after explicit operator confirmation. The confirmation shall not be a component of a routine command sequence and shall present sufficient safeguard against inadvertent actions.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### O.2.2 OPERATOR/COMPUTER DIALOGUE

(Ref: NUREG-0700, Sec. 6.7.12)

The following criteria shall apply for the operator/computer dialogue:

- A. Command language utilized in the operator/computer interaction shall be based on vocabulary and syntax suitable for use by the expected user population.
- B. Keywords the operator is required to input in the dialogue shall approximate generally used words.
- C. Abbreviations shall be used whenever practical to minimize the entry length. Only standard abbreviations from the Abbreviations List in Appendix L shall be used.
- D. In any entry sequence, individual input words shall not have more than seven characters.
- E. Entry sequences shall be initially stored in the buffer area and displayed for operator reviewing before being collectively inserted by special command.
- F. Provisions shall be made so that information about the mode of system operation, currently processed file, and peripheral devices summary are available upon request to indicate the status of the system and system peripherals.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX P

GUIDELINES PERTAINING TO KEYBOARDS, FUNCTION CONTROLS,  
COMPUTER RESPONSE TIMES, AND ACCESS AIDS



P.1 KEYBOARDS AND COMPUTER FUNCTION CONTROLS

(Ref. NUREG-0700, Sec. 6.7.1.4, 6.7.1.5)

The following criteria shall apply for the computer keyboards:

- A. If alphanumeric keyboards are used they shall be of standard "QWERTY" typewriter keyboard configuration. However, dedicated function keyboards shall be the primary means of communication with the computer by the control room operators at the main control boards.
- B. To maximize the effectiveness of keyboards:
  - 1. Key dimensions and separations shall be as indicated in Table P-1.
  - 2. Keyboard shall have a slope between 15° and 25° from the horizontal.
  - 3. Key displacement and resistance shall be as indicated in Table P-2.
- C. Control room keyboards shall contain only those keys which are used by the operators. A positive key activation feedback shall be provided to the operator.
- D. Data shall be displayed as it is being entered via the keyboard.
- E. Function pushbuttons located on the control panel shall be grouped together.
- F. Each function key shall have a label identifying its function.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- G. Terms and abbreviations used on function controls shall be consistent with those designating the associated computer function.

Refer to Appendix Q for criteria specific to CRT displays.

Refer to Appendix R for criteria specific to printers.

### P.2 MASTER CONTROLS AND CONTROL DEVICES

(Ref: NUREG-0700, Sec. 6.7.1.6)

The computer's control devices shall conform to the following criteria:

- A. Centrally located CRT controls shall have positive indication of what CRTs are operated by them. At the same time, individual CRTs shall have indication of whether they are under local or centrally located control.
- B. Control devices shall be operable from the locations designated for operator/computer interaction.
- C. Speed and accuracy of control devices shall be commensurate with the functions to be served.
- D. Location and design of controls shall allow the operator sufficient freedom of movement.

### P.3 COMPUTER RESPONSE TIME TO QUERIES

(Ref. NUREG-0700 Sec. 6.7.1.7)

The computer system shall have response time for each type of query which does not exceed the limits in Table P-3.



P.4 ACCESS AIDS

(Ref: NUREG-0700, Sec. 6.7.1.8)

A complete set of documents necessary to accomplish all of the operator-computer interface functions shall be available in the control room. Documents shall be in hard-copy form and prepared from the point of view of the control room operator. The set of documents shall include the following:

- A. Manual for the computer system describing its operation and interface procedures, including a functional diagram and location of status information.
- B. Addresses by which data displays can be called up by the operator shall be cross-indexed by: Alphanumeric or numeric codes, program name, system/subsystem identification and functional group identification.
- C. Plant computer system restart log.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

TABLE P-1  
KEY DIMENSIONS AND SEPARATIONS

	<u>Key Dimension</u> <u>(inches)</u>	<u>Key Separation</u> <u>(inches)</u>
Minimum	0.385	0.25
Maximum	0.75	
Preferred	0.5	0.25

TABLE P-2  
KEY DISPLACEMENT/RESISTANCE RANGE

	<u>Displacement</u> <u>(inches)</u>	<u>Resistance</u> <u>(ounces)</u>
Minimum	0.05	0.9
Maximum	0.25	5.3



TABLE P-3  
MAXIMUM RESPONSE TIME

<u>Query Type</u>	<u>Seconds</u>
Control activation	0.1
System initialization 3.0	
Request for given service	
Simple	2
Complex	5
Loading and feedback	15-60
Error feedback	2-4
Response to ID	2
Information on next procedure	2
Response to simple inquiry from list	2
Response to complex inquiry	2-4
Request for next page 0.5-1	
Response to "execute problem"	15
Response to complex inquiry in graphic form	2-10
Response to graphic manipulation	2
Response to user intervention in automatic process	4

When response time for a query exceeds three seconds, normal computer operation shall be periodically confirmed by delay messages.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX Q

GUIDELINES SPECIFIC TO CRT DISPLAYS





Q.1 CRT DISPLAY CHARACTERISTICS  
(Ref. NUREG-0700, Sec. 6.7.2.1)

Most contemporary process computer systems include one or more CRTs. These CRTs comprise the principal interface between computer output and control room operators. It is therefore important that the characteristics of the CRT display optimize the information transfer from the computer to the operator. The quality of the displayed image must be consistent with operator needs. The following criteria shall be used to ensure image quality:

- A. Readability - All characters, both alphanumeric and graphic, shall be easily readable by the operator under all control room lighting conditions.
- B. Reflected Glare - CRT screens shall be installed to minimize or eliminate glare at normal operator viewing angles.
- C. Screen Luminance
  - 1. Ambient illumination shall contribute no more than 25 percent to screen luminance.
  - 2. When the CRT employs dark characters on a light background, the screen background luminance shall be between 23 foot-Lamberts (minimum) and 46 foot-Lamberts (preferred).
  - 4. When the CRT employs light characters on a dark background, the character luminance shall be between 23 foot-Lamberts (minimum) and 46 foot-Lamberts (preferred).



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### D. Luminance Contrast

Contrast between the characters and the background shall be 15:1 (minimal) and 20:1 (preferred).

### E. Geometric Distortion - No point on the CRT viewing area shall be displaced by more than five percent of the picture height from its correct position.

### F. Resolution

1. Alphanumeric CRTs shall have a minimum of 20 resolution elements per inch.
2. CRTs for displaying complex symbols and graphic detail shall have a minimum of 100 resolution elements per inch.
3. Complex symbols which must be distinguished from other complex shapes shall have a minimum of 10 resolution elements for the longest dimensions of the symbol.
4. Alphanumeric characters shall have a minimum of 10 resolution elements per character height.

### G. Regeneration Rate

The regeneration rate for a particular CRT display shall be above the critical frequency at fusion so that the occurrence of disturbing flicker is not perceptible.



H. CRT Display Controls

1. Brightness, contrast and color shall be adjustable by the operator.
2. Adjustment controls shall conform to the appropriate criteria in Section 6.2 for Controls, and Section 6.6 for Control-Display Integration.

Q.2 SYMBOLS AND CHARACTERS

(Ref. NUREG-0700, Sec. 6.7.2.2)

Visual angles are the vertical angles subtended at the eye by a viewed object, symbol, or character. This angle, expressed in minutes of arc, decreases in proportion to the operator's distance from the CRT. This distance varies considerably because of the operator's movements within the control room. The human eye can distinguish symbols and characters at visual angles of five minutes of arc under ideal conditions. However, because operational environments are not ideal, more stringent criteria than the above have to be applied. Following is a list of such criteria for seven CRT symbol/character variables.

- A. Symbol Size - A visual angle of least 20 minutes of arc shall be used for complex symbols that must be distinguished.
- B. Alphanumeric Character Size
  1. Alphanumeric character shall have a visual angle of not less than 12 minutes of arc at the required viewing distance.
  2. Alphanumeric characters shall be upper case letters.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- C. Character Width-to-Height Ratio - The width-to-height ratio for alphanumeric characters shall be between 3:5 and 1:1.
- D. Stroke Width to Character Height Ratio - Stroke width to character height ratio shall be between 3:5 to 1:10.
- E. Graphics - Graphic lines shall contain a minimum of 50 resolution elements per inch to ensure the illusion of continuity among these elements.
- F. Character and Symbol Separation
  - 1. Horizontal separation between characters or symbols shall be between 10 percent and 65 percent of symbol height.
  - 2. Separation shall not be less than 25 percent of character or symbol height when any of the following degraded conditions are present:
    - a. Character or symbol width is less than 85 percent of height
    - b. Character or symbol luminance is less than 12 foot-Lamberts
    - c. Luminance contrast is less than 88 percent
    - d. CRT screen location is greater than 35° to either side of the operator's straight ahead line-of-sight (LOS)
    - e. Visual angle subtended by symbol height is less than 15 minutes of arc



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- f. Visual angle subtended by character height is less than 12 minutes of arc

### G. Character Style (Font)

1. Simple character fonts shall be used (no serifs, variable stroke widths, slanting, etc.).
2. When dot-matrix characters are used, 7x9 dot-matrix shall be used in preference to 5x7 dot-matrix.
3. Character styles such as Lincoln/Mitre or Leroy shall be used.

### Q.3 OPERATOR - DISPLAY RELATIONSHIP (Ref. NUREG-0700, Section 6.7.2.3)

CRTs may be either (1) fixed position mounted in a seated operator console; (2) fixed position mounted in a vertical standup panel; or (3) rotatable or moveable mounted on a stand or desktop. The following criteria will be considered regardless of the type of CRT installation and applied as necessary.

- A. Viewing distance shall be at least 18 inches.
- B. The minimum angle between the operator's actual line-of-sight (LOS) as measured from the operator's normal work location when viewing a display and the plane of the display screen shall be 45° or greater, in either the horizontal or vertical direction.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### C. Screen Location, Seated Operators

1. CRT displays requiring frequent or continuous monitoring, or which display critical (e.g. alarm) information, shall be located within the following limits as measured from the normal operator work station:
  - a. Horizontal Limits - Not more than  $35^{\circ}$  to either side of the operator's straight-ahead LOS
  - b. Vertical Limits - Not more than  $20^{\circ}$  above and  $40^{\circ}$  below the operator's horizontal LOS
2. CRTs not requiring frequent or continuous monitoring, and which do not display critical (e.g. alarm) information, shall be located within the following limits as measured from normal work stations permitting full head and eye rotation:
  - a. Horizontal Limits - Not more than  $95^{\circ}$  to either side of the operator's straight-ahead LOS
  - b. Vertical Limits - Not more than  $70^{\circ}$  above and  $90^{\circ}$  below the operator's horizontal LOS

### D. Screen Location, Standing Operators

1. CRT displays requiring frequent or continuous monitoring, or which display critical (e.g. alarm) information, shall be located within the following limits as measured from normal operator work locations in the control room:
  - a. Horizontal Limits - Not more than  $35^{\circ}$  to either side of the operator's straight ahead LOS



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- b. Vertical Limits - Not more than 35° above and 25° below the operator's horizontal LOS
- 2. CRTs not requiring frequent or continuous monitoring, and which do not display critical (e.g. alarm) information, shall be located within the following limits as measured from normal work locations in the control room permitting full head and eye rotation:
  - a. Horizontal Limits - Not more than 95° to either side of the operator's straight ahead LOS
  - b. Vertical Limits - Not more than 85° above and 90° below the operator's horizontal LOS
- E. When CRTs are mounted in consoles, the console configuration, dimensions, and type of use shall conform to the criteria that apply to work station design. These criteria are given in Appendix A.
- F. All data and messages shall be within the unobstructed view of an operator at the normal work station.

### Q.4 DATA PRESENTATION FORMAT (Ref. NUREG-0700, Section 6.7.2.4)

The format used in presenting CRT data shall correspond to the following criteria:

- A. Usability of Data
  - 1. Data shall be presented in a readily usable format.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

2. Operators shall not be required to transpose, compute, interpolate, or mentally translate displayed data into other numerical units or bases.
- B. Illustrations shall be used whenever possible to supplement text.
- C. Character Grouping
1. Characters shall be grouped in blocks of three to four when five or more digits and/or non-text alphanumerics are displayed, and no natural organization exists.
  2. Groups should be separated by a minimum of one blank character space.
- D. Elements in a data field should be displayed in logical order (e.g. chronological)
- E. Presentations of Identical Data
1. The manner of presentation of identical data should be based on the uses to which the data will be put by the operator.
  2. Within the limits of 1. above, identical data in different presentations shall be displayed in a consistent, standardized manner.
- F. Menu Designators
1. Numbers shall be used as designators when listing selectable items unless confusion is created because of other numbers comprising the designated items in which case, alphabetic characters may be used.



2. Numerical designators shall start with the number "1" or "101" (not zero).
3. If used, alphabetic designators shall start with the letter "A".

G. Lists

1. Lists shall be vertically aligned and left-justified.
2. Indentation shall be used for subclassifications.

H. Tables and Graphs - Quantitative data to be scanned and compared shall be presented in either tabular or graphic form.

I. Hyphenation - Hyphenation will be minimized.

J. Alignment

1. When presented in tabular form, alphanumeric data shall be left-justified.
2. When presented in tabular form, numeric data shall be right-justified with decimal points aligned.

K. Periods shall be placed after item selection designators and at the end of a sentence.

L. The following standardized fields will be used:

1. Telephone Number: (914) 555-1212
2. Time: HH:MM:SS, HH:MM, MM:SS:(.S)
3. Date: MM:DD:YY





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### M. Data Group Labeling

1. Descriptive titles shall be used for each individual data group or message.
2. Unique characteristics of the content of the data group or message shall be reflected in the selection of labels.

### N. Labels shall be located in a consistent manner either above or to the left of the data group or message they describe.

### O. Labels shall be horizontally (not vertically) oriented.

### P. Label Highlighting

1. Labels shall be highlighted or otherwise accentuated to facilitate operator scanning and recognition.
2. The technique used to highlight labels shall be easily distinguished from that used to highlight emergency and other critical messages.

### Q. When presenting a list of operation options, the label shall reflect the question or choices being posed to the operator.

## Q.5 SCREEN LAYOUT AND STRUCTURING

(Ref. NUREG-0700, Section 6.7.2.5)

Screen layouts and data structure presented on CRTs shall minimize the probability of operator error. The following criteria shall be used to achieve this goal:

- ### A.
- Displayed data shall be organized in a logical, consistent manner and shall reflect some obvious and inherent quality of the data groups (e.g. hierarchical, sequential, or mimic).





- B. Consistent physical locations shall be used for specific data groups.
- C. Organization and separation of information subgroups shall be made apparent through the use of blank spaces, lines, or some other form of visible demarcation.
- D. Lists of options shall be organized according to the probability of selection of each item (high probability items presented first).
- E. Non-option lists of equal probability options shall be presented in alphabetical or numerical order.
- F. At least one blank line shall be used to separate paragraphs in continuous text.
- G. At least one blank space shall be used to separate selection designators from text designators.
- H. When multiple pages are used to present data, each page shall display both page number and total number of pages.
- I. Items contained in a numbered list and described on "continue" pages shall be numbered relative to the first number on the first page of the list.
- J. Operator instructions shall precede the list of options.
- K. Urgent messages requiring immediate operator response shall be:
  - 1. Highlighted to attract attention
  - 2. Displayed in the same location



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- L. In systems where selection is made by use of a cursor, formats shall be organized to minimize positioning movements of the cursor.
- M. The amount of information-bearing activated screen area shall not exceed 25% of the total screen area (excluding demarcation lines used to separate data groups).
- N. Trend plot scales shall be consistent with the intended functional use of the data .

### Q.6 MESSAGES

(Ref. NUREG-0700, Section 6.7.2.6)

Messages (whether prompts, error messages, or systems feedback) shall conform to the following criteria:

- A. Messages shall be concise and provide information required to complete a specific action or decision sequence.
- B. Information contained in messages shall be necessary, complete, and readily usable.
- C. Prompts shall be used when the operator may need direction or guidance to initiate or complete an action or sequence of actions.
- D. Prompts shall contain clear and specific cues and instructions which are relevant to the action to be taken.
- E. Directions shall be in the sequence to be used by the operator.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- F. Error messages shall be included for any error or invalid input.
- G. Error messages shall contain instructions regarding required corrective action.
- H. Capability shall be provided for individual error correction without affecting adjacent valid entries.
- I. When system status changes, feedback messages shall convey this information to the operator.
- J. When a displayed item is selected as an option or input to a system, the item shall be highlighted, or otherwise positively identified, to indicate acknowledgment by the system.
- K. When system functioning requires the operator to standby, such as when the computer is searching for requested data, periodic feedback shall be provided the operator to indicate normal system operation and the reason for delay.
- L. When a process or sequence is completed by the system, positive indication shall be provided concerning the outcome of the process and requirements for subsequent operator actions.

### Q.7 GRAPHIC CODING AND HIGHLIGHTING

(Ref. NUREG-0700, Section 6.7.2.7)

The following criteria shall be applied:

- A. Highlighting shall be used to attract attention to displayed data that are important to actions and decisions.



B. Consistent Approach

1. Highlighting methods shall be consistent among applications.
2. Highlighting methods shall be different for normal and abnormal conditions.

C. When contrast enhancement is used for highlighting, not more than two (preferable) or three (maximum) brightness levels shall be used in a single presentation.

D. Blinking of a symbol or message shall be used for emergency (or other critical) conditions only.

E. Blink Rates

1. No more than two blink rates shall be used.
2. For a single blink rate, the rate shall be two to three blinks per second with a minimum of 50 msec "on" time between blinks.
3. When two blink rates are used, the fast blink shall approximate four per second and the slow rate shall approximate one per second. The on/off ratio shall approximate 50%, and the higher rate shall apply to the most critical information.

F. Image reversal (e.g., dark characters on a light background) shall be used primarily for dense data fields, such as a word or phrase in a paragraph of text, or a set of characters in a table of data.



- G. Graphic coding (e.g., boxes, symbols, underlining) shall be used to present standard qualitative information or to draw attention to a particular portion of the display.
- H. Graphic codes shall have the same meaning in all applications.
- I. When geometric shape (symbol) coding is used, the symbols shall vary widely in shape.
- J. Number of Symbols
  - 1. The number of basic symbols used for coding shall not exceed the operator's ability to discriminate among them. This will range from 6-20 symbols, depending on the display conditions.
  - 2. Other highlighting and graphic techniques (e.g., color) shall be used as needed to display different states or qualities of a basic symbol.
- K. Use of Color

The following criteria shall be applied to the use of color for CRT display presentations:

- 1. CRT colors shall be consistent in use and meaning with all other color codes in the control room.
- 2. Once colors are assigned a specific use or meaning, no other color shall be used for the same purpose.





L. Color Meanings - Where possible, color meanings shall equate with the commonly understood meanings of those colors. Following are the specific meanings for three colors - red, green, and yellow/amber. However, other meanings of these colors, which are commonly understood for control room use, are also acceptable.

1. Red - Unsafe, danger, immediate action required, or critical parameter value out of tolerance.
2. Green - Safe, no action required, or parameter value is within tolerance.
3. Yellow/amber - Hazard, potentially unsafe, caution, attention, marginal parameter value exists.

M. Red-Green Combinations

1. Whenever possible, red and green colors shall not be used in combination.
2. Use of red symbols on a green background shall be avoided.

Q.8 MULTIPLE-PAGE CONSIDERATIONS  
(Ref. NUREG-0700, Section 6.7.2.8)

When it is necessary to include multiple pages, or when scrolling, panning, and zooming of a single page is anticipated, the following criteria will be applied:

- A. All data relevant to a specific operator entry shall be displayed on a single page, and requirements for operator memory shall be minimized.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### B. Location References

1. When scrolling or panning is required, location references shall be provided in the viewable portion of the frame.
2. Sectional coordinates shall be used when large schematics must be panned or magnified.

C. A capability shall exist for controlling the amount, format, and complexity of information displayed by the system.

D. If the message is a variable option list, common elements shall maintain their physical relationship to other recurring elements.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX R

PRINTERS GUIDELINES



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### R.1 CHARACTERISTICS

(Ref. NUREG-0700, Section 6.7.3.1)

The following criteria apply to the use of printers:

#### A. Printer Applications

1. Printers shall be part of the process computer system and be located in the primary operating area.
2. Control room printers shall provide the capability to record alarm data, trend data, and plant status data.

#### B. Display Copies

1. The capability shall exist to print any page appearing on the CRT.
2. If the print request is to be executed on a device remote to the operator, a confirmation (or denial) message shall be displayed.

#### C. Printed information shall be in a directly usable form with minimal requirements for decoding, transposing, and interpolating.

#### D. Printing speed shall be adequate to avoid more than one minute backlog of trend, alarm, and critical status information.



E. Printer Operation - Paper, ribbons, and ink (if used) shall be consistent with the following:

1. Hard-finish matte paper shall be used.
2. Instructions for routine maintenance (e.g. paper, ribbon reload) shall be attached to the printer.
3. When the printer is temporarily down, data which would normally be printed shall not be lost.
4. A takeup device for printed material shall be provided. This device shall require minimal operator attention.
5. Printers shall be plug-compatible and interchangeable.

F. Print Copy Accessibility

1. An operator shall always be able to read the most recently printed line.
2. Printed material shall have a contrast ratio sufficient to ensure easy reading.
3. It shall be possible to annotate the print copy while it is still in the machine.
4. Recorded matter shall not be obscured, masked, or otherwise hidden in a manner which prevents direct reading of the material.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### R.2 ALARM MESSAGES

(Ref. NUREG-0700, Section 6.7.3.2)

The following criteria shall be applied to alarm messages:

- A. Alarm Records
  - 1. A printer shall be provided for recording alarm messages.
  - 2. All annunciator alarms shall be recorded.
- B. Alarm messages shall be recorded in their sequence of occurrence.
- C. Upon operator request, printouts by alarm group (e.g., system, subsystem, component) shall be provided.
- D. Alarm messages shall be readily distinguishable from other messages.
- E. Alarm messages shall provide rapid identification of the nature of the alarm.
- F. Wording in alarm message should:
  - 1. Clearly relate to the specific annunciator tile that is illuminated, if such a relationship exists.
  - 2. Contain at least that information presented in the annunciator tile.
  - 3. Provide additional specific data.



R.3 GRAPH AND TABLE REQUIREMENTS

(Ref. NUREG-0700, Section 6.7.3.3)

When printers are used to record/present tabular data, criteria applicable to CRTs shall be used.

- A. If decisions are predicated on the shape of the function, a graph shall be used.
- B. If interpolation is necessary, line graphs are preferable to bar graphs and tables.
- C. Tables
  - 1. Tables shall be simple, concise, and readable.
  - 2. When table columns are long, numbers shall be separated into groups by providing a space between groups of five lines.
  - 3. When columns are not separated by vertical lines, the columns shall be separated by at least two character widths.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX C  
REVIEW CHECKLISTS



DATE 030983

PAGE 3



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE

\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG

\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF

\*\*\*\*\*

0510 03 ANNUNCIATORS 00 001 8.4.1 6.2.2.1

\*CRITERION TITLE ANNUNCIATOR AUDITORY ALERT-LOCATION OF ALARM

CRITERION NO. : 001

HORNS AND CHIMES ARE LOCATED ON THE CONTRL PANELS SO THAT THE LOCATION OF THE ALARM CAN BE DETERMINED BY THE DIRECTION OF THE SOUND.

\*HUMAN ERROR

CATEGORY NO. : A

DELAY IN IDENTIFYING ALARM.

\*DESCRIPTION OF OBSERVATION

SPECIFICATION PROVIDES FOR ONLY ONE DC BUZZER.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION

PRIORITY: 1

0036: PROVIDE ANNUNCIATOR HORN FOR EACH PANEL

\*PROJECT REVIEW TEAM - DISPOSITION

ACCEPT?: YES

0122: PROVIDE ANNUNCIATOR HORN FOR OPERATING AREA: PANELS 1,2,3,PANELS 4&amp;5, PANELS 6; PANELS 7,8,9,&amp;10, AND RECORDER &amp; HVAC PANEL.

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. DEVICE TAG NO. DEVICE CODE DEVICE TYPE

\*\*\*\*\*

1 N100-XXXXX--XXXX 00-A00-206 ANNUNCIATORS



DATE 030983

PAGE



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

* SHT .CK.	CHECKLIST	.PN.CRT.RV	STP	NUREG
* NO .NO.	TITLE	.NO. NO.NO	REFERENCE	. 0700 REF
0516	03 ANNUNCIATORS	00 016	8.4.4	6.1.3.4

\*CRITERION TITLE ANNUNCIATOR-PRIORITYIZATION  
THERE SHALL BE THREE PRIORITY LEVELS FOR COMPUTER DISPLAYS.

CRITERION NO. : 016

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
THERE IS NO PRIORITY OF THE COMPUTER ALARMS.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0037: PROVIDE PRIORITY CODING OF ANNUNCIATOR SYSTEM

PRIORITY: 1

\*PROJECT REVIEW TEAM - DISPOSITION  
0124: PROVIDE PRIORITY CODING OF ANNUNCIATOR SYSTEM OF WITHIN THE  
CAPABILITY OF THE COMPUTER SYSTEM.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE	DEVICE TYPE
1	N100-XXXXX--XXXX	00-A00-206	ANNUNCIATORS





DATE 030983

PAGE 3



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE

*SHT	CK	CHECKLIST	PN	CRT	RV	STP	NUREG
* NO	NO	TITLE	NO	NO	NO	REFERENCE	0700 REF

0518	03	ANNUNCIATORS	00	018	8.4.5	6.3.1.3	
------	----	--------------	----	-----	-------	---------	--

\*CRITERION TITLE ANNUNCIATOR-FIRST OUT  
SOME METHOD IS PROVIDED TO DETERMINE WHICH ALARM OCCURED FIRST.

CRITERION NO. : 018

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
A FUNCTION TO DETERMINE WHICH UNIT TRIP REACTOR OR TURBINE ALARM  
OCCURRED FIRST IS NOT INCLUDED IN THE SPECIFICATION OF THE  
ANNUNCIATOR SYSTEM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0062: ADD FIRST OUT TO ANNUNCIATOR SYSTEM

PRIORITY: 1

\*PROJECT REVIEW TEAM - DISPOSITION  
0125: ADD FIRST OUT TO ANNUNCIATOR SYSTEM.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
-----	----------------	--------------	-------------

1	N100-XXXXX--XXXX	00-A00-206	ANNUNCIATORS
---	------------------	------------	--------------



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0520 03 ANNUNCIATORS OO 023 8.4.9

\*CRITERION TITLE ANNUNCIATOR-ALARM COMBINATIONS  
ALARM CONDITIONS SHALL BE COMBINED INTO MULTIPLE INPUT WINDOWS WHERE THE  
MULTI-INPUT ALARMS SUMMARIZE SINGLE INPUT ANNUNCIATORS OR WHERE THE  
OPERATOR RESPONSE WOULD BE THE SAME FOR ALL.

CRITERION NO. : 023

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
ALARM CONDITIONS ARE NOT COMBINED INTO MULTIPLE INPUT WINDOWS.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0063: COMBINE THE SAME ALARM CONDITIONS INTO MULTIPLE INPUT TILES  
AND USE THE COMPUTER TO SUPPLY ALARM DETAILS OR ADD STATUS  
INDICATION ON THE CONTROL PANEL.

PRIORITY: 1

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0063: COMBINE THE SAME ALARM CONDITIONS INTO MULTIPLE INPUT TILES  
AND USE THE COMPUTER TO SUPPLY ALARM DETAILS OR ADD STATUS  
INDICATION ON THE CONTROL PANEL.  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N101-XXXXX--0015M OO-A28-206 ANNUNCIATORS  
2 N101-XXXXX--0002M OO-A12-206 ANNUNCIATORS  
3 N102-XXXXX--0013M OO-A27-206 ANNUNCIATORS



PAGE

DATE 030983

4	N102-XXXXX--0002M	00-A10-206	ANNUNCIATORS
5	N103-XXXXX--0002M	00-A20-206	ANNUNCIATORS
6	N103-XXXXX--0002M	00-A08-206	ANNUNCIATORS
7	N104-XXXXX--0009M	00-A17-206	ANNUNCIATORS
8	N105-XXXXX--0008M	00-A25-206	ANNUNCIATORS
9	N105-XXXXX--0009M	00-A07-206	ANNUNCIATORS
10	N106-XXXXX--0005M	00-A17-206	ANNUNCIATORS
11	N107-XXXXX--0008M	00-A13-206	ANNUNCIATORS
12	N108-XXXXX--0003M	00-A09-206	ANNUNCIATORS
13	N110-XXXXX--0003M	00-A13-206	ANNUNCIATORS



DATE 030983

PAGE



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF

\*\*\*\*\*  
0521 03 ANNUNCIATORS 00 025 8.4.9 6.3.1.2

\*CRITERION TITLE ANNUNCIATOR-ALARM COMBINATIONS  
DETAILED INFORMATION ON COMBINATION ALARMS IS AVAILABLE IN THE COMPUTER  
DRIVEN ALARM DISPLAYS AND ON THE ALARM LOG.

CRITERION NO. : 025

\*HUMAN ERROR  
FAILURE TO GIVE PROMPT ATTENTION TO PLANT DEVIATION  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : C

\*DESCRIPTION OF OBSERVATION  
THERE ARE ONLY 150 OUTPUTS FROM ANNUNCIATION WHICH CAN GO TO THE  
FROM MULTIPLE INPUT ALARMS AVAILABLE IN THE COMPUTER.

PRIORITY: 1

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0064: EXPAND THE NUMBER OF ANNUNCIATOR OUTPUTS WHICH CAN GO TO THE  
COMPUTER.

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0064: EXPAND THE NUMBER OF ANNUNCIATOR OUTPUTS WHICH CAN GO TO THE  
COMPUTER.  
0093: CHANGE CATEGORY NUMBER TO C.  
-----  
-----  
-----

ACCEPT?: YES

## \*REMARKS

IMPLEMENT ONLY IN CONJUNCTION WITH ANNUNCIATOR DESIGN CHANGES TO  
MINIMIZE FIELD CABLING. IMPLEMENT ONLY FOR MULTIPLE INPUTS.  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

## \*REMARKS

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*

1 N100-XXXXX--XXXX 00-A00-206 ANNUNCIATORS



DATE 030983

PAGE



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0526 03 ANNUNCIATORS 00 039 8.5.1.1

\*CRITERION TITLE OPERATOR INTERFACE  
CRITERION IS NOT AVAILABLE FOR THE CK. NO. & CRT. NO. ISSUED INDIVIDUAL  
ANNUNCIATOR TILES ARE ORGANIZED IN SYSTEM AND FUNCTIONAL GROUPS.

CRITERION NO. : 039

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
FUNCTIONALLY RELATED ANNUNCIATORS ARE NOT LOGICALLY AND ARE NOT CON-  
SISTENTLY GROUPED.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0018: REPOSITION ANNUNCIATORS

PRIORITY: 1

\*PROJECT REVIEW TEAM - DISPOSITION  
0128: AS PART OF THE ANNUNCIATOR STUDY, REPOSITION ANNUNCIATORS CONCURRENT  
WITH PANEL MODIFICATION.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX--0015M	01-A28-206	ANNUNCIATORS
2	N101-XXXXX--0002M	01-A12-206	ANNUNCIATORS
3	N102-XXXXX--0013M	02-A27-206	ANNUNCIATORS
4	N102-XXXXX--0002M	02-A10-206	ANNUNCIATORS
5	N103-XXXXX--0002AM	03-A20-206	ANNUNCIATORS
5	N103-XXXXX--0002M	03-A08-206	ANNUNCIATORS





DATE 030983

PAGE

7	N104-XXXXX--0009M	04-A17-206	ANNUNCIATORS
8	N105-XXXXX--0008M	05-A25-206	ANNUNCIATORS
9	N105-XXXXX--0009M	05-A07-206	ANNUNCIATORS
10	N106-XXXXX--0005M	06-A17-206	ANNUNCIATORS
11	N107-XXXXX--0008M	07-A13-206	ANNUNCIATORS
12	N108-XXXXX--0003M	08-A09-206	ANNUNCIATORS
13	N110-XXXXX--0003M	10-A13-206	ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT CK. CHECKLIST PN.CRT.RV STP NUREG  
\* NO NO. TITLE NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0536 03 ANNUNCIATORS 00 063 8.5.1.5

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER DISPLAY DEVICES  
AN ADEQUATE NUMBER OF ALARM DISPLAY DEVICES ARE DISTRIBUTED ON THE VERTICAL  
BOARDS AROUND THE CONTROL ROOM.

CRITERION NO. : 063

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : C

\*DESCRIPTION OF OBSERVATION  
ONLY 3 CRT ARE MOUNTED ON THE VERTICAL BOARDS. THIS IS INSUFFICIENT TO  
HAVE AN ALARM DISPLAY DEVICE REASONABLY NEAR ALL PARTS OF THE BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0098: DEVELOP COORDINATED SCHEME FOR ALARMS OR ANNUNCIATOR TILES AND CRT  
DISPLAYS.

PRIORITY: 1

\*PROJECT REVIEW TEAM - DISPOSITION  
0130: DESIGNATE EXISTING ALARM CRT FOR PANEL 7 AND ONE FOR PANEL 4-5 AREA.  
CONSIDER PROVIDING ERF DISPLAYS FOR ESF ANNUNCIATION ON PANELS 1-3.  
0093: CHANGE CATEGORY NUMBER TO C.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N105-XXXXX--0001M	05-B02-213	CRT'S
2	N106-XXXXX--0006M	06-D02-213	CRT'S
3	N107-XXXXX--0007M	07-B02-213	CRT'S
4	N104-XXXXX--0010M	04-B02-213	CRT'S



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0549 03 ANNUNCIATORS 00 078 8.5.2.1 6.3.3.3

\*CRITERION TITLE ANNUNCIATOR-FUNCTIONAL CRITERIA FOR EQUIPMENT  
THE MAXIMUM NUMBER OF TILES PER ANNUNCIATOR WINDOW BOX IS 50.

CRITERION NO. : 078

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.  
FAILURE TO GIVE PROMPT ATTENTION TO PLANT DEVIATION

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATOR WINDOW BOXES HAVE UP TO 96 ALARM WINDOWS.

PRIORITY: 1

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0103: DECREASE THE NUMBER OF ANNUNCIATOR TILES PER ANNUNCIATOR BOX.

\*PROJECT REVIEW TEAM - DISPOSITION  
0103: DECREASE THE NUMBER OF ANNUNCIATOR TILES PER ANNUNCIATOR BOX.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N101-XXXXX--0015M 01-A28-206 ANNUNCIATORS  
2 N101-XXXXX--0002M 01-A12-206 ANNUNCIATORS  
3 N102-XXXXX--0013M 02-A27-206 ANNUNCIATORS  
4 N102-XXXXX--0002M 02-A10-206 ANNUNCIATORS  
5 N103-XXXXX--0002A 03-A20-206 ANNUNCIATORS  
6 N103-XXXXX--0002A 03-A08-206 ANNUNCIATORS  
7 N104-XXXXX--0009A 04-A17-206 ANNUNCIATORS  
8 N105-XXXXX--0002A 05-A25-206 ANNUNCIATORS  
9 N105-XXXXX--0009A 05-A07-206 ANNUNCIATORS



PAGE

DATE 030983

10 N106-XXXX--0005A 06-A17-206 ANNUNCIATORS  
11 N107-XXXX--0008A 07-A13-206 ANNUNCIATORS  
12 N100-XXXX--0003M 00-A09-206 ANNUNCIATORS  
13 N100-XXXX--0003M 00-A13-206 ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0566 03 ANNUNCIATORS 00 102 8.6.10 6.3.3.4

\*CRITERION TITLE ANNUNCIATORS-TILE LEGEND  
TILE LEGEND ARE UNAMBIGUOUS AND ADDRESS SPECIFIC CONDITIONS.

CRITERION NO. : 102

\*HUMAN ERROR  
MISINTERPRETATION OF DISPLAYED INFORMATION  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
INTENT OF LEGEND ON MANY TILES IS NOT CLEAR ALL ANNUNCIATOR LAMP  
BOXES ARE AFFECTED.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0104: REWORD LEGENDS TO ADDRESS SPECIFIC CONDITIONS.

PRIORITY: 1

\*PROJECT REVIEW TEAM - DISPOSITION  
0136: REWORD LEGENDS TO ADDRESS SPECIFIC CONDITIONS AS PART OF ANNUNCIATOR  
STUDY.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX--015M	00-A28-206	ANNUNCIATORS
2	N101-XXXXX--002M	00-A12-206	ANNUNCIATORS
3	N102-XXXXX--013M	00-A27-206	ANNUNCIATORS
4	N102-XXXXX--002M	00-A10-206	ANNUNCIATORS
5	N103-XXXXX--002AM	00-A20-206	ANNUNCIATORS
6	N103-XXXXX--002M	00-A08-206	ANNUNCIATORS
7	N104-XX.XX--009M	00-A17-206	ANNUNCIATORS





DATE 030983

8	N105-XXXXX	--008M	00-A25-206	ANNUNCIATORS
9	N105-XXXXX	--009M	00-A07-206	ANNUNCIATORS
10	N106-XXXXX	--005M	00-A17-206	ANNUNCIATORS
11	N107-XXXXX	--008M	00-A13-206	ANNUNCIATORS
12	N108-XXXXX	--003M	00-A09-206	ANNUNCIATORS
13	N110-XXXXX	--003M	00-A13-206	ANNUNCIATORS



DATE 030983

PAGE 3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0514 03 ANNUNCIATORS 00 014 8.4.3 6.3.4.2

\*CRITERION TITLE ANNUNCIATOR-CONTROL ARRANGEMENT  
THE ANNUNCIATOR RESPONSE CONTROLS SHALL BE CODED IN SOME WAY FOR EASY  
RECOGNITION.

CRITERION NO. : 014

\*HUMAN ERROR  
DELAY IN LOCATING/IDENTIFYING CONTROL(S)

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATOR CONTROLS ARE NOT CODED FOR EASY RECOGNITION.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0039: HIGHLIGHT ANNUNCIATOR CONTROLS FOR EASY RECOGNITION

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0123: HIGHLIGHT ANNUNCIATOR CONTROLS FOR EASY RECOGNITION BY ENHANCEMENT.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX-0132S	00-D14-307	PUSHBUTTON - (NON-LEGEND)
2	N101-XXXXX-0133S	00-D15-307	PUSHBUTTON - (NON-LEGEND)
3	N101-XXXXX-0134S	00-D16-307	PUSHBUTTON - (NON-LEGEND)
4	N101-XXXXX-0135S	00-D17-307	PUSHBUTTON - (NON-LEGEND)
5	N102-XXXXX-0118S	00-D16-307	PUSHBUTTON - (NON-LEGEND)
6	N102-XXXXX-0119S	00-D17-307	PUSHBUTTON - (NON-LEGEND)
7	N102-XXXXX-0120S	00-D18-307	PUSHBUTTON - (NON-LEGEND)
8	N102-XXXXX-0121S	00-D19-307	PUSHBUTTON - (NON-LEGEND)
9	N103-XXXXX-0106S	00-D15-307	PUSHBUTTON - (NON-LEGEND)



DATE 030983

PAGE

1

10	N103-XXXXX--01075	00-D16-307	PUSHBUTTON -	(NON-LEGEND)
11	N103-XXXXX--01085	00-D17-307	PUSHBUTTON -	(NON-LEGEND)
12	N103-XXXXX--01095	00-D18-307	PUSHBUTTON -	(NON-LEGEND)
13	N104-XXXXX--00855	00-D20-307	PUSHBUTTON -	(NON-LEGEND)
14	N104-XXXXX--00865	00-D21-307	PUSHBUTTON -	(NON-LEGEND)
15	N104-XXXXX--00875	00-D22-307	PUSHBUTTON -	(NON-LEGEND)
16	N104-XXXXX--00885	00-D22-037	DEVICE TYPE NOT AVAILABLE	
17	N105-XXXXX--00545	00-D05-307	PUSHBUTTON -	(NON-LEGEND)
18	N105-XXXXX--00555	00-D06-307	PUSHBUTTON -	(NON-LEGEND)
19	N105-XXXXX--00565	00-D07-307	PUSHBUTTON -	(NON-LEGEND)
20	N105-XXXXX--00575	00-D08-307	PUSHBUTTON -	(NON-LEGEND)
21	N106-XXXXX--00335	00-D02-307	PUSHBUTTON -	(NON-LEGEND)
22	N106-XXXXX--00345	00-D03-307	PUSHBUTTON -	(NON-LEGEND)
23	N106-XXXXX--00375	00-D04-307	PUSHBUTTON -	(NON-LEGEND)
24	N106-XXXXX--00365	00-D05-307	PUSHBUTTON -	(NON-LEGEND)
25	N108-XXXXX--00705	00-D07-307	PUSHBUTTON -	(NON-LEGEND)
26	N108-XXXXX--00715	00-D08-307	PUSHBUTTON -	(NON-LEGEND)
27	N108-XXXXX--00725	00-D09-307	PUSHBUTTON -	(NON-LEGEND)
28	N108-XXXXX--00735	00-D10-307	PUSHBUTTON -	(NON-LEGEND)
29	N110-XXXXX--00825	00-D16-307	PUSHBUTTON -	(NON-LEGEND)
30	N110-XXXXX--00835	00-D17-307	PUSHBUTTON -	(NON-LEGEND)
31	N110-XXXXX--00845	00-D18-307	PUSHBUTTON -	(NON-LEGEND)
32	N110-XXXXX--00855	00-D19-307	PUSHBUTTON -	(NON-LEGEND)



DATE 030983

PAGE 4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0517 03 ANNUNCIATORS 00 017 8.4.4 6.3.1.4

\*CRITERION TITLE ANNUNCIATOR-PRIORITIZATION  
THERE ARE TWO PRIORITY LEVELS FOR ANNUNCIATOR WINDOWS.

CRITERION NO. : 017

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
THERE IS NO PRIORITIZATION OF ANNUNCIATION TILES.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0037: PROVIDE PRIORITY CODING OF ANNUNCIATOR SYSTEM

PRIORITY: 2

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0037: PROVIDE PRIORITY CODING OF ANNUNCIATOR SYSTEM  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-A00-206 ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0522 03 ANNUNCIATORS 00 031 8.4.13

\*CRITERION TITLE ALARM LIST PAGING  
THE CAPABILITY TO RETURN TO THE LATEST PAGE OF ALARMS BY A SINGLE DEPRESSION  
OF A PUSH BUTTON EXISTS.

CRITERION NO. : 031

\*HUMAN ERROR  
FAILURE TO QUICKLY OBTAIN INFORMATION ON LATEST ALARMS.  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
PAGING PUSHBUTTONS MOVE ONE PAGE AT A TIME.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0065: PROVIDE THE CAPABILITY TO RETURN TO THE LATEST PAGE OF ALARMS  
BY A SINGLE DEPRESSION OF A PUSHBUTTON.

PRIORITY: 2

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0126: IMPLEMENT WITHIN CAPABILITY OF EXISTING COMPUTER. INCORPORATE INTO  
ERF COMPUTER.  
0091: CHANGE CATEGORY NO. TO D.  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-AXX-206 ANNUNCIATORS





DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0525 03 ANNUNCIATORS 00 038 8.5.1.1

\*CRITERION TITLE ANNUNCIATOR-OPERATOR INTERFACE-MAIN ANNUNCIATORS  
PANELS OF ANNUNCIATOR WINDOWS ARRANGED AS MATRICES OF VISUAL ALARM TILES,  
ARE LOCATED JUST ABOVE THE RELATED CONTROLS AND DISPLAYS AT A HEIGHT WHERE  
THEY CAN BE EASILY OBSERVED AND READ BY AN OPERATOR.

CRITERION NO. : 03P

\*HUMAN ERROR  
DELAY IN READING THE DISPLAY(S)  
DELAY IN ACTIVATING CONTROL(S)

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
RCP TILES ON 1LB005A SHOULD BE LOCATED ON CPO04. CONDENSER TILES ON  
1LB007 SHOULD BE LOCATED ON CPO08, CPO09.

PRIORITY: 2

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0018: REPOSITION ANNUNCIATORS

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0018: REPOSITION ANNUNCIATORS  
0127: CHANGE CATEGORY NUMBER TO B.  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N105-XXXX-0009M 00-A07-206 ANNUNCIATORS  
2 N107-XXXX-0008M 00-A13-206 ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .

\*\*\*\*\*  
0774 03 ANNUNCIATORS 00 041 8.6.11 6.3.3.5

\*CRITERION TITLE ANNUNCIATOR VISUAL TILE READABILITY-DISTANCE  
LETTER HEIGHT SHOULD SUBTEND A MINIMUM VISUAL ANGLE OF 15 MINUTES, OR .004X  
VIEWING DISTANCE, OR PREFERRED VISUAL ANGLE OF 20 MINUTES OR .006X VIEWING  
DISTANCE.

CRITERION NO. : 041

\*HUMAN ERROR  
MISREAD THE DISPLAY(S)  
DELAY IN READING THE DISPLAY(S)

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
LETTER HEIGHT DOES NOT SUBTEND A VISUAL ANGLE OF 20 MINUTES OR .006X  
VIEWING DISTANCE. ALL TILES CAN NOT BE READ FROM THE ANNUNCIATOR  
CONTROLS.



DATE 030983

PAGE



\*DESIGN REVIEW TEAM - RECOMMENDED ACTION

0000: NO RECOMMENDED ACTION HAS BEEN ISSUED

*Design team agrees according to specification.*

\*PROJECT REVIEW TEAM - DISPOSITION

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE	DEVICE TYPE
1	N103-XXXXX--XXXXXX	03-AXX-206	ANNUNCIATORS

PRIORITY:

ACCEPT?: YES

ACCEPT?: YES



DATE 030983

PAGE



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0527 03 ANNUNCIATORS OO 049 8.6.11 6.3.3.5

\*CRITERION TITLE ANNUNCIATOR-VISUAL TILE READABILITY  
STROKE-WIDTH-TO-CHARACTER-HEIGHT RATIO SHOULD BE BETWEEN 1:6 AND 1:8.

CRITERION NO. : 049

\*HUMAN ERROR  
MISREAD THE DISPLAY(S)  
DELAY IN READING THE DISPLAY(S)

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
STROKE-WIDTH-TO-CHARACTER-HEIGHT RATIO IS NOT BETWEEN 1:6 & 1:8 AND  
STROKE WIDTH IS NOT CONSISTENT ACROSS AN TILES.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. . DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N101-XXXXX--0015M 01-A28-206 ANNUNCIATORS  
2 N101-XXXXX--0002M 01-A12-206 ANNUNCIATORS  
3 N102-XXXXX--0013M 02-A27-206 ANNUNCIATORS  
4 N102-XXXXX--0002M 02-A10-206 ANNUNCIATORS  
5 N103-XXXXX--0002A 03-A20-206 ANNUNCIATORS  
6 N103-XXXXX--0002A 03-A08-206 ANNUNCIATORS  
7 N104-XXXXX--0009A 04-A17-206 ANNUNCIATORS  
8 N105-XXXXX--0008A 05-A25-206 ANNUNCIATORS



DATE 030983 PAGE

9 N105-XXXXX--0009A 05-A07-206 ANNUNCIATORS  
10 N106-XXXXX--0005A 06-A17-206 ANNUNCIATORS  
11 N107-XXXXX--0008M 07-A13-206 ANNUNCIATORS  
12 N108-XXXXX--0003M 08-A09-206 ANNUNCIATORS  
13 N110-XXXXX--0003M 10-A13-206 ANNUNCIATORS





## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

* CONTROL ROOM DESIGN REVIEW REPORT 3		TOTAL DATA BASE			
*SHT	CK.	CHECKLIST	.PN.CRT.RV	STP	NUREG
* NO	NO.	TITLE	.NO. NO.NO	REFERENCE	0700 REF
0528	03	ANNUNCIATORS	00 052	8.6.11	6.3.3.5

\*CRITERION TITLE ANNUNCIATOR-VISUAL TILE READABILITY  
MINIMUM SPACE BETWEEN CHARACTERS IS ONE STROKE WIDTH.

CRITERION NO. : 052

\*HUMAN ERROR  
MISREAD THE DISPLAY(S)  
DELAY IN READING THE DISPLAY(S)

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
SPACE BETWEEN CHARACTERS IS NOT CONSISTENTLY ONE STROKE WIDTH.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX--0015M	01-A28-206	ANNUNCIATORS
2	N101-XXXXX--0002M	01-A12-206	ANNUNCIATORS
3	N102-XXXXX--0013M	02-A27-206	ANNUNCIATORS
4	N102-XXXXX--0002M	02-A10-206	ANNUNCIATORS
5	N103-XXXXX--0002AM	03-A20-206	ANNUNCIATORS
6	N103-XXXXX--0002M	03-A08-206	ANNUNCIATORS
7	N104-XXXXX--0009M	04-A17-206	ANNUNCIATORS
8	N105-XXXXX--0008M	05-A25-206	ANNUNCIATORS
9	N105-XXXXX--0009M	05-A07-206	ANNUNCIATORS



PAGE

DATE 030983

05-A17-206 ANNUNCIATORS  
07-A13-206 ANNUNCIATORS  
08-A09-206 ANNUNCIATORS  
10-A13-206 ANNUNCIATORS

10 N106-XXXXX--0005M  
11 N107-XXXXX--0008M  
12 N108-XXXXX--0003M  
13 N110-XXXXX--0003M





DATE 030983

PAGE 3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.Rv STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0529 03 ANNUNCIATORS 00 054 8.6.11 6.3.3.5

\*CRITERION TITLE ANNUNCIATOR-VISUAL TILE READABILITY  
MINIMUM SPACE BETWEEN LINES IS ONE-HALF THE CHARACTER HEIGHT.

CRITERION NO. : 054

\*HUMAN ERROR  
MISREAD THE DISPLAY(S)  
DELAY IN READING THE DISPLAY(S)

CATEGORY NO. : B

\*DESCRIPTION OF OBSERVATION  
MINIMUM SPACE BETWEEN LINES IS NOT ONE-HALF THE CHARACTER HEIGHT.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0072: ENGRAVE LEGENDS ACCORDING TO SPECIFICATION.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. . DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N101-XXXXX--0015M 01-A28-206 ANNUNCIATORS  
2 N101-XXXXX--0002M 01-A12-206 ANNUNCIATORS  
3 N102-XXXXX--0013M 02-A27-206 ANNUNCIATORS  
4 N102-XXXXX--0002M 02-A10-206 ANNUNCIATORS  
5 N103-XXXXX--0002AM 03-A20-206 ANNUNCIATORS  
6 N103-XXXXX--0002M 03-A08-206 ANNUNCIATORS  
7 N104-XXXXX--0009M 04-A17-206 ANNUNCIATORS  
8 N105-XXXXX--0008M 05-A25-206 ANNUNCIATORS  
9 N105-XXXXX--0009M 05-A07-206 ANNUNCIATORS



PAGE

DATE 030983

06-A17-206 ANNUNCIATORS  
07-A13-206 ANNUNCIATORS  
08-A09-206 ANNUNCIATORS  
10-A13-206 ANNUNCIATORS

10 N106-XXXXX--0005M  
11 N107-XXXXX--0008M  
12 N108-XXXXX--0003M  
13 N110-XXXXX--0003M





DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . C700 REF

\*\*\*\*\*  
0530 03 ANNUNCIATORS 00 056 8.5.1.2

\*CRITERION TITLE ANNUNCIATOR-OPERATOR INTERFACE-ESF-STATUS MONITORING.  
LETTERING ON THE ESF STATUS INDICATOR LIGHT PANELS ARE LARGE ENOUGH TO BE  
READ BY A PERSON STANDING NEAR THE PANEL.

CRITERION NO. : 056

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
ESF STATUS INDICATORS CAN NOT BE EASILY READ, EVEN WHILE STANDING CLOSE  
TO THE PANEL.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0066: REVISE CHARACTER SIZE TO MEET VIEWING DISTANCE REQUIREMENTS.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0129: CONSIDER RELOCATION AS PART OF RE-LAYOUT AND REVIEW OTHER ALTERNATIVES.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX--0019M	00-D41-207	STATUS LIGHT BOXES
2	N101-XXXXX--0020M	00-B38-207	STATUS LIGHT BOXES
3	N101-XXXXX--0021M	00-B33-207	STATUS LIGHT BOXES
4	N101-XXXXX--0022M	00-B28-207	STATUS LIGHT BOXES
5	N101-XXXXX--0023M	00-B24-207	STATUS LIGHT BOXES
6	N101-XXXXX--0025M	00-B17-207	STATUS LIGHT BOXES





DATE 030983

PAGE

2



7	N101-XXXXX--0026M	00-B14-207	STATUS	LIGHT	BOXES
8	N101-XXXXX--0027M	00-B09-207	STATUS	LIGHT	BOXES
9	N101-XXXXX--0028M	00-B05-207	STATUS	LIGHT	BOXES
10	N101-XXXXX--0029M	00-B02-207	STATUS	LIGHT	BOXES
11	N101-XXXXX--0030M	00-B14-207	STATUS	LIGHT	BOXES
12	N102-XXXXX--0017M	00-B13-207	STATUS	LIGHT	BOXES
13	N102-XXXXX--0018M	00-B36-207	STATUS	LIGHT	BOXES
14	N102-XXXXX--0019M	00-B32-207	STATUS	LIGHT	BOXES
15	N102-XXXXX--0020M	00-B27-207	STATUS	LIGHT	BOXES
16	N102-XXXXX--0022M	00-B20-207	STATUS	LIGHT	BOXES
17	N102-XXXXX--0024M	00-B13-207	STATUS	LIGHT	BOXES
18	N102-XXXXX--0025M	00-B23-207	STATUS	LIGHT	BOXES
19	N102-XXXXX--0026M	00-B05-207	STATUS	LIGHT	BOXES
20	N102-XXXXX--0027M	00-B03-207	STATUS	LIGHT	BOXES
21	N102-XXXXX--0028M	00-B01-207	STATUS	LIGHT	BOXES
22	N102-XXXXX--0021M	00-B24-207	STATUS	LIGHT	BOXES
23	N103-XXXXX--0006M	00-B31-207	STATUS	LIGHT	BOXES
24	N103-XXXXX--0007M	00-B29-207	STATUS	LIGHT	BOXES
25	N103-XXXXX--0008M	00-B24-207	STATUS	LIGHT	BOXES
26	N103-XXXXX--0009M	00-B21-207	STATUS	LIGHT	BOXES
27	N103-XXXXX--0010M	00-B16-207	STATUS	LIGHT	BOXES
28	N103-XXXXX--0011M	00-B16-207	STATUS	LIGHT	BOXES
29	N103-XXXXX--0012M	00-B07-207	STATUS	LIGHT	BOXES
30	N103-XXXXX--0013M	00-B05-207	STATUS	LIGHT	BOXES
31	N103-XXXXX--0014M	00-B03-207	STATUS	LIGHT	BOXES
32	N103-XXXXX--0015M	00-B01-207	STATUS	LIGHT	BOXES
33	N106-XXXXX--0011M	00-B23-207	STATUS	LIGHT	BOXES
34	N106-XXXXX--0012M	00-B26-207	STATUS	LIGHT	BOXES
35	N106-XXXXX--0013M	00-B28-207	STATUS	LIGHT	BOXES



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0537 03 ANNUNCIATORS OO 064 B.5.1.5

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER DISPLAY DEVICES  
THE DISPLAY DEVICES ARE MOUNTED RECESSED AND HAVE THE FACE ANGLE ADJUSTED  
FOR OPTIMUM GLARE CONTROL UNDER EXISTING CONTROL ROOM LIGHTING CONDITIONS.

CRITERION NO. : 064

\*HUMAN ERROR  
MISREAD THE DISPLAY(S)  
DELAY IN READING THE DISPLAY(S)

CATEGORY NO. : C

\*DESCRIPTION OF OBSERVATION  
CRT'S ARE NOT MOUNTED RECESSED TO MINIMUZE GLARE ON CRT FACE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0099: RECESS AND ADJUST FACE ANGLE OF CRT'S.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0131: REVIEW OTHER ALTERNATIVES  
0093: CHANGE CATEGORY NUMBER TO C.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N105-XXXXX--0001M	05-B02-213	CRT'S
2	N106-XXXXX--0006M	06-B02-213	CRT'S
3	N107-XXXXX--0007M	07-B02-213	CRT'S
4	N104-XXXXX--0010M	04-B02-213	CRT'S



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0538 03 ANNUNCIATORS 00 066 8.5.1.4 6.9.1.2

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
A FUNCTION CONTROL KEYBOARD IS AVAILABLE ON THE MAIN CONTROL BOARD NEAR  
EACH OF THE ALARM DISPLAYS.

CRITERION NO. : 066

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
THIS KEYBOARD IS THE CLOSEST TO 2 CRTS. IT IS APPROX 3' FROM ONE AND  
6' FROM THE OTHER. UNLESS CRT'S ARE MOUNTED AS ADJACENT PAIRS, THIS  
CRITERION REQUIRES A SEPARATE FUNCTION CONTROL KEYBOARD FOR EACH CRT.

PRIORITY: 2

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0101: PROVIDE LIMITED FUNCTION CONTROLS.

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.  
0091: CHANGE CATEGORY NO. TO D.  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N106-XXXXX--0012 00-A14-312 KEYBOARD



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
-----  
0539 OJ ANNUNCIATORS OO 067 8.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
THE FUNCTION CONTROLS ENABLE THE OPERATOR TO OBTAIN DESIRED ALARM DETAILS  
QUICKLY.

CRITERION NO. : 067

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
THE FUNCTION KEYS ARE SMALL AND IT IS POSSIBLE TO DEPRESS THE WRONG ONE  
WHEN IN A HURRY.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0101: PROVIDE LIMITED FUNCTION CONTROLS.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. . DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE  
-----  
1 N105-XXXXX--0017M 05-D12-312 KEYBOARD  
2 N107-XXXXX--0012M 07-D01-312 KEYBOARD





DATE 030983

PAGE 3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO. NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0540 03 ANNUNCIATORS 00 068 8.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
THE FUNCTION CONTROLS REQUIRE MINIMUM OPERATOR TRAINING TO UNDERSTAND  
AND TO UTILIZE THEM.

CRITERION NO. : 068

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION  
DELAY IN ACTIVATING CONTROL(S)

CATEGORY NO. : D

\*DESCRIPTION OF CONSERVATION  
FUNCTION KEYS ARE USED IN CONJUNCTION WITH CURSOR CONTROLS AND ALPHA-  
NUMERIC KEYBOARD. THEY ARE NOT TOTALLY SELF EXPLANATORY AND WILL  
REQUIRE TRAINING AND FREQUENT PRACTICE TO USE.

PRIORITY: 2

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0101: PROVIDE LIMITED FUNCTION CONTROLS.

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0133: PROVIDE TRAINING.  
0091: CHANGE CATEGORY NO. TO D.  
-----  
-----  
-----

ACCEPT?: YES

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N105-XXXXX--0017M 00-A14-312 KEYBOARD  
2 N107-XXXXX--0012M 00-A01-312 KEYBOARD





DATE 030983 PAGE

SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. .NO. NO. NO. REFERENCE . 0700 REF  
\* . . . . .  
0541 03 ANNUNCIATORS OO 069 3.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY CONTROLS  
FUNCTION KEYS ARE AVAILABLE FOR CAUSING ALARMS TO BE ORDERED CHRONOLOGIC/ .LY  
OR BY PRIORITY.

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.  
DELAY IN IDENTIFYING ALARM.

\*DESCRIPTION OF OBSERVATION  
NO CAPABILITY IS AVAILABLE FOR CAUSING ALARMS TO BE ORDERED CHRONO-  
LOGICALLY OR BY PRIORITY.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
O102: PROVIDE FUNCTION ON LIMITED FUNCTION PANEL.

\*PROJECT REVIEW TEAM - DISPOSITION  
O132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

\*REMARKS

NO. . . . . DEVICE TAG NO. . . . . DEVICE CODE. . . . . DEVICE TYPE . . . . .  
\* . . . . .  
1 N105-XXXXX--0017M 05-D12-312 KEYBOARD  
2 N107-XXXXX--0012M 07-D01-312 KEYBOARD

CRITERION NO. : 069

CATEGORY NO. : D

PRIORITY: 2

ACCEPT?: YES

ACCEPT?: YES NO



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
=====

0542 03 ANNUNCIATORS 00 070 8.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
A 'QWERTY' TYPE KEY BOARD IS NOT USED FOR ALARM DISPLAY CONTROLS.

CRITERION NO. : 070

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION  
SELECTION OF THE WRONG CONTROL(S)

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
PART OF THE ALARM DISPLAY FUNCTIONS REQUIRES USE OF THE 'QWERTY'  
KEYBOARD IN ADDITION TO THE FUNCTION KEYS.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0101: PROVIDE LIMITED FUNCTION CONTROLS.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. . DEVICE TAG NO. . DEVICE CODE. . DEVICE TYPE  
=====

1	N105-XXXXX--0017M	00-D12-312	KEYBOARD
2	N107-XXXXX--0012M	00-D01-312	KEYBOARD



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0553 03 ANNUNCIATORS 00 084 8.5.2.2

\*CRITERION TITLE ANNUNCIATOR-COMPUTER ALARM DISPLAYS  
THE ALARM DISPLAY SHOWS POINT IDENTIFICATION DEVIATION TYPE AND/OR NUMERIC  
VALUE, SET POINTS AND PRIORITY LEVEL.

CRITERION NO. : 084

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
THERE IS NO PRIORITY INDICATION IN THE ALARM LINE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0105: PROVIDE POINT IDENTIFICATION FOR DISPLAYED ALARM LINES.

PRIORITY: 2

\*\*\*\*\*  
\*PROJECT REVIEW TEAM - DISPOSITION  
0132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.  
0091: CHANGE CATEGORY NO. TO D.  
\*\*\*\*\*

ACCEPT?: YES

\*REMARKS  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

ACCEPT?: YES NO

\*REMARKS  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

NO. . DEVICE TAG NO. .DEVICE CODE. .DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS



DATE 030983

PAGE



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF

=====

0555 03 ANNUNCIATORS	00 086	8.5.2.2
----------------------	--------	---------

=====

\*CRITERION TITLE ANNUNCIATOR-COMPUTER ALARM DISPLAYS  
COLOR CODING AT THE FLASHING CHARACTER IS USED TO SUPPLEMENT THE INDICATED  
NUMERIC PRIORITY.

CRITERION NO. : 086

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
THERE IS NO PRIORITY CODING IN THE ALARM FUNCTIONS.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0037: PROVIDE PRIORITY CODING OF ANNUNCIATOR SYSTEM

PRIORITY: 2

-----

\*PROJECT REVIEW TEAM - DISPOSITION  
0132: PROVIDE ENHANCEMENTS WITHIN THE EXISTING COMPUTER SYSTEM CAPABILITY.  
0091: CHANGE CATEGORY NO. TO D.

-----

ACCEPT?: YES

\*REMARKS

-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION

-----

ACCEPT?: YES NO

\*REMARKS

-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
=====

1	NI/O-XXXXX--XXXX	00-4XX-206	ANNUNCIATORS
---	------------------	------------	--------------

=====





DATE 030983

PAGE 1



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0556 03 ANNUNCIATORS OO 088 8.5.2.3 6.3.1.1

\*CRITERION TITLE ANNUNCIATOR-ANNUNCIATION OPERATION  
THE COORDINATED ANNUNCIATION PLAN CONTAINS FEATURES SIMILAR TO THE TABLE IN  
SECTION 8.5.2.3 OF THE CRITERIA REPORT.

CRITERION NO. : 088

\*HUMAN ERROR  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.  
FAILURE TO DETECT EQUIPMENT FAILURE  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
PRIORITIZATIN OF ALARMS IS NOT INCLUDED IN EITHER THE MAIN PLANT  
ANNUNCIATOR OR IN THE PLANT COMPUTER. DIFFERENT ACKNOWLEDGE CONTROLS  
USED FOR ANNUNCIATOR AND FOR COMPUTER. EDGE CONTROLS USED FOR

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0107: PROVIDE A COORDINATED ANNUNCIATION PLAN.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0134: PROVIDE COMMON ACKNOWLEDGEMENT CONTROLS FOR ANNUNCIATOR & COMPUTER.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.. DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX OO-AXX-206 ANNUNCIATORS





DATE 030983

PAGE 4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0558 03 ANNUNCIATORS 00 091 8.6.2

\*CRITERION TITLE ANNUNCIATORS-COMPUTER DEVICE ALTERNATES  
NO SINGLE FAILURE OF A DEVICE WILL CAUSE LOSS OF INFORMATION.

CRITERION NO. : 091

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
FAILURE OF CRT CONTROLLER CAN RENDER ALL CONTROL ROOM CRT'S INOPERATIVE.

PRIORITY: 2

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0108: PROVIDE A BACKUP CRT CONTROLLER.

ACCEPT?: YES

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
0091: CHANGE CATEGORY NO. TO D.  
0135: DESIGN REVIEW TEAM, PLEASE CLARIFY.  
-----  
-----  
-----

\*REMARKS  
-----  
-----  
-----

ACCEPT?: YES NO

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-213 CRT'S



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV .P NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0560 03 ANNUNCIATORS 00 094 8.6.5

\*CRITERION TITLE ANNUNCIATORS-CONSTANT METHODS  
IDENTIFICATION TECHNIQUES , USE OF COLOR, SOUND AND OPERATOR RESPONSE IS  
CONSISTENT FOR ALL SUBSYSTEMS WITHIN THE COORDINATED ANNUNCIATOR PLAN.

CRITERION NO. : 094

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.  
DELAY IN COMPREHENSION OF PLANT DEVIATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATOR ALARM RESPONSE CONTROLS AND COMPUTER RESPONSE CONTROLS ARE  
COMPLETELY DIFFERENT PHYSICALLY AND FUNCTIONALLY.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0107: PROVIDE A COORDINATED ANNUNCIATION PLAN.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
0134: PROVIDE COMMON ACKNOWLEDGEMENT CONTROLS FOR ANNUNCIATOR & COMPUTER.  
0091: CHANGE CATEGORY NO. TO D.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO. . DEVICE TAG NO. . DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS





PAGE

DATE 030983

10 N106-XXXXX--005M 06-A17-206 ANNUNCIATORS  
11 N107-XXXXX--008M 07-A13-206 ANNUNCIATORS  
12 N108-XXXXX--003M 08-A09-206 ANNUNCIATORS  
13 N110-XXXXX--003M 10-A13-206 ANNUNCIATORS





DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
=====

0567 03 ANNUNCIATORS	00 104	8.6.10	6.3.3.4
----------------------	--------	--------	---------

\*CRITERION TITLE ANNUNCIATORS-TILE LEGEND  
CONSISTANT ABBREVIATIONS AND ACRONYMS ARE USED.

CRITERION NO. : 104

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
ENGRAVING ON ANNUNCIATOR TILES AND ESF STATUS LIGHTS IS NOT COMPLETELY  
CONSISTENT. OBSERVED INCONSISTANCIES ARE:  
OG - D/G  
FHB - FUEL HDLG BLDG  
BTRS - BT  
4.16KV -4160V  
MAB - MEAB  
SG - STM GEN

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
OOB3: USE STANDARD ABBREVIATIONS LISTED IN CRDR CRITERIA REPORT, APPENDIX L.

PRIORITY: 2

\*PROJECT REVIEW TEAM - DISPOSITION  
OOB3: USE STANDARD ABBREVIATIONS LISTED IN CRDR CRITERIA REPORT, APPENDIX L.

ACCEPT?: YES

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.	DEVICE TAG NO.	DEVICE CODE.	DEVICE TYPE
1	N101-XXXXX--015M	01-A28-206	ANNUNCIATORS
2	N101-XXXXX--002M	01-A12-206	ANNUNCIATORS
3	N102-XXXXX--013M	02-A27-206	ANNUNCIATORS





DATE 030983 PAGE

4 N102-XXXX--002M	02-A10-206 ANNUNCIATORS
5 N103-XXXX--002AM	03-A20-206 ANNUNCIATORS
6 N103-XXXX--002M	03-A08-206 ANNUNCIATORS
7 N104-XXXX--009M	04-A17-206 ANNUNCIATORS
8 N105-XXXX--002M	05-A25-206 ANNUNCIATORS
9 N105-XXXX--009M	05-A07-206 ANNUNCIATORS
10 N106-XXXX--005M	06-A17-206 ANNUNCIATORS
11 N107-XXXX--008M	07-A13-206 ANNUNCIATORS
12 N108-XXXX--003M	08-A09-2C3 ANNUNCIATORS
13 N110-XXXX--003M	10-A13-206 ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0511 03 ANNUNCIATORS 00 002 8.4.2 6.3.3.4

\*CRITERION TITLE ANNUNCIATOR-VISUAL ALARM  
VISUAL ALARM INFORMATION INDICATES THE NATURE OF THE DEVIATION.

CRITERION NO. 002

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
SPECIFIC PROBLEM OR DEVIATION IS NOT GIVEN ON ONE OR MORE TILES OF  
LAMP BOX.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0041: CHANGE ANNUNCIATOR TILE WORDING TO STATE SPECIFIC PROBLEMS

PRIORITY: 3

\*PROJECT REVIEW TEAM - DISPOSITION

ACCEPT?: NO

## \*REMARKS

OBSERVATION NOT SPECIFIC - WORDING SHOULD BE ADDRESSED AS PART OF THE  
ANNUNCIATOR STUDY.

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

## \*REMARKS

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N101-5X10X--0015M 01-A28-206 ANNUNCIATORS  
2 N101-6X01X--0002M 01-A12-206 ANNUNCIATORS  
3 N101-2X02X--0002M 01-A12-206 ANNUNCIATORS  
4 N101-2X03X--0002M 01-A12-206 ANNUNCIATORS  
5 N101-1X04X--0002M 01-A12-206 ANNUNCIATORS  
6 N101-2X04X--0002M 01-A12-206 ANNUNCIATORS  
7 N101-3X12X--0002M 01-A12-206 ANNUNCIATORS  
8 N102-5X11X--0013M 02-A27-206 ANNUNCIATORS



9	N102-6X02X--0002M	02-A10-206	ANNUNCIATORS
10	N102-2X03X--0002M	02-A10-206	ANNUNCIATORS
11	N102-2X04X--0002M	02-A10-206	ANNUNCIATORS
12	N102-2X12X--0002M	02-A10-206	ANNUNCIATORS
13	N103-6X01X--0002AM	03-A20-206	ANNUNCIATORS
14	N103-2X02X--0002AM	03-A20-206	ANNUNCIATORS
15	N103-2X03X--0002AM	03-A20-206	ANNUNCIATORS
16	N104-7X01X--0009AM	04-A17-206	ANNUNCIATORS
17	N104-7X02X--0009AM	04-A17-206	ANNUNCIATORS
18	N104-8X02X--0009AM	04-A17-206	ANNUNCIATORS
19	N104-3X04X--0009AM	04-A17-206	ANNUNCIATORS
20	N105-1X10X--0008AM	05-A25-206	ANNUNCIATORS
21	N105-2X10X--0008AM	05-A25-206	ANNUNCIATORS
22	N105-3X10X--0008AM	05-A25-206	ANNUNCIATORS
23	N105-3X11X--0008AM	05-A25-206	ANNUNCIATORS
24	N105-3X12X--0008AM	05-A25-206	ANNUNCIATORS
25	N105-4X11X--0008AM	05-A25-206	ANNUNCIATORS
26	N105-4X12X--0008AM	05-A25-206	ANNUNCIATORS
27	N106-1X06X--0005AM	06-A17-206	ANNUNCIATORS
28	N107-1X05X--0008AM	07-A13-206	ANNUNCIATORS
29	N107-1X09X--0008AM	07-A13-206	ANNUNCIATORS
30	N107-1X10X--0008AM	07-A13-206	ANNUNCIATORS
31	N107-5X10X--0008AM	07-A13-206	ANNUNCIATORS
32	N107-5X11X--0008AM	07-A13-206	ANNUNCIATORS
33	N107-8X11X--0008AM	07-A13-206	ANNUNCIATORS
34	N107-1X12X--0008AM	07-A13-206	ANNUNCIATORS
35	N107-2X12X--0008AM	07-A13-206	ANNUNCIATORS
36	N107-4X12X--0008AM	07-A13-206	ANNUNCIATORS
37	N107-6X12X--0008AM	07-A13-206	ANNUNCIATORS
38	N107-8X12X--0008AM	07-A13-206	ANNUNCIATORS
39	N108-2X06X--0003AM	09-A09-206	ANNUNCIATORS
40	N108-1X12X--0003AM	09-A09-206	ANNUNCIATORS
41	N108-2X12X--0003AM	09-A09-206	ANNUNCIATORS
42	N108-3X12X--0003AM	09-A09-206	ANNUNCIATORS
43	N108-4X12X--0003AM	09-A09-206	ANNUNCIATORS
44	N110-4X07X--0003AM	10-A13-206	ANNUNCIATORS
45	N110-4X09X--0003AM	10-A13-206	ANNUNCIATORS
46	N110-4X10X--0003AM	10-A13-206	ANNUNCIATORS
47	N110-4X11X--0003AM	10-A13-206	ANNUNCIATORS
48	N110-4X12X--0003AM	10-A13-206	ANNUNCIATORS



DATE 030983

PAGE

3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT CK. CHECKLIST PN.CRT.RV STP NUREG  
\* NO NO. TITLE NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0515 03 ANNUNCIATORS 00 015 8.4.3 6.3.4.2

\*CRITERION TITLE ANNUNCIATOR-DEFEAT OF CONTROLS  
THE DESIGN OF THE COORDINATED ANNUNCIATION PLAN IS SUCH THAT THE OPERATORS  
SHALL HAVE LITTLE REASON TO ATTEMPT TO DEFEAT THE CONTROLS.

CRITERION NO. : 015

\*HUMAN ERROR  
FAILURE TO GIVE PROMPT ATTENTION TO PLANT DEVIATION

CATEGORY NO. : C

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATION CONTROLS CAN EASILY BE DEPRESSED CONTINUOUSLY WITH A  
SMALL OBJECT SUCH AS A PAPER CLIP, OR A QUARTER.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0040: STATEMENTS SHOULD BE ADDED TO ADMINISTRATIVE PROCEDURES INDICATING THAT  
DEFEATING ANNUNCIATORS IS NOT ALLOWED.

PRIORITY: 3

\*PROJECT REVIEW TEAM - DISPOSITION  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

ACCEPT?: NO

\*REMARKS  
THIS WILL NOT BE ACCEPTABLE PRACTICE, GENERAL KNOWLEDGE AND PRODUCE IS  
NOT NECESSARY.  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

ACCEPT?: YES NO

\*REMARKS  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

NO.	DEVICE TAG NO.	DEVICE CODE	DEVICE TYPE
1	N101-XXXXX--01325	NO-D14-307	PUSHBUTTON - (NON-LEGEND)
2	N101-XXXXX--01335	CO-D15-307	PUSHBUTTON - (NON-LEGEND)
3	N101-XXXXX--01345	CO-D16-307	PUSHBUTTON - (NON-LEGEND)
4	N101-XXXXX--01355	OO-D17-307	PUSHBUTTON - (NON-LEGEND)
5	N102-XXXXX--01185	OO-D16-307	PUSHBUTTON - (NON-LEGEND)
6	N102-XXXXX--01195	OO-D17-307	PUSHBUTTON - (NON-LEGEND)





DATE 030983

PAGE



7 N102-XXXXX--0120S	00-D18-307 PUSHBUTTON - (NON-LEGEND)
8 N102-XXXXX--0121S	00-D19-307 PUSHBUTTON - (NON-LEGEND)
9 N103-XXXXX--0106S	00-D15-307 PUSHBUTTON - (NON-LEGEND)
10 N103-XXXXX--0107S	00-D16-307 PUSHBUTTON - (NON-LEGEND)
11 N103-XXXXX--0108S	00-D17-307 PUSHBUTTON - (NON-LEGEND)
12 N103-XXXXX--0109S	00-D18-307 PUSHBUTTON - (NON-LEGEND)
13 N104-XXXXX--0085S	00-D20-307 PUSHBUTTON - (NON-LEGEND)
14 N104-XXXXX--0086S	00-D21-307 PUSHBUTTON - (NON-LEGEND)
15 N104-XXXXX--0087S	00-D22-307 PUSHBUTTON - (NON-LEGEND)
16 N104-XXXXX--0088S	00-D23-307 PUSHBUTTON - (NON-LEGEND)
17 N105-XXXXX--0054S	00-D05-307 PUSHBUTTON - (NON-LEGEND)
18 N105-XXXXX--0055S	00-D06-307 PUSHBUTTON - (NON-LEGEND)
19 N105-XXXXX--0056S	00-D07-307 PUSHBUTTON - (NON-LEGEND)
20 N105-XXXXX--0057S	00-D08-307 PUSHBUTTON - (NON-LEGEND)
21 N106-XXXXX--0033S	00-D02-307 PUSHBUTTON - (NON-LEGEND)
22 N106-XXXXX--0034S	00-D03-307 PUSHBUTTON - (NON-LEGEND)
23 N106-XXXXX--0035S	00-D04-307 PUSHBUTTON - (NON-LEGEND)
24 N106-XXXXX--0036S	00-D05-307 PUSHBUTTON - (NON-LEGEND)
25 N108-XXXXX--0070S	00-D07-307 PUSHBUTTON - (NON-LEGEND)
26 N108-XXXXX--0071S	00-D08-307 PUSHBUTTON - (NON-LEGEND)
27 N108-XXXXX--0072S	00-D09-307 PUSHBUTTON - (NON-LEGEND)
28 N108-XXXXX--0073S	00-D10-307 PUSHBUTTON - (NON-LEGEND)
29 N110-XXXXX--0082S	00-D16-307 PUSHBUTTON - (NON-LEGEND)
30 N110-XXXXX--0083S	00-D17-307 PUSHBUTTON - (NON-LEGEND)
31 N110-XXXXX--0084S	00-D18-307 PUSHBUTTON - (NON-LEGEND)
32 N110-XXXXX--0085S	00-D19-307 PUSHBUTTON - (NON-LEGEND)





DATE 030983

PAGE 4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0519 03 ANNUNCIATORS 00 022 8.4.8

\*CRITERION TITLE ANNUNCIATOR-ALARM SORT  
THE CAPABILITY TO SORT AND DISPLAY ALARMS BY TIME OF OCCURANCE, PRIORITY,  
SYSTEM, AND FUNCTIONAL OF GROUP IS PROVIDED.

CRITERION NO. : 022

\*HUMAN ERROR  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : 8

\*DESCRIPTION OF OBSERVATION  
THERE IS NO CAPABILITY TO SORT AND DISPLAY ALARMS BY TIME OCCURENCE,  
PRIORITY, SYSTEM AND ITS FUNCTIONAL GROUP WITHIN THE PLANT COMPUTER.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0042: PROVIDE MORE SORTING AND DISPLAY CAPABILITY

PRIORITY: 3

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: NO

\*REMARKS

THIS CAPABILITY ALREADY EXISTS WITHIN COMPUTER SYSTEM.  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-A00-206 ANNUNCIATORS



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0523 03 ANNUNCIATORS 00 035 8.4.14

\*CRITERION TITLE ANNUNCIATOR-ESF STATUS MONITORING  
ANNUNCIATOR TILES ARE NOT USED TO DISPLAY STATUS MONITORING INFORMATION BUT  
ARE RESERVED FOR ANNUNCIATION OF PLANT DEVIATION FROM NORMAL.

CRITERION NO. : 035

\*HUMAN ERROR  
CONFUSION AS TO WHERE ALARM AND WHERE STATUS INFORMATION IS FOUND  
DELAY IN COMPREHENSION OF PLANT DEVIATION

CATEGORY NO. : A

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATION TILES ARE BEING USED FOR STATUS INDICATION ON  
APPROXIMATELY HALF THE LAMP BOXES.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0044: MOVE STATUS INDICATION TO ANOTHER PART OF THE CONTROL BOARD.

PRIORITY: 3

\*PROJECT REVIEW TEAM - DISPOSITION

ACCEPT?: NO

\*REMARKS

INCORRECT INTERPRETATION OF CRITERIA.

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.. DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE

\*\*\*\*\*  
1 N101-XXXXX--0015M 00-A28-206 ANNUNCIATORS  
2 N101-XXXXX--0002M 00-A12-206 ANNUNCIATORS  
3 N102-XXXXX--0013M 00-A27-206 ANNUNCIATORS  
4 N102-XXXXX--0002M 00-A10-206 ANNUNCIATORS  
5 N103-XXXXX--0002M 00-A20-206 ANNUNCIATORS  
6 N103-XXXXX--0002M 00-A08-206 ANNUNCIATORS  
7 N104-XXXXX--0009M 00-A17-206 ANNUNCIATORS



PAGE

DATE 030983

8 N105-XXXXX--0008M 00-A25-206 ANNUNCIATORS  
9 N105-XXXXX--0009M 00-A07-206 ANNUNCIATORS





DATE 030983

PAGE

3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
-----  
0551 03 ANNUNCIATORS 00 080 8.5.2.1

\*CRITERION TITLE ANNUNCIATOR-ANNUNCIATOR TILES  
A RETURN TO NORMAL CAUSES THE TILE TO FLASH SLOWLY AT 1/2 THE LOW PRIORITY  
ALARM FLASH FREQUENCY.

CRITERION NO. : 080

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.  
DELAY IN OBTAINING NEEDED INFORMATION

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
RETURN TO NORMAL FLASH RATE IS NOT 1/2 THE LOW PRIORITY ALARM FLASH  
FREQUENCY.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0100: ADJUST FLASH RATE.

PRIORITY: 3

\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: NO

\*REMARKS

NO OBSERVATION - RETURN TO NORMAL FLASH RATE MEETS CRITERIA.  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE  
-----  
\* 1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS





DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
=====

0552 03 ANNUNCIATORS OB1 8.5.2.2 6.7.3.2

\*CRITERION TITLE ANNUNCIATOR-COMPUTER ALARM DISPLAYS  
SELECTED ALARMS GENERATED WITHIN OR GOING TO THE MAIN PLANT ANNUNCIATOR  
SYSTEM SHALL BE AVAILABLE TO THE PL'NT COMPUTER FOR DISPLAY PURPOSES.

CRITERION NO. : 081

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
ANNUNCIATOR SYSTEM ALLOWS FOR ONLY 150 OUTPUTS TO PLANT COMPUTER.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0064: EXPAND THE NUMBER OF ANNUNCIATOR OUTPUTS WHICH CAN GO TO THE  
COMPUTER.

PRIORITY: 3

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: NO

\*REMARKS

OBSERVATION NOT SPECIFIC AND DOES NOT REFLECT SYSTEM DESIGN CHANGE  
CATEGORY NO. TO D.  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
=====

1 N1 -XXXXX--XXX -AXX-206 ANNUNCIATORS





DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0561 03 ANNUNCIATORS 00 095 8.6.6

\*CRITERION TITLE ANNUNCIATORS-PARALLEL INPUT  
INPUTS TO THE MAIN PLANT ANNUNCIATION ARE ISOLATED AND DIRECTED IN PARALLEL  
TO THE PLANT COMPUTER.

CRITERION NO. : 095

\*HUMAN ERROR  
DELAY IN IDENTIFYING ALARM.  
FAILURE TO IMMEDIATELY RECOGNIZE URGENCY OF ALARM.

CATEGORY NO. : D

\*DESCRIPTION OF OBSERVATION  
ONLY 150 PLANT COMPUTER INPUTS ARE AVAILABLE FROM THE ANNUNCIATOR  
UNDER THE PRESENT SPECIFICATION.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0064: EXPAND THE NUMBER OF ANNUNCIATOR OUTPUTS WHICH CAN GO TO THE  
COMPUTER.

PRIORITY: 3

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: NO

\*REMARKS

MISINTERPRETATION OF CRITERIA.



DATE 030983 PAGE 1

-----  
-----  
-----  
NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXX--XXXX 00-XXX-206 ANNUNCIATORS  
\*\*\*\*\*



DATE 030983

PAGE 4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0524 03 ANNUNCIATORS OO 036 8.4.16 6.3.1.2

\*CRITERION TITLE ANNUNCIATOR-LOCAL ANNUNCIATION  
ANNUNCIATION OF APPLICABLE ALARMS ARE PROVIDED ON THE AUXILIARY SHUTDOWN  
PANEL WHEN IT HAS BEEN ACTIVATED.

CRITERION NO. : 036

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. . DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX OO-XXX-206 ANNUNCIATORS



DATE 030983

PAGE 3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0531 03 ANNUNCIATORS 00 058 8.5.1.3

\*CRITERION TITLE ANNUNCIATOR-OPERATOR INTERFACE-AUCILIARY SHUTDOWN PANEL  
PANELS OF ANNUNCIATOR WINDOWS ARRANGED AS MATRICES OF VISUAL ALARM TILES ARE  
LOCATED JUST ABOVE THE RELATED CONTROLS AND DISPLAY AT A HEIGHT WHERE THEY  
CAN BE EASILY OBSERVED AND READ BY AN OPERATOR.

CRITERION NO. : 058

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL ROOM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

\*\*\*\*\*  
\*PROJECT REVIEW TEAM - DISPOSITION  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

ACCEPT?: YES NO

\*REMARKS  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

ACCEPT?: YES NO

\*REMARKS  
\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS



DATE 030983

PAGE

4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0532 03 ANNUNCIATORS OO 059 8.5.1.3

\*CRITERION TITLE ANNUNCIATOR-OPERATOR INTERFACE-AUXILIARY SHUTDOWN PANEL  
THE AUDITORY ANNUNCIATOR SOURCES ARE LOCATED NEAR THE AUXILIARY SHUTDOWN  
PANEL.

CRITERION NO. : 059

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL ROOM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX OO-XXX-206 ANNUNCIATORS





DATE 030983

PAGE

5



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT CK. CHECKLIST PN.CRT.RV STP NUREG  
\* NO NO. TITLE NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0533 03 ANNUNCIATORS 00 060 8.5.1.3

\*CRITERION TITLE ANNUNCIATOR-OPERATOR INTERFACE-AUXILIARY SHUTDOWN PANEL  
INDIVIDUAL ANNUNCIATOR TILES ARE ORGANIZED IN SYSTEM AND FUNCTIONAL GROUPS.

CRITERION NO. : 060

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL ROOM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS



DATE 030983

PAGE

J



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0534 03 ANNUNCIATORS OO 061 8.5.1.5

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER DISPLAY DEVICES  
ONE DISPLAY DEVICE IS LOCATED ON THE OPERATOR CONSOLE FOR ALARM DISPLAY.

CRITERION NO. : 061

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. .DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX OO-XXX-XXX TO BE DETERMINED



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0535 03 ANNUNCIATORS 00 062 9.5.1.5

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER DISPLAY DEVICES  
A SECOND UTILITY DISPLAY DEVICE IS AVAILABLE ON THE OPERATOR CONSOLE FOR  
ANNUNCIATION SUPPORT INFORMATION, ALARM SORTS, AND AS A BACKUP DEVICE.

\*HUMAN ERROR  
TO BE DETERMINED

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-XXX TO BE DETERMINED

CRITERION NO. : 06

CATEGORY NO. : E

PRIORITY:

ACCEPT?: YES NO

ACCEPT?: YES NO



DATE 03C983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0543 03 ANNUNCIATORS 00 071 9.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
THE OPERATOR CONSOLE CONTAINS THE SAME FUNCTION CONTROL KEY BOARDS AS ARE  
MOUNTED ON THE MAIN CONTROL BOARDS TO CONTROL THE ALARM PRESENTATION DISPLAY.

CRITERION NO. : 071

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL OPERATOR'S CONSOLE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-101 COMPUTER CONSOLE



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT CK. CHECKLIST PN CRT RV STP NUREG  
\* NO NO. TITLE NO. NO. NO REFERENCE 0700 REF  
\*\*\*\*\*  
0544 03 ANNUNCIATORS 00 072 8.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
ON THE OPERATOR CONSOLE THERE ARE FUNCTION KEYS TO SELECT 'ALL ALARMS' AND  
TO SELECT ALARMS APPLICABLE TO ANY SPECIFIED PART OF THE CONTROL BOARD.

CRITERION NO. : 072

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL OPERATOR'S CONSOLE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-XXX TO BE DETERMINED





DATE 090983

PAGE 2



## SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )

\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .

\*\*\*\*\*  
0545 03 ANNUNCIATORS 00 073 R.5.1.4

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
ON THE OPERATOR CONSOLE THERE IS THE CAPABILITY TO SELECT ALARM PRESENTATION  
BY SYSTEM AND FUNCTIONAL GROUPINGS.

CRITERION NO. : 073

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL OPERATOR'S CONSOLE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-1C1 COMPUTER CONSOLE



DATE 030983

PAGE 1



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .

-----  
0546 03 ANNUNCIATORS 00 074 8.5.1.4  
-----

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER ALARM DISPLAY-CONTROLS  
ON THE OPERATOR CONSOLE THERE ARE KEYS FOR REASSIGNMENT OF ALARM DISPLAYS  
ON THE MAIN CONTROL PANELS.

CRITERION NO. : 074

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL OPERATOR'S CONSOLE.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE DEVICE TYPE  
-----  
1 N100-XXXXX--XXXX 00-XXX-101 COMPUTER CONSOLE



DATE 030983

PAGE 2



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TCTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
0547 03 ANNUNCIATORS 00 076 8.5.1.4 6.3.1.2

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER PRINTERS  
A SECOND PRINTER SERVES AS A UTILITY PRINTER AND TO BACK UP THE ALARM PRINTER.

CRITERION NO. : 076

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL ROOM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-212 COMPUTER PRINTER



DATE 030983

PAGE

3



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
\*\*\*\*\*  
054B 03 ANNUNCIATORS OO 077 8.5.1.4 6.3.1.2

\*CRITERION TITLE ANNUNCIATOR-PLANT COMPUTER PRINTERS  
THE SECOND PRINTER SUPPLIES HARD COPY TO THE OPERATOR FOR ALARM RELATED  
FUNCTIONS SUCH AS ALARM SORTS, ESF EQUIPMENT BYPASSED OR INOPERABLE ETC.

CRITERION NO. : 077

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL ROOM.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. . DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX OO-XXX-212 COMPUTER PRINTER



DATE 030983

PAGE 4



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .

\*\*\*\*\*  
0557 03 ANNUNCIATORS 00 090 8.6.2

\*CRITERION TITLE ANNUNCIATORS-COMPUTER DEVICE ALTERNATES  
ALL COMPUTER DRIVEN DISPLAY AND PRINTER DEVICES HAVE ALTERNATES AND DEVICES  
FAILURES CAUSES THE ALTERNATE TO BE USED AUTOMATICALLY.

CRITERION NO. : 090

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ONPUTER.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

\*\*\*\*\*  
\*PROJECT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*\*\*\*\*  
\*REMARKS

\*\*\*\*\*  
\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*\*\*\*\*  
\*REMARKS

\*\*\*\*\*  
NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-XXX TO BE DETERMINED





DATE 030983

PAGE

.5



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\* SHT CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO NO. TITLE NO. NO.NO REFERENCE 0700 REF  
\*\*\*\*\*  
0559 03 ANNUNCIATORS 00 093 8.6.4

\*CRITERION TITLE ANNUNCIATORS-RESPONSE TIME  
THE TIME FROM THE OCCURANCE OF A PLANT DEVIATION TO THE TIME OF THE ANNUNCI-  
ATION AND DISPLAY IS NOT GREATER THAN ONE SECOND.

CRITERION NO. : 093

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. DEVICE TAG NO. DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-206 ANNUNCIATORS



DATE 030983

PAGE

6



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
\*\*\*\*\*  
0563 03 ANNUNCIATORS 00 097 8.6.8

\*CRITERION TITLE ANNUNCIATORS-REPLACEMENT OF ANNUNCIATOR LAMPS  
THE ANNUNCIATOR DESIGN PERMITS RAPID REPLACEMENT OF LAMPS, PRESENT NO SHOCK  
HAZARD DURING MAINTAINANCE, AND INCLUDE A MEANS TO ENSURE CORRECT TILE  
REPLACEMENT.

CRITERION NO. : 097

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

\*PROJECT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

\*MANAGEMENT REVIEW TEAM - DISPOSITION

ACCEPT?: YES NO

\*REMARKS

NO.. DEVICE TAG NO. .DEVICE CODE. DEVICE TYPE  
\*\*\*\*\*  
1 N100-XXXXX--XXXX 00-XXX-XXX TO BE DETERMINED



DATE 030983

PAGE



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF  
=====

0564	03	ANNUNCIATORS	00	100	8.6.9	6.3.3.3
------	----	--------------	----	-----	-------	---------

\*CRITERION TITLE ANNUNCIATORS-TILE LIGHTING  
BLANK TILES ARE NEVER BE LIT EXCEPT FOR TESTING.

CRITERION NO. : 100

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
=====

1	N100-XXXXX--XXXX	00-XXX-XXX	TO BE DETERMINED
---	------------------	------------	------------------



DATE 030983

PAGE

18



SOUTH TEXAS NUCLEAR PROJECT ( 14926-001 )  
\* CONTROL ROOM DESIGN REVIEW REPORT 3 TOTAL DATA BASE  
\*SHT .CK. CHECKLIST .PN.CRT.RV STP . NUREG  
\* NO .NO. TITLE .NO. NO.NO REFERENCE . 0700 REF .  
-----  
0565 03 ANNUNCIATORS OO 101 8.6.9 6.3.3.2

\*CRITERION TITLE ANNUNCIATORS-TILE LIGHTING  
IN CASE OF FLASH FAILURE, THE TILE WILL STILL LIGHT UP.

CRITERION NO. : 101

\*HUMAN ERROR  
TO BE DETERMINED

CATEGORY NO. : E

\*DESCRIPTION OF OBSERVATION  
TO BE DETERMINED ON FINAL CONTROL BOARD.

\*DESIGN REVIEW TEAM - RECOMMENDED ACTION  
0076: TO BE DETERMINED.

PRIORITY:

-----  
\*PROJECT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

\*MANAGEMENT REVIEW TEAM - DISPOSITION  
-----  
-----  
-----

ACCEPT?: YES NO

\*REMARKS  
-----  
-----  
-----

NO. . DEVICE TAG NO. .DEVICE CODE. . DEVICE TYPE  
-----  
1 N100-XXXXX--XXXX OO-XXX-XXX TO BE DETERMINED



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX D

ANNUNCIATOR REVIEW GUIDE





HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR

REVIEW

GUIDE



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR REVIEW GUIDE  
TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
	<u>TABLE OF CONTENTS</u>	i
1.0	<u>SUMMARY</u>	1
2.0	<u>OBJECTIVE</u>	1
3.0	<u>CRITERIA</u>	2
4.0	<u>METHODOLOGY</u>	3



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR REVIEW GUIDE

#### 1.0 SUMMARY

The Control Room Design Review Annunciator Review Guide establishes the basis and methodology for completion of the review of the annunciator system, including the Bypassed and Inoperable Status Lights.

The criteria and methodology set out in this guide will be used to determine the physical parameters, alarm message, and location of each alarmed point. The alarm printout and computer I/O will be revised to reflect changes made by this study.

#### 2.0 OBJECTIVE

This guide will provide the basis for completion of the Annunciator Study. The remaining tasks are:

1. Firm up, from plant design requirements, what needs to be communicated to the operator as:
  - o Plant annunciator alarms
  - o Computer alarms
  - o Local panel annunciator alarms
  - o ESF by pass and inoperable status displays
  - o Other status indicators
2. Within each of the above major systems: where the message should be displayed and what audible signal, if required, should be used to alert the operator.
3. Prioritize each message



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

4. Firm up message display physical characteristics:
  - o Engraved plates or tile size
  - o Selection of lettering type
  - o Selection of letter size
  - o Usage of abbreviations
  - o Selection of numbers of lines per tile, maximum number of letters and spaces per line.
  - o Spacing within a tile and between:
    - Letter and characters
    - Words (including abbreviations)
    - Lines - single line, two lines or three lines
5. Design documentation formatting to effect integration of the annunciator systems
6. Final annunciator study report

### 3.0 CRITERIA

The annunciator study will be based on criteria developed by:

- o STP CRDR Criteria Report Rev. 1.
- o STP CRDR Labeling Guide
- o The contents of this guide, considering:

The list of points to be alarmed, including any new alarm points to be added. Combining alarm inputs to reduce the total number of alarms in the control room is necessary to reduce operator confusion. Where multiple inputs to a window are present, the computer is used to identify the source.



The Annunciator list will be reviewed for conformance with the list of acceptable abbreviations in the Criteria Report, Appendix L. This review will assure that wording is consistent, and that the chosen wording can be fitted onto the tiles.

Priorities shall be assigned within the three categories identified in the Criteria Report, Section 8. Physical locations will be determined based upon priority, and the review team's recommendations as to the relative importance of a particular alarm, with the more important alarms being located higher in the tile array.

#### 4.0 METHODOLOGY

4.1 The major annunciator study effort will be made by the Annunciator Study Task Group. (ASTG)

- o Bob Arnold - TPT (Chairman)
- o Ken Christian - HL&P Operations
- o John Tedens - HL&P Operations
- o Ashok Joshi - Bechtel Responsible Group Leader (Annunciator and Computer)
- o Systems engineers and TPT Human Factors consultant as needed.

#### 4.2 Organizational Meeting

An initial meeting will be held with the PRT to firm up:

- o Order for review of systems
- o Determine which systems engineer (including, if necessary, Westinghouse participation) and operations personnel will attend each of the systems review sessions





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

- o Schedule for each systems review
- o Review documents to be used
- o Administrative rules

4.3 The ASTG will meet to cover the above scheduled meetings as follows:

- o Review in committee meeting what has to be annunciated and why. Consider plant function and equipment protection needs (plant operations, plant safety, and plant availability).
- o The system engineer should provide a general outline of what action the operator shall take in response to the alarm.
- o The committee shall determine:
  - Where and how the annunciation should take place
  - The optimum message
  - The message priority
  - If the I/O Lists (Annunciator Computer or others) reflect the correct inputs and if modifications are necessary.
- o Revise the Annunciator and Computer lists to incorporate the agreed changes. This list will be submitted to the PRT for approval.

4.4 The ASTG Chairman shall determine when to initiate the preparation of physical characteristics recommendations item 1.0 Para. 4 to the Human Factors engineer. These will be reviewed and accepted by the ASTG.

4.5 The documented results of the committee will be processed through the PRT.

4.6 TPT will prepare the final Annunciator Study Report



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

APPENDIX E  
MEETING MINUTES



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 10

5-18-83

#### Attendees

Bob Arnold	- TPT
Ken Hobbs	- CRT EE
David Martin	- Electrical Wiring
Dan Wicks	- Bechtel
J. R. Polu	- Bechtel
Chuck Pohla	- Bechtel
William Edwards	- Bechtel
A. Joshi	- Bechtel
John Tedens	- HL&P

#### Discussion:

The group reviewed each annunciator on panel 10 and had the following comments.

1. Keep separate sudden pressure relay alarms for each transformer. Make them priority 2.
2. Keep a trouble alarm for each transformer. Make them priority 2. AJ is to get separate inputs into the computer, to define the trouble.
3. Move windows 4-10 and 4-11 to panel 3. Combine 3-10 into 4-10; and combine 3-11 into 4-11. Make priority 2.
4. Put "BOP Diesel Running" on the computer as status.  
Put "BOP Diesel Trouble" on panel 3 - Priority 3.
5. Retain "Loss of Lockout Relay (2-1), as it contains all transformer and the main generator lockout relays.
6. Window 1-2 "Generator Voltage Hi/Lo" - Electrical to check on what this indicates. Same for 2-2 "Generator frequency Hi/Lo". This may be deleted.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

7. HOLD "Generator field voltage Hi/Low.
8. Window 2-4. Electrical will come up with a new title and explain the operation.
9. HOLD windows 1-5 & 1-6; keep 1-5 and make priority 3. Rename 1-6. It is a pre trip for 1-5.
10. Window 2-6. Put on Hold.
11. Window 1-7. Make priority 3.
12. Windows 1-8, 2-8, 1-9 & 2-9. Hold. Electrical to look into and report back.
13. Combine windows 3-1 & 4-1 and make priority 2.
14. Windows 3-12, 4-12. Electrical to check.
15. There is no window for 345KV Bus trouble, Electrical to find out if these should be.
16. Keep the 2 existing windows for 345-KV on panel 10, even though the Turbine and generator alarms are moved.  
Each of the 13.8 KV tie, supply, and ESF feeder breakers will be alarmed. For the 4160 volt system, keep one alarm.
17. Transfer 8 under voltage (for 13.8 kV) alarms to the computer.
18. For the 13.8 kV Breaker trips, make priority 2. Eliminate the words BUS and SUPPLY in row 5 alarms to eliminate the spacing problem of too many words.
19. Add 6 new 480V load center undervoltage alarms; make them priority 3.
20. Window 8-10 - Change to a trouble alarm and eliminate 8-11 and 8-12. Put on computer for definition and make priority 2.
21. The undervoltage alarms should be put on hold.
22. Add 15 new Windows for feeder breakers.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 10

5-19-83

#### Attendees

A. Joshi	- Control Systems
William Edwards	- Control Systems
Chuck Pohla	- Control Systems
J. R. Polu	- Electrical
Dan Wicks	- Electrical
David Martin	- Electrical Wiring Group
Bob Arnold	- TPT
John Tedens	- HL&P

#### Discussion:

The group continued discussions on Panel 10 alarms, with the following comments:

1. Electrical wants to remove the words "SUPPLY BREAKER" and add back "BUS" from window 5-1 and other places in row 5.
2. Windows 8-10, 8-11, and 8-12 are repeated on ZLP-150. Therefore, the action taken on 5-18 is valid.
3. Windows 3-1 and 4-1 can be combined.
4. The group will segregate out the first outs as we go. We need an answer to: Should the first outs be duplicated on both the alarm box, and on the first out panel?  
Answer: Duplicate them, because the first out panel will not flash and sound a horn.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

5. A recommendation was referred to the PRT to use an array of 5 X 10 windows of 3" by 3" each, because of the difficulty in reducing the number of characters to 3 lines of 9 characters each.

Resolution: The array and window size will stay the same. However, the letter height can be reduced to a nominal one-quarter inch because the overall height, after adding stroke width, becomes greater than the minimum 0.269" required.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 10

5-25-83

#### Attendees

A. Joshi	- Control Systems
William Edwards	- Control Systems
Chuck Pohla	- Control Systems
J. R. Polu	- Electrical
Dan Wicks	- Electrical
David Martin	- Electrical Wiring Group
Bob Arnold	- TPT
John Tedens	- HL&P

#### Discussion:

Electrical and operations made further comments on panel 10 alarms.

1. There should be separate windows for the Lockout Relays on
  1. The main generator
  2. The main transformer
  3. The Unit Aux transformerEach of these should be a priority 1.
2. The priority of main transformer 1A, 1B, and Aux. Transformers should be 1.
3. Delete the "Parallel" alarms. (6-1, 6-4, 6-7, and 6-10).
4. Need to add a new alarm for the Emergency Transformer Lockout.
5. The alarms for Y510 and Y520 (4 windows) should be relocated to panel 7.
6. Received a printout from W. Edwards on New Computer I/O for digital inputs.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### Discussion of Panel 8 (1LB009)

1. The HP heater Drip Pump, startup deaerator, and FW heaters 8 and 12 have been deleted. Windows as follows:  
1-1, 1-2, 1-3, 1-4, 1-5, 2-1, 2-2, 3-1, 3-2, 5-6, 6-6, 7-4, & 8-4.
2. Delete the overcurrent alarms, windows 3-3, 3-4, and 3-5.
3. The new deaerator will require about 10 new windows.
4. On the alarms (on 1LB007) for Turbine bearing steam seal pressures Hi/Lo, Windows 1-4, 2-4, 3-4, 4-4, 5-4, and 6-4, the Hi/Lo should be defined by the computer, as the operator needs to know whether the system is losing steam, or is taking in air. Make priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANELS 9 AND 10

5-26-83

#### Attendees

A. Joshi	- Control Systems
William Edwards	- Control Systems
Chuck Pohla	- Control Systems
J. R. Polu	- Electrical
Dan Wicks	- Electrical
David Martin	- Electrical Wiring Group
Bob Arnold	- TPT
John Tedens	- HL&P

#### Discussion:

The group had the following comments on panel 9 alarms:

1. The three Condensate groups overcurrent alarms (1-7, 2-7 and 3-7) should be deleted. The plant operators (John Tedens and Ken Christian) state that when a pump trips the operator action will be to dispatch someone, and if overcurrent has caused the trip, there will be local indication.
2. Keep pump trip alarm (4-7) and make priority 2.
3. Delete window 8-4.
4. Keep window 5-8. Priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

5. Reviewed a new P&ID. There are to be Seal Water differential pressure measurements on 3 new Feedwater Booster Pumps, and a level (1) on the seal leakoff Tank, which controls flow to the condenser. Also Hi/Lo levels on 2 new deaerator storage tanks for a total of 4. The tank Hi/Lo should be combined to come up with a total of 6 new alarms, ie 1 on the seal leakoff tank, 3 on the boost pumps, and 1 Hi/Lo on each of 2 storage tanks.

Discussion of the generator alarms that were relocated from Panel 10 to panel 7. (Window numbers refer to the old designations).

1. Windows 1-1 and 1-2. there are no provisions to provide these. Place on Hold and see if we can either/or get it or want it. The operators will check with Stan Eldridge at the site, also.
2. Windows 1-3 thru 1-9 are recommended by Westinghouse and should be kept.
3. Window 2-6 may cause a lockout and trip. Make priority 1.
4. Delete the word "Auto" from window 2-7 and make priority 3.
5. Make window 2-9 priority 3.
6. Dan Wicks of electrical says there will be one new alarm.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 7

6-1-83

#### Attendees

Jivan Pulijal	- Bechtel
Chuck Pohla	- Bechtel
John Tedens	- HL&P
K. Christian	- HL&P
Bob Arnold	- TPT
David Martin	- Electrical Wiring

#### Discussion:

The following comments concern the group's discussion of panel 7 alarms.

1. Window 1-10 is a re-transmitted alarm from ZLP 119. Change the title to "Generator Auxiliaries Trouble" to cover all 3 systems at ZLP 119. this allows the deletion of window 1-9 "Hydrogen Seal Oil trouble", which is also retransmitted from ZLP-119.
2. Windows 2-10 (.....Lo) and 3-10 (.....Lo-Lo): Jivan is to research the set points and report back 6-2-83.
3. Window 4-10-make priority 3.
4. Discussed adding a Stator Cooling Water Temperature Hi, which is already alarmed on ZLP 119. Decided that is is not necessary.
5. Discussed adding a ZLP119 Power failure, indicating loss of 125 VDC input power. This is available as a contact closure. However, all local panels have the potential for loss of power, and all can not be alarmed. Decided to add loss of power into the Trouble alarm, window 1-10.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

6. Need to add 2 windows  
Generator H<sub>2</sub> Temp Lo.  
Generator H<sub>2</sub> Press Hi/Lo
7. Discussion of ZLP 119 relative to 3 aux systems equipment. Jivan will find out and report. The question is one of time required to determine the trouble and walk to the equipment, as opposed to the control room telling the AO which piece of equipment to go to, if the system alarms are separated.
8. Suggest removing "DC Seal Oil pump running" from the common alarm "Seal Oil Trouble", to avoid having 2 alarms for 1 condition.
9. Combine windows 3-7 and 4-7 into one " Temp Hi/Lo", and delete 4-7.
10. Combine 7-3 into 6-3; delete 7-3; make priority 1.
11. Hold 8-3 until discussion on main steam system. Hold 4-1 & 5-1.
12. Make window 1-1 a priority 1. Also, make 5-5 a priority 1.
13. Delete window 3-1. Also, delete 8-5 which is effectively the same as 7-5.
14. Operations wants a window for 3-2 and 5-2. Presently, these and 1-2, 2-2 and 4-2 are only on the computer as T/C measurements, without the trip outputs required to alarm.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 7

6-2-83

#### Attendees

W. Edwards	- Bechtel
Chuck Pohla	- Bechtel
John Tedens	- HL&P
K. Christian	- HL&P
David Martin	- Electrical Wiring
Bob Arnold	- TPT
R. Mistry	- Bechtel

#### Discussion:

The group continued the review of the alarm windows on panel 7, with the following comments.

1. Delete the following windows from the annunciator and put them on the computer: 2-8, 4-8 (pump over loads), and 2-9, 6-7 (vapor extractors not running).
2. Combine windows 6-8 and 7-8, make priority 1, and delete 8-8. Send two new inputs to the computer from Turbine Bearing oil press Lo to be able to test the Turbine Trip on Lo Bearing Oil Press.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

3. Explanation of 5 Temp Alarms (1-2, 2-2, 3-2, 4-2 & 5-2): Window 3-2 Turbine base/cover DT Hi and 4-2 Turbine base/cover DT Hi-Hi indicate the presence of water in the HP Turbine. Window 2-2 indicates that one of the other 2 is burned out. The operators still want to have 2 alarms of these 5 T/Cs, ie 3-2 and 5-2. Jivan will investigate possibilities for getting trip outputs without using the computer to generate inputs to the annunciator system, for those times when the computer is not available.

### Discussion on Panel 6 - SGFPTs

1. Does SGFPT Control Oil Press Lo cause a trip of the SGFPT? If so, this alarm can be deleted, Rajan to find out and report back.
2. Combine windows 2-3, 3-3, 4-3 5-3 and 6-3 into SGFPT 11 Trouble alarm (new). Repeat for SGFPT 12 (Col.6) and SGFPT 13 (Col.10). Make the new trouble alarms priority 3. Retain tripped, suction press Lo, and Sel Water DP Lo, far each feed pump. Make the trip alarm priority 2, and the other 2 priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 6

6/8/83

#### Attendees

Bob Arnold	TPT
Dave Martin	Electrical
W. Edwards	Controls
R. Mistry	Controls
C. Pohla	Controls
J. Tedens	HL&P
K. Christian	HL&P
B. Martinez	Controls

#### Discussion:

The group continued to review the alarms located on Panel CP006.

1. Windows 3-3, 4-3, 5-3 and 6-3 should be combined into a single "SGFPT 11 Trouble". Repeat for the other two SGFPT, Columns 6 and 10. Priority 3. Retain the others for each SGFPT. Make the tripped alarm priority 2. All others priority 3. Martinez supplied a list of trips.
2. Combine 3 windows that announce to load switchover (7-1, 8-1, and 8-2) and use the computer for detail. Repeat for each of 4 SGs. Priority 3.





3. Keep windows 2-1, 3-1, 5-1 and 6-2. Priority 3. Assign priority 1 to 4-1 and 6-1, and move to the first out panel.
4. As of now, there is no audible alarm on the QPDS.
5. Martinez thinks that there will be one new temperature alarm per SG. He will check, and get back to us.
6. The large window (2 ea) 4 x 6 lamp boxes are for status only. There is no priority, no flash, and no audible.

Aux. FW Alarms - These were previously on panels 1, 2 or 3

1. AFWP #14: Steam supply pressure Hi/Lo - there is an indicator to determine whether it is Hi or Lo. Retain & assign priority 3. Low discharge pressure - assign priority 3. Trip and throttle valve trip - assign priority 3; shorten to "T and T valve trip"; add "T & T" to the abbreviation list. Exhaust pressure Hi - delete and put on computer.

2. AFWP #11, 12 & 13

Delete the overcurrent alarms, as per previous discussion. Retain the tripped (priority 2) and the Discharge Pressure Low (priority 3) alarms.

3. Discussed the Bypass and Inoperable Status lights in general. A window with no verb, ie "AFW PUMP II", is a white light, and means that the device is bypassed. A window legend with a verb, ie "AFW Pump II Not Running", is a red light, and means that the device did not operate when required. It is inoperable.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

4. A question came up concerning the "dark board" concept. How far should the design go in attempting to turn off alarms when there is no faulted condition? The answer came to the committee in a memo from the PRT, dated June 15, 1983, to minimize so-called nuisance alarms.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES FOR PANEL 6 & 7

6/9/83

#### Attendees

Bob Arnold	TPT
Dave Martin	Electrical
J. Tedens	HL&P
C. Pohla	Bechtel
W. Edwards	Bechtel
K. Christian	HL&P
J. Botello	Bechtel *
A. Biswas	Bechtel *
J. Pulijal	Bechtel *

\* Part Time

#### Discussion:

The group discussed some new alarms, and cleaned up some unanswered questions.

1. On Panel 5, windows 1-11 & 1-12, change name to "Bypass BKR, Train R (S) CLOSED" instead of "connected".
2. Discussed the status boxes on Panel 5. These signals are provided by Westinghouse, and were agreed upon as necessary.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

3. K. Christian (HL&P Op'ns) suggested adding a new annunciator window "P6/P10 NOT SATISFIED" to Panel 5, as an aid to operating without tripping the plant inadvertently.
4. Discussed the desirability of adding a status light for C-5 permissive. Decided that it was not necessary.
5. Discussed the SG Blowdown alarms. Operators suggested putting the steam flows and water flows on a dual indicator (1251) and adding a level indicator to the panel.
6. Combine windows 5-7 and 6-7 into a Pressure Hi/Lo alarm, priority 3, and to combine 7-7 and 8-7 into a Level Hi/Lo alarm, priority 3.
7. Combine 4 Blowdown flow windows into a common window. The operator can then go over to Panel 018, where the Flow Indicating Controllers are located, determine which one is high and correct it. Since he has to go to Panel 018, even if he already knew which SG Blowdown flow was high, there is no need to have 4 separate alarms.
8. Discussed a new P&ID. There are alarms for filter delta P high, Cation Demin delta p, mixed bed demin, high turbidity, and demin outlet strainer delta P hi. As there are no controls for these in the main control room, they should be put on ZLP-150.
9. The loop "alert" alarms on Panel 6, windows 1-2, 2-2, 3-2, and 4-2 are priority 3. Window 5-2 is priority 1 and should be moved to the first out panel.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

More on Panel 7 alarms with Jivan Pulijal.

1. The alarm that we made "Gen Aux Sys Trouble" - contains 3 system trouble alarms. These are Seal Oil, Generator Hydrogen, and Stater Cooling Water systems. We need 3 separate alarms, as the 3 systems are somewhat separated physically, and there would be a delay in determining which system had trouble.
2. The earlier discussion on an alarm for loss of power to ZLP-119 left the question on "hold". We decided that it was not needed.
3. Window 4-1: not clear on its meaning - it may prevent the turbine - generator from motoring. Leave it in for now.
4. Remove the hold from 8-6.
5. Keep 5-1; more on 3-2 and 5-2. Right now, there is no temperature switch to provide these alarms. If we put them on the ERF computer, and let it generate set points, the ERF can then drive the alarms. The alternative is to mount 2 new temperature switches.
6. Hold window 1-5.
7. PORVs in Local Control - windows 1-3, 2-3, 3-3, 4-3: Look into putting this function on the operations console as STATUS - ie, one window. "PORV not closed": make priority 3, and move to Panel 6.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

6/15/83

#### Attendees:

Bob Arnold	TPT
G. Boghosian	Controls
D. Martin	Elect.
W. Edwards	Controls
K. Christian	HL&P
J. Tedens	HL&P
C. Pohla	Controls
M. Vincin	Controls*
B. Martinez	Controls*
C. Nguyen	Controls*
U. Giveon	Controls*

\* Part Time

#### Discussion:

The group continued to clear up questions from previous meetings, after which we started on Panel 1.

1. There was some uncertainty about "Turbine Zero Speed" on Panel 7. Baldo Martinez will check the logic and report back.
2. The previously discussed new Turbine temperature alarm will be sent to the computer and there an alarm will be generated.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

3. Hold discussion of transfer to local until a resolution is made on all local control alarms.

Discussion on Panel 1

RHR:

1. Window 4-8 on Box 1A: it is not clear what is the source, ie PY-861. Miles Vincin will check it out.
2. There is an RHR pump unavailable signal composed of Pull-to-Lock, and loss of Control power. As RHR does not have a Bypassed/Inoperable window box, it may be desirable to add this to the alarms, even though it is status.

CCW: Comments apply to all three trains.

1. Hold 6-3 "Local Control" for resolution, as above.
2. Pump overcurrents - hold until we find out if the overcurrent causes a trip. May want to eliminate.

Containment Spray: Nguyen

1. Panel 1A, window 2-11, overcurrent: send to computer.
2. Do we want a new alarm for ground fault? No, the bus has ground fault detection.
3. Retain the other windows for containment spray. Make the pump trip and discharge press lo alarms priority 2. Make valve overload priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

Make the Aux Shutdown Panel Entry Alarm a priority 3 and move to the operator's console.

More on CCW system.

1. Delete part of 3-3 Auto trips inoperative as it no longer exists in the logic. Retain the Outlet press lo function.
2. The operators would prefer a Lo function to be added to window 2-3 outlet temp hi.
3. Delete window 5-4 "... Auto Start," and send to the computer.
4. Hold 7-4, "... Cubicle Temp Hi" for the HVAC review.
5. There are no new CCW alarms.

ECW System - Uzi Giveon

1. Retain 1-1 and 1-2, and make priority 3. Change 1-1 to "... screen stopped".
2. Delete 3-1 overcurrent
3. Retain 4-1 tripped; make priority 2
  - 3-2 strainer hi delta p; make priority 3
  - 5-1 disch press lo; eliminate auto trips; make priority 3
  - 6-2 Strainer tripped; priority 3. If we need the window for space, we can put on the computer
4. Hold 6-1, Local Control, and delete Disch strainer hi delta p. This is on the computer.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

6/16/83

#### Attendees:

B. Arnold	TPT
W. Edwards	Controls
D. Martin	Elect.
K. Christian	HL&P
J. Tedens	HL&P
C. Pohla	Controls
R. Mahanta	Bechtel*
R. Savins	Bechtel*
M. Muneer	Bechtel*
R. Patlovany	Bechtel*
R. Dwivedi	Bechtel*

\*Part Time

#### Discussion:

The panel continued consideration of the alarms on the ESF panels. These are on a "train" basis, and there are generally 3 alarms for each discussed.

#### RCFC System

1. Lo delta p is interlocked with fan running, and shutdown is automatic. The operator must start the standby train.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

2. Combine the Two fan trips into 1, and the two Lo delta p alarms into one (these are 2 fans per train). Since the operator must go to the panel to start the standby train, there is not need for train identification, therefore combine all three trains into 2 windows and define in the computer.
3. Containment pressure hi - priority 3. Combine Vacuum hi into Press hi/lo.
4. Window 1-10 on box 1 - breathing air, move to HVAC panel.
5. ECCS pump cubicle sump level Hi and Hi-Hi: This must be a qualified display to meet the regulatory requirements. Move all six to the QDPS.
6. General answer for local control alarms: Delete from the annunciator and add a separate, system level, white light for each status box. When lit, without a component level white light, this indicates that some part of that system is in local control.

The group discussed the turbine alarms on Panel 7 some more

1. Put back "Turbine zero speed" as this is needed to minimize damage to equipment, ie, the turbine shaft.
2. Add back "RCB Personnel Airlock seal failure". This had been moved to the computer. Make it priority 2 and leave it on the computer, as well as alarm it on the operator's console.
3. Add back "Turbine Overspeed Latch".





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

4. Manual Trip of turbine - put on computer as priority 1. Also put on the first out panel.
5. Move the following to the computer. RCB Pers. Airlock Open, RCB Emergency Pers. Airlock open, RCB Pers. Airlock Trouble, RCB Emergency Pers. Airlock Trouble. These are from Panel 7. Also, Radwaste Control Room Trouble.
6. Also on panel 7, delete Bulk CO<sub>2</sub> Supply Hdr. press lo, and Bulk lo press N<sub>2</sub> supply Hdr. press lo.

On window box 1A

1. Delete Load Seq. Trouble. This is to be on the new ESF status, for the Emergency diesels.
2. Move 1-12, Aux Panel entry alarm, to the operator's console.
3. Delete 2-12, Aux panel local Control initiated.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

6/29/83

#### Attendees:

B. Arnold	TPT
A. Karkare	Controls*
D. Martin	Elect.
W. Edwards	Controls
C. Pohla	Controls
R. Dwivedi	Controls*
J. Tedens	HL&P
K. Christian	HL&P
J. Polu	Controls*
D. Wicks	Elect*

\* Part Time

#### Discussion:

The group first discussed some open items and then picked up the Post Accident Monitoring Alarms, and the EIA Bus Alarms.

1. The Annunciator spec. was discussed. Right now, there is no provision for a first out panel, and, to confirm; there is no audible on the lamp test. The audible gets turned on each time there is an alarm, and the group felt that this was often enough, and an audible on lamp test was not required.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

2. The previously deleted ECW Pump discharge strainer delta p hi alarm should be put back.
3. The "valve not fully open" alarms in HHSL, LHSL and Accumulator systems should be put on the ESF Status panel, because they are used in high stress situations. During testing, etc., the operator will be watching the pump.
4. Add the RHR pumps into the ESF status.
5. Defer "CCW auto start required and did not" until later.

### Hydrogen monitoring and Post Accident Monitoring. Aril Karkare

1. Keep the Hydrogen Monitor Trouble, and assign priority 3. The equipment is vendor supplied, and this alarm is a summary of hot box temperature, power failure, low analyzer cell flow, cell failure, and low gas pressure.
2. For the Hi/Hi-Hi alarm; move to the QDPS and delete from the annunciator.
3. Delete 8-10 as there is no safety position, ie. no controls for the hydrogen recombiner.
4. Move 7-10 to the ESF status panel.

### Discussed the EIA bus alarms on window box 1A.

1. Retain 1-1; make priority 3.
2. Delete 2-1 as it is also on ESF status



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

3. Change titles to 4 kV from 4.16 kV to save character space.
4. Delete 3-1. This identifies a manual function, breakers in parallel, and the operator will know that he has put them in parallel. Leave on the computer.
5. Delete 4-1, as it, Bus undervoltage, is on ESF status.
6. Retain 5-1, and assign priority 3. Remove "Fault" from titles.
7. Assign ESF load sequencer Trouble to the ERF computer.
8. Combine 4 windows, 7-1, 7-2, 8-1, 8-2 into one load center Trouble, and define in the computer. Assign priority 3.
9. Combine 1-2, 2-2, 3-2 & 4-2 into one, 125 Vdc bus E1-I Trouble, and assign priority 2.
10. Combine 1-3, 2-3, 3-3 and 4-3 into one, 125 Vdc bus E1-II Trouble, and assign priority 2. Let the ERF computer define.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

6/30/83

#### ATTENDEES:

B. Arnold	TPT
R. Dwivedi	Controls*
W. Edwards	Controls
C. Pohla	Controls
J. Tedens	HL&P
K. Christian	HL&P
D. Martin	Elect
V. Shertukde	Controls

\* Part Time

#### Discussion:

The panel covered the emergency diesel alarms and the RMU system. There are 3 trains of diesels.

#### Diesels:

1. Delete 1-4 as it is on ESF status.
2. Keep 2-4, DG Trouble, and make priority 3.
3. Delete 3-4, Thrust bearing failure. For testing purposes, this function is on the DG local control panel, and is by passed during an SL. The alarms would come on, but the trips are bypassed and the operator cannot do anything.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

4. Delete 4-4 and 5-4; See #3 above.
5. Delete 6-4, overspeed, as it is on ESF status.
6. Keep 1-5, DG local control, because SI is not bypassed when DG is in local. Assign priority 3.
7. Keep 6-5, 7-5 and assign priority 3. Keep 8-5, level Lo-Lo, and assign priority 2 because this is a tech spec violation.
8. Need to add "Sequencer mode 1 not reset" to remind operator that the logic must be reset to re-enable the sequencer to respond to a loss of offsite power after an SI has been reset. The operators want the alarm to come in after SI has been reset, instead of as soon as SI occurs. Suggest adding a 2 min. delay to the alarm.

RMU system on Panel 4.

1. Assign priority 3 to 1-2, Stor TK level Hi/Lo.
2. Delete the "Lo/Lo" from 2-2. Retain Hi-Hi.
3. Combine the 2 RMW pump trips into one window and assign priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES ON ESF PANELS

7/7/83

#### ATTENDEES:

B. Arnold	TPT
D. Martin	Elect
C. Pohla	Controls
J. Tedens	HL&P
K. Christian	HL&P
M. Vincin	Controls*
R. Dwivedi	Controls*
R. Mistry	Controls*
J. V. Pulijal	Controls*
R. Martin	Controls*
D. Wicks	Elect*
D. Campbell	Controls*
J. Botello	Controls*

\* Part Time

#### Discussion:

The group continued to examine the layout and desirability of alarms on the ESF systems on panels 1, 2, and 3.

#### Safety Injection - Miles Vincin

1. Keep 6-8 and 6-9, pump tripped, and assign priority 2.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

2. Hold 5-8 and 5-9, overcurrents, until we can get an answer to the logic - i.e., do these alarms also cause the pumps to trip, or do they come in at a lower current.
3. Assign priority 3 to train X valve overload, window 4-9. We want each valve to be in the computer for definition. This requires 45 additional computer points total (for the 3 trains).
4. Need to add a new alarm, "Standby Jockey Pump Started". This pump starts upon low press. in the RHR heat exchanger.
5. Retain 2-10, 3-10, & 4-10 for the accumulator system, and 7-10 and 8-10 for the RWST system. Assign priority 2 for all.
6. J. Botello recommends putting 3-12 on the ESF status panel.
7. A question came up concerning retransmitted alarms from the annunciator to the computer versus using separate contacts and cable for the computer. The retransmit capability of the annunciator is limited.
8. Change: On EHC Ch. 1 and Ch. 2, Press Lo - Combine into one window.
9. Add 2 new windows on the new 7A: One each for "Turb. Lube Oil Press Lo" and for "Condenser Vacuum Lo". Assign priority 3.
10. Discussed the need for pre-trip alarms for EHC, Bearing Oil and Condenser Vacuum Pressure Lo Signals. After a call to STP site for confirmation, decided that these were not necessary.
11. Added back "Turbine Zero Speed"



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

Discussed the BOP Diesel Generator.

1. Keep the "BOP DG Trouble". The other inputs are duplicated on the local engine panel. Priority 3.
2. Move BOP DG Running to the computer.
3. Add a new alarm "Security DG Trouble" to panel 3. Priority 3.
4. Add "BOP 48 Vdc Trouble" to panel 3. Priority 3.
5. Downgrade the 250 Vdc Trouble and 125 Vdc Trouble to priority 3.
6. On the general subject of overcurrents; Presently there are 2 relays, one for the overcurrent alarm and one for the trip. Dan Wicks recommends overcurrent alarms. HL&P operations will discuss and come back to the committee with an answer.
7. Retain "BOP INVERTER TROUBLE", priority 3.
8. "E OF DG TROUBLE": Operators have no control over this equipment, and do not want it in the control room.
9. Emergency Sump Levels are to be sent to the QDPS.
10. On window Box 2A, 1-10 "Bulk Hi Press N2" change title to ACC N2 Supply Header Press Lo. Priority 3.
11. On 2A, windows 1-6 & 2-6, Cond Storage Tank levels: These move to panel 6 and change title to Aux FW Storage Tank Level Hi/Lo, and Lo-Lo. Assign priority 2. These are also on the QPDS, except the Hi alarm.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

12. Subsequently, on a telecon from the plant site to C. Pohla, the following was decided:

- A. Combine the EHC CH.1 & CH.2 Press Lo. (CP007A)
- B. Remove Condenser Vacuum below Setpoint (CP007A)
- C. Remove Turbine Bearing Oil Pretrip (CP007)
- D. Send all overcurrents to the computer





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-13-83

#### Attendees:

B. Arnold	TPT
D. Martin	Elect
T. Crawford	Controls*
C. Pohla	Controls
J. Tedens	HL&P
K. Christian	HL&P
R. Patlovany	Controls*
D. Spinelli	Controls*
U. Giveon	Controls

\* Part Time

#### Discussion:

T. Crawford gave a run down of the QDPS and its functions. The group recommended that we try for a common silence button for all the various alarm systems.

We then started the discussion on Panel 4 alarms.

RCDT - R. Patlovany

1. RCDT level Hi/Lo window 1-1: The Lo level trips the pump, but there is manual start. Change to Hi/Lo-Lo. Priority 3.
2. Retain 2-1, 3-1, 4-1, priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-13-83

Page 2

3. Valve overload: Delete. The ESF status panel contains the IRC valve not fully closed. If it overloads during isolation phase A, nothing can be done. Since the motor continues to try to drive closed, put on the computer, priority 3.

Radiation Monitor - D. Spinelli

Operators suggested an alarm from the radiation monitor computer, with the other alarms going to the plant computer.

1. Delete 6-2, 7-2, 8-2.
2. Keep 7-1 and 8-1, and move to Panel 3 or to the console. Assign priority 2 and 3 resp. Change 8-1 to Rad Mon Computer fail.

VCT System - U. Giveon

1. Retain 1-7, 2-7, 3-7, 4-7; priority 3.
2. Delete 5-5 and 5-6. The 4-7 alarm is ahead of the pumps, and will be the controlling function.
3. Delete and put on the computer, windows 5-7 and 8-8 for the positive displacement pump.
4. Hold all local control alarms that are not now on ESF status panels for resolution by a later EGL meeting.
5. Move to HVAC panel (ZCP0022): 7-5, 7-6, 7-7, 8-5, 8-6 & 8-7



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-13-83

Page 3

6. Move to Computer: 5-5 and 5-6, Centrifugal charging pumps trip. Also, 4-6, suction valve overload, and 1-5 VCT IV overload. Priority 3.
7. There will be a logic change to have 8-12 include both fitters. Priority 3.
8. Retain 2-5, 2-6, 3-6. Assign priority 3.

#### BA Tank - U. Giveon

1. Retain 1-3 and 2-3, priority 3. The Hi/Lo on these is OK because the operator has time to send someone out to look. The most likely time to get the high temp alarm is during a batching operation when someone is already there.
2. Combine: 3-3 with 6-3 (8 inputs total), and 4-3 with 7-3 (8 inputs total) and define in the computer, priority 3.
3. Combine 5-3 with 8-3 and define by control board indication. Assign priority 3.
4. A new purification system has been added, thru the polishing demin. There are measurements for Lo flow, hi turbidity, and Hi/Lo flow. Decided to add 1 new window "BA POL DEMIN TRBL" with 3 inputs, priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-14-83

Attendees:

B. Arnold	TPT
D. Martin	Elect
K. Christian	HL&P
J. Tedens	HL&P
U. Giveon	Controls
C. Pohla	Controls
V. Shertukde	Controls

Discussion:

The group continued to consider the alarms for Panel 04 with the following comments.

Letdown system - U. Giveon

1. Retain 8-11, 1-9, 1-10, 1-11, 1-12, 2-9, 2-10, 2-11, 2-12 with priority 3.
2. Retain 3-9, 3-10, 3-11, 3-12, combining the Hi and Lo flows for seal #1 (4-9, 4-10, 4-11, 4-12).
3. Retain 5-9 thru 5-12, 6-9 thru 6-12, and 7-9 thru 7-12, with priority 3.
4. Retain all of column 8, with priority 3. (1-8, 2-8 etc.)



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-14-83

Page 2

BTRS - U. Giveon

1. Move 1-4, Local Control, to the computer.
2. Window 4-4: Hi/Lo is acceptable because the operator action is to send AO in either condition. Assign priority 3.
3. Retain 5-4, 6-4, 7-4 and 8-4 with priority 3.
4. Move 1-6 to computer; other indications are available if the computer is down.
5. Combine 2-4 and 3-4; make priority 3.
6. Move 8-9 and 8-10 to the computer with priority 3.

RMW - U. Giveon

1. Retain 1-2 and 2-2, RMW Stor. TK levels. Assign priority 3.
2. Move 3-2 and 4-2, pump trips, to the computer, priority 3.

Began discussion of Panel 5.

1. Add a new window "Cold Overpass Blocked," for over pressure protection if T cold drops and a block valve is closed.
2. Add "Overpress Actuation Alert" indicating that the actual RC pressure is greater than allowable.





HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-14-83

Page 3

3. Retain 8-6 on 5A. Make priority 3.
4. Move 6-5, Lo flow Rx Trip, to the 1st Out panel, priority 1.
5. Retain 6-1 thru 6-4 priority 3.
6. Retain 1-5, 2-5, 3-5, 4-5, bypass flow Lo, priority 3.
7. Combine 1-1 thru 1-4 with 2-1 thru 2-4 respectively. The highs and lows for both reservoirs can be combined as the action is the same for either alarm. Put 8 measurements from each on one window, for 4 windows total. Priority 3.
8. Delete 4-1 thru 4-4, L.O. press Lo, as pressure is interlocked with the RCP start logic.
9. Window 8-5 Delete from both annunciator and computer. This is the RCP Oil Lift pumps tripped.
10. Combine 3-1 thru 3-4 into one window "RCP L.O. CCW Flow Lo. Make priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-20-83

#### Attendees:

R. Villa	Elect. Wiring
B. Arnold	TPT
J. Tedens	HL&P
K. Christian	HL&P
C. Pohla	Controls
W. Edwards	Controls
U. Giveon	Controls

#### Discussion:

The group covered some comments from HL&P Site operations then continued with panel 5 alarms.

1. Need to add 4 new alarms; one per lo

FW	IA	ISOL	BYP	FLOW	F
FW	IB	ISOL	BYP	FLOW	I
FW	IC	ISOL	BYP	FLOW	
FW	ID	ISOL	BYP	FLOW	HI

2. We need to separate the "Upper Reservoir Level Hi/Lo" from the Lower Reservoir levels.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-20-83

Page 2

PRZR - U. Giveon

1. Move all PRZR alarms to Panel 4.
2. Retain 3-9, 4-9, 5-9, 6-9. Priority 3. Combine 1-9 and 2-9, Vapor/Liq Temp Hi, priority 3.
3. On Box 5, move 2-7, 3-8, 6-8, 8-8, 2-11, 6-11, 2-12, 5-12 and 6-9 to the first out panel.
4. On Box 5A, move 2-7, 2-1, 4-8, and 6-8 to the first out panel.
5. Retain 3-7 and 8-8, priority 3.
6. Combine 5-7 and 6-7 "PRZR LVL LO HTRS OFF/LETDN ISOL", priority 3.
7. Retain 4-7, 1-8, 3-8, 5-8, 4-10, 5-10, 6-10, all priority 3.
8. Combine 8-7, 8-8 into PRZR HTRS TRIP, priority 3.
9. Hold 7-9 and 8-9.

PRT -

1. Make 1-10, 2-10, 3-10 priority 3 and move to Panel 4.

RCP - U. Giveon

1. On Box 5, move 8-1, 8-2, Rx trips, to the first out panel.
2. Delete 7-1 thru 7-4, overcurrents and put on computer.

3316W/0102W



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-20-83

Page 3

3. Retain 8-3, priority 3.

Rod Controls - U. Giveon

1. Delete 1-11, 1-12 alerts for runback.
2. Assign priority 3 to 2-11, 2-12.
3. Move 3-11, 3-12 to first out panel.
4. Retain 4-11, 5-11, 6-11, 7-11, 8-11 priority 3.
5. Delete 5-12 as there is no dispatch loading at STP.
6. Combine 7-9 and 8-9 (were on hold). The system has been changed. Re-name PRZR PRESS LO PORV BLOCKED.
7. Add PORV Open Command, Priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-21-83

#### Attendees:

B. Arnold	TPT
D. Martin	Elect
W. Edwards	Controls
J. Botello	Controls *
C. Pohla	Controls
K. Christian	HL&P
J. Tedens	HL&P
W. Stevens	Controls *
R. Patlovany	Controls *
M. Buttrill	Controls *

\* Part Time

#### Discussion:

The group continued discussing the alarms for Panel 5. A suggestion was made to add alarms on the PORV Block Valves, but decided to put them on the computer.

#### Protection Sys. - J. Botello

1. Windows 1-11, 1-12: Retain, priority 3, change title to BYP BKR TRAIN R, S CLOSE.
2. Move 2-11, 2-12; Manual SI trips, to First Out panel.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-21-83

Page 2

3. Revise title of 3-11, 3-12 to SSPS DC POWER LOSS TRAIN R, S, Priority 3.

4. Delete 4-11, 4-12; now on ESF status.

#### Containment Pressure

1. Retain 5-11, priority 3.

2. Move 6-11 and 5-12 to First Out panel.

3. Retain 6-12, priority 3; 7-12 priority 2.

4. Hold 8-12 as containment Isol Phase B may be eliminated.

5. Combine 7-11 and 8-11 into one RPI TROUBLE, priority 3.

6. Retain 1-10, 2-10, 3-10, 6-10, 7-10, 8-10 and 8-9, priority 3.

7. Revise 5-10 to "... Not Out": Hold 4-10 and 5-10, make 7-9 priority 3.

#### Nuclear Instr. - J. Botello

1. Make 1-7 priority 3. Juan is to check if this is interlocked to prevent the alarm from coming in after the source range power level is exceeded.

2. Retain 3-7, 5-7, 8-7, priority 3. Delete 4-7.

3. Move 3-8, 6-8, 8-8 and 6-9 to first out panel.

4. Retain 1-8, 2-8, 4-8, 5-8, 7-8, 1-9, 5-9 to first out panel.

3316W/0102W



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-21-83

Page 3

5. Hold 2-9, 3-9, 4-9.
6. Use the abbreviations PR, IR and SR for power range, intermediate range, and source range.
7. Add 2 new windows, priority 3, on Box 5A
  - A. RCP Bus Undervoltage Rx Trip Alert
  - B. RCP Bus Underfrequency Rx Trip Alert
8. Retain 1-6 and 4-12, priority 3.
9. Add a new first out alarm, RCP + P8 Rx Trip.

PASS - B. Stevens

1. Add a new alarm Post Acc Sampling Sys Trouble, priority 3, on Panel 5.

Discussed Sump Alarms on Panel 5.

1. Retain 6-4 and 7-4, Containment Normal Sump Level, priority 3.
2. Move 5-6 and 6-6 to first out panel.
3. Move the FW Isol valves, 1-5 thru 8-5 to Panel 6.
4. Move 6-3, 7-3, 8-3 to Panel 3, priority 3.
5. Delete 6-1, 7-1, 8-1.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-21-83

Page 4

6. Move 4-1, 5-1, 6-2 and 7-2 to Panel 2, priority 3.
7. Move 3-1, 3-3, 3-4 and 4-4 to Panel 4, priority 2.
8. Move 1-1 thru 1-4 to Panel 1, priority 2.
9. Move 2-1, 2-2 and 2-4 to Panel 2, priority 2.
10. Hold 5-2.
11. Move 4-3, 5-3 and 5-4 to Panel 2, priority 2.
12. Delete 2-3, EAB Elevator sump.
13. Move 3-2 to Panel 3, priority 3.
14. Move 4-2 and 8-4 to the HVAC panel, priority 3.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-27-83

#### Attendees:

B. Arnold	TPT
D. Martin	Elect
H. Henderson	Elect *
C. Pohla	Controls
K. Christian	HL&P
W. Edwards	Controls
J. Pulijal	Controls *

\* Part Time

#### Discussion:

Discussed the remainder of the sump alarms on panel 5 and cleaned up some items on hold.

Delete the previously added RCP Trip above P8 from the first out panel.

Add a new one, ECW INTAKE STRUCT SUMP LVL Hi-Hi, put on Panel 2, priority 3.

1. On Panel 5A, 5-6, 6-6, 7-6, move to Panel 2, priority 3.
2. Retain 7-5, priority 3.
3. Add one window for 10 drain pots level Hi-Hi, on Panel 8, titled MS BYP DRIP LEG LVL HI-HI, priority 3. Let computer define.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-27-83

Page 2

4. Add MS CHEST DRIP LEG LVL HI-HI, priority 3. There will be 4 inputs, and computer will define.
5. On Panel 5, 4-10 and 5-10 were on hold. Delete 5-10. Change title on 4-10 to ROD DEVIATION, priority 2.
6. Put back 4-7 SOURCE RANGE SHUTDN FLUX HI ALARM BLOCKED, priority 3.

Discussed bistable status lights. Delete the windows associated with containment hi press IL





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-28-83

#### Attendees:

B. Arnold	TPT
D. Martin	Elect
R. Dwivedi	Controls
R. Tsai	Controls
R. Mahanta	Controls
C. Pohla	Controls
W. Edwards	Controls
K. Christian	HL&P
R. Savans	Controls

#### Discussion:

Discussed the HVAC annunciators for the new panel ZCP 022. First covered 5 DCNs that are changing P&IDs.

1. RCFC Lo flow, 6 windows: Combine into one window, let the ERF computer define. Combine 6 RCFC fan Trips into one and let the computer define. Retain the priorities assigned earlier.
2. DG Room Temp Hi: Combine 3 into one window, priority 3.
3. ECCS pump Cubicle Temp: Combine 3 into one, priority 3.
4. ECW Pump Bldg. Temp.: Combine 3 into one, priority 3.



ANNUNCIATOR MEETING NOTES

7-28-83

Page 2

5 Seven new alarms:

- A. RMS ROOM TEMP HI, priority 3.
- B. ESS CHLR AREA TEMP HI, one window for 3 trains, define in ERF Computer.
- C. MAB VALVE CUBICLE TEMP HI, 3 inputs; one window, define in ERF computer.
- D. RMW PUMP ROOM TEMP HI, priority 3.
- E. BA PUMP ROOM TEMP HI, priority 3.
- F. CHG PUMP ROOM TEMP HI, combine 3 into one window, priority 3.
- G. CHG PUMP CUB SUPPL FAN TRIP, combine 3 into one window, priority 3.

MAB HVAC

- 1. Remove flow from MAB HVAC TRBL.
- 2. Combine Chem. Lab and Sample Room Exhaust Fan trip into MAB SUPPLEMENT HVAC TRBL. This alarm will contain trips for 2 supply fan, 2 exhaust fans, the conf. room, the locker room temps Hi/Lo. Priority 3.
- 3. Delete MAB Rad Chem Lab Filter Temp Hi, and MAB Sample Room Filter Temp Hi. These belong on the fire protection panel.
- 4. Revise title of MAB Filter Temp Hi-Lo to MAB SUPP SYS Temp Hi-Lo, priority 3.
- 5. Add MAB SUPP FLTR DP HI, priority 3.
- 6. Delete MAB/OUTSIDE DP HI/LO



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

7-28-83

Page 3

7. The radiation monitor in the MAB goes directly to the computer, and needs no alarm.
8. Add "-Hi" to MAB CHLD WTR EXPETK LVL LO, priority 3.
9. Change MEAB to MAB in CHLD WTR PUMP TRIP

#### FHB HVAC

1. Combine 3 SUPP Fan Trips into one window.
2. Change title of SUPP AIR TEMP to SUPP SYS TEMP HI/LO.
3. Add FHB SUPP FLTR DP HI
4. Combine EXH FLTR A & B into FHB EXH FLTR DP HI, priority 3, with 18 inputs.
5. Delete the carbon filter outlet temps hi, as these should be on the fire protection panel.
6. Add SFP PUMP ROOM TEMP HI, SFP RECIRC VLV ENCL RM TEMP HI, FHB EMER EXH HUM HI, and FHB EMER EXH FLOW LO.

#### HVAC for DG Bldg

1. Combine 3 "DG ROOM TEMP HI" into one window.
2. Combine 3 "DG OIL TK ROOM EXH FAN TRIP" into one window.
3. Combine 3 "DG OIL TK ROOM TEMP HI" into on window.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

7-28-83

Page 4

4. Add "DGB FILTER DP HI" with 3 inputs into computer for definition.
5. Add "DGB EMER FAN FLOW LO" with 3 inputs into computer for definition.
6. Add "CW ELECT EQUIP RM TEMP HI/LO".



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

8-3-83

Attendees:

B. Arnold	TPT
D. Martin	Elect
W. Edwards	Controls
K. Christian	HL&P
J. Tedens	HL&P
C. Pohla	Controls
R. Mahanta	Controls
R. Tsai	Controls

Discussion:

The group continued the coverage of HVAC alarms and miscellaneous items.

1. On Panel 9, add "AUX BOILER TROUBLE", priority 3.
2. On Panel 9, add "RESERVOIR MAKEUP TROUBLE" from ZLP500, priority 3.
3. Discussed the need for alarming the room temp in the boric acid tank room. However, since there is no heater in the room, and the tank temp is monitored Hi/Lo, there is no need for an additional alarm.
4. For the RWST level, want two windows, one for Hi/Lo, and another for Lo-Lo/EMPTY. The Hi, Lo, and Lo-Lo measurements are all in the upper portion of the tank and another alarm, empty, is needed near the bottom.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-3-83

Page 2

5. For RWST, on the new layout for Panel 1, combine three trains of Level Hi/Lo into one window and define in the computer. Do the same for level Lo-Lo/empty, and reduce 6 windows to 2.

HVAC - CR - Rabin M.

Makeup is the emergency system.

1. Revise "EAB M/U FLTR HI DP" to "CR M/U ...", combine three windows into one, and define in the computer.
2. Add "CR M/U FAN TROUBLE", and define in the computer.
3. Add "CR M/U AIR HUMIDITY HI," and "CR M/U FLOW HI/LO".
4. Move three alarms, "EAB M/U CARBON FILTER" etc, to the fire protection panel. Also, move the three CR CLEANUP CARBON FILTER..." alarms.
5. Combine "EAB/CR INTAKE AIR CHEM CONC HI" with the smoke detector in the intake air duct into one alarm. Subsequent to the meeting, J. Tedens pointed out that this was not possible. The chemical being monitored is very toxic, and the control room operator needs to identify this condition immediately. Leave as 2 separate windows.

HVAC - CR Cleanup

This is the normal system, and runs all the time.

1. Add "CR SUPPLY FAN TRBL", One window for 3 trains.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-3-83

Page 3

2. Add "CR SUPPLY FLTR DP HI", one window for 3 trains.
3. Add "CR SUPPLY TEMP HI/LO", one window for 3 trains.
4. Combine three "CR CLEANUP FILTER DP HI" into one.
5. Add "CR CLEANUP SYS TROUBLE" and add into this the flow switch High-Lo functions.
6. Add "CR RETURN SMOKE" and define which train in computer.

#### EAB HVAC

1. Add "EAB SUPPLY FILTER DP HI", one window for 3 trains.
2. Add "EAB FAN TROUBLE", one window for 3 trains.
3. Add "EAB RETURN SMOKE", one window for 3 trains.
4. Combine three EAB EXH FAN TRP into the TRBL alarm of 2 above. Define in the computer. In this system, a supply and an exhaust fan, per train, are interlocked to run together.
5. Add "EAB BATT RM EXH FAN TRBL", one window for 3 trains.
6. Delete "EAB/CR EXH FAN TRPs "(3 ea), as they are now on ESF status.
7. Add "EAB SPLY/RET TEMP HI/LO", with 9 inputs to the computer for definition.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-3-83

Page 4

8. Add "BATT RM SPLY FLOW LO", and define in the computer.
9. Add "PLANT COMPUTER BATT RM FLOW LO".
10. Hold TSC Temps, and Penetration Space Temps.

#### Containment HVAC

1. Add "CNTMT CUB EXH FAN TRBL", with 4 inputs. There are two fans on Train A, one on B, and one on C.
2. Combine 8 windows into 4; containment Normal Purge supply fan trip A & B, exhaust fan trip A & B, Supplemental purge supply fan trip A & B, and exhaust fan trip A & B. Define in computer.
3. Add "CNTMT PUR FILTER DP HI", for 2 filters, normal and supplemental.
4. Decided to send to the computer all the Reactor Vessel Support Space Temps.
5. Combine 3 "CRDM Vent Fan Trouble" alarms into one, and define in the computer.
6. Delete RWST Run Temp Lo. Supply air to the room is heated and alarmed.
7. Delete "RX CAVITY VENT FAN TRP", 2 ea, as it is on computer.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

8-3-83

Page 5

8. Combine 4 Containment Carbon Filter Fan Trips (11A, B, 12A, B) into one window "CNTMT CARBON UNIT FAN TRIP" and define in computer.
9. Move the two carbon filter outlet temp hi alarms to the fire protection panel.
10. Combine 2 ea Carbon Filter DP Hi alarms into one window and define in computer.
11. Hold 3 Isol Valve Cub Temps.
12. Delete penetration/outside DP Lo.
13. Retain 3 alarms associated with RCB: RCB CHLD WTR PUMP TRIP, RCB CHLR TRBL, RC CHLD WTR EXPTK LVL LO.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-4-83

#### Attendees:

B. Arnold	TPT
D. Martin	Elect
W. Edwards	Controls
K. Christian	HL&P
J. Tedens	HL&P
C. Pohla	Controls
J. Pulijal	Controls*
V. Shertukde	Controls*
P. Nguyen	Controls*
H. E. Reese	Controls*
M. Muneer	Controls*
B. Martinez	Controls*
R. Mistry	Controls*

\* Part Time

#### Discussion:

The group considered the alarms presently identified as being on ZLP 150, the basement operators cubicle, and some others.

1. Delete three 4 kV alarms, 1-10, 2-10 & 3-10, which are redundant with 4 kV TRBL in the CR.
2. Delete 4-10, 5-10, 6-10, 7-10, 1-11, 2-11, 4-11, 5-11 & 6-11. Same reason as 1 above.





HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

8-4-83

Page 2

3. Delete 1-12, 2-12, 4-12, 7-11 & 8-11.
4. The group considered the possibility of eliminating the retransmitted signal to the control room, and alarming ZLP 150 in various areas of the building for those times when no one is in the room.

Gen. Aux. Systems - Jivan P.

1. Delete 5-12 and 6-12. ZLP-119 retransmits to the CR.
2. Delete 7-3, 7-8, 6-8 and 8-8.

Main Steam on Main Control Panels Veejay S.

1. On Panel 8, there are 4 new MSR Drip pumps (= 100 hp ea). Add one common alarm, MSR DRIP TK PUMP TRIP, and define in the computer. Priority 3.
2. Add, on Panel 8, MSR DRIP TK PUMP SU'CT PRESS LO, priority 3, and define which of 4 is low in computer.
3. On ZLP 150, delete 3-3, 4-3 which are duplicated in CR.
4. Delete 1-3 and 2-3 because these pumps are deleted.

ACW System

1. Delete 2-4 and 6-4; duplicated in CR.
2. Retain 1-4, 3-4, 5-4, 7-4, 4-4, and 3-5.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-4-83

Page 3

P. Nguyen

1. Delete 8-6. The valve has been deleted.
2. Retain all sumps: 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, 4-2, 5-1, 5-2.

Circ. Water

1. Delete 1-5 which comes from Panel 148. It is in CR.
2. Delete 2-5.
3. Delete 2-6 & 3-6 which are in CR already. Remove yard water system trouble from the computer.
4. Ken Christian will check on the proposed manning for ZLP 139. If someone is planned for there continuously, then M/U DEMIN SYS TRBL on ZCP 009 can be deleted.

IAS/SAS - Muher M.

1. On ZCP 008, delete IAS/SAS TRBL
2. Add to ZLP 150, IAS/SAS CLG WTR PRESS LO.
3. Retain 5-6, 6-6, 7-7, and 8-5.
4. Move 6-7 "STATION TO INSTR AIR CROSSOVER VALVE OPEN" to ZCP 008. The plant operator needs to know the status of this valve.



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-4-83

Page 4

SGFPT - Baldo M.

1. Delete 1-9 & 2-9. Redundant with CR.
2. Retain 6-9.
3. Retain 3-9 and 4-9 tentatively.
4. Add one window for three pumps, CONDENSATE PUMP SUCTION STRAINER DP HL. The AO can determine which pump needs attention.

SGFPT Lube Oil- Rajan M.

1. Delete 3-9 as it is already in CR as part of Lube Oil TRBL.
2. Delete 5-9.

Main Turb. Lube Oil

1. Delete 1-8 as it is in the computer.
2. Delete 2-8 as it is in CR.
3. Retain 3-8 and 4-8.
4. Delete 6-3, 4-5 and 5-5 as they are in CR.
5. Retain 5-3, 8-2 and 8-3.
6. Delete 2-7 - it doesn't exist any longer.

3316W/0102W



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

8-4-83

Page 5

7. Delete 1-7, it is in CR.
8. Delete 3-7, it is now on QDPS.
9. Delete 4-7 and 5-7; now on HVAC panel.
10. Retain 8-12, TG BLDG HVAC SYS TROUBLE
11. Move 7-12, TRANSFORMER DELUGE ACT, to Fire Protection Panel.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

ANNUNCIATOR MEETING NOTES

8-10-83

Attendees:

B. Arnold	TPT
W. Edwards	Controls
R. Mahanta	Controls - HVAC
R. Tsai	Controls
D. Martin	Elect
J. Tedens	HL&P

Discussion:

The group covered some open items, with resolutions as follows:

1. The present HVAC alarm box layouts show 3 boxes, but the HVAC panel will have four sections (ZCP 022-1, -2, -3 & -4). The Alarm layouts will be separated correctly after the panel layout is complete.
2. Combine the windows for MS ISOL VLV CUB SPLY FANS TRP (2 ea), into one which will have 5 inputs. Define in computer.
3. Retain MSIV CUB TEMP HL, which has 4 inputs.
4. Add, in the EAB area of the HVAC panel alarms, EAB PENETR NORM AHU TRBL. There are three fans that are 1E, and are on ESF status. This alarm is for 3 normal and 2 exhaust fans that are non-safety. The computer will define.





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

### ANNUNCIATOR MEETING NOTES

8-10-83

Page 2

5. Discussed TSC alarms and decided that is not in the ASTG scope.
6. Essential Chilled Water: There are 6 chillers and 3 pumps in this system, all class 1E. There are also 3 expansion tanks with level Hi/Lo alarms. The tank levels are non-safety. The chillers and pumps will be on ESF status. Add one window for the tank levels, ESS CHLR EXPTK LVL HI/LO.
7. There will be some alarms to be added as a result of the new generator breaker. No details are now available.
8. The temperature out of the Turbine Lube Oil cooler is to go to the computer as an analog measurement. No alarm.
9. Add a Turbine Overspeed Trip to the first out panel.
10. Remove the Turbine Overspeed latch from Panel 7.



HOUSTON  
LIGHTING  
&  
POWER CO.

**CONTROL ROOM  
DESIGN REVIEW**

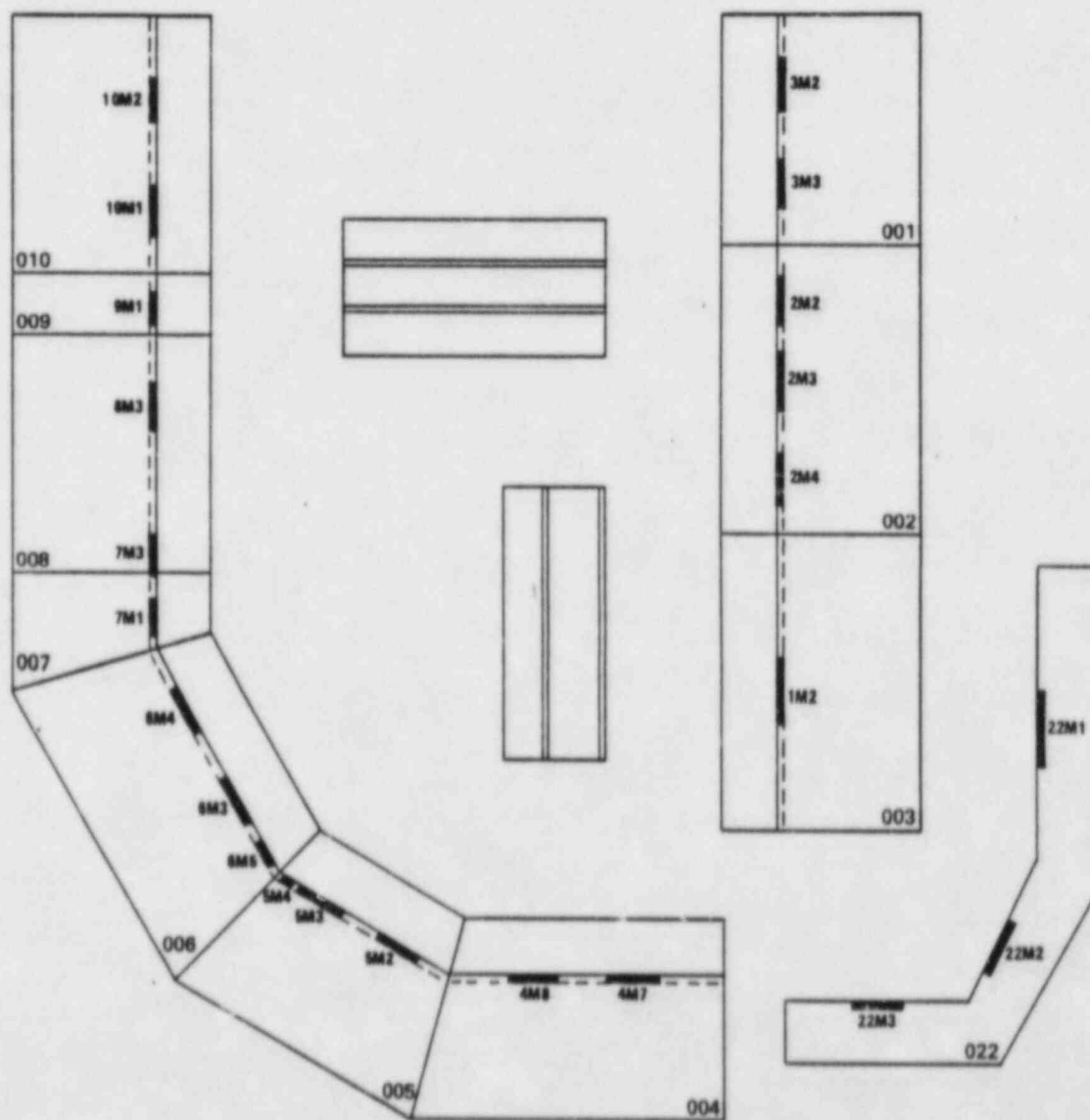
APPENDIX F

ANNUNCIATOR LAYOUT



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW



ANNUNCIATOR LAMPBOX LAYOUT



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A			ACC TK 1A PRESS HI/LO		ACC TK 1B PRESS HI/LO		ACC TK 1C PRESS HI/LO	ACC N2 SUPP HNR PRESS LO
B		WAB FLR DRN SUMP 1 LVL HI HI	ACC TK 1A LEVEL HI/LO		ACC TK 1B LEVEL HI/LO		ACC TK 1C LEVEL HI/LO	
C	HWST LEVEL HI/LO	WAB FLR DRN SUMP 2 LVL HI HI	ACC TK 1A ISOL VLV NFO	RHR LHSI PUMP 1A DISCH PRESS HI	ACC TK 1B ISOL VLV NFO	RHR LHSI PUMP 1B DISCH PRESS HI	ACC TK 1C ISOL VLV NFO	RHR LHSI PUMP 1C DISCH PRESS HI
D	HWST LO/EMPTY	WAB FLR DRN SUMP 3 LVL HI HI	HHSI PUMP 1A TRIP	LHSI PUMP 1A TRIP	HHSI PUMP 1B TRIP	LHSI PUMP 1B TRIP	HHSI PUMP 1C TRIP	LHSI PUMP 1C TRIP
E		WAB FLR DRN SUMP 4 LVL HI HI		RHR PUMP 1A TRIP		RHR PUMP 1B TRIP		RHR PUMP 1C TRIP
F		STANDBY SIS JOCKEY PUMP START		RHR PUMP 1A DISCH FLOW LO		RHR PUMP 1B DISCH FLOW LO		RHR PUMP 1C DISCH FLOW LO

ILB001M2



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8	
A		CNTRM PRESS H/LO			RCFC FAN TRIP				
B					RCFC FAN OP LO				
C		CNTRM ELEC PENETR EL 90 LEAK HI		CNTRM SPR PUMP 1A TRIP		CNTRM SPR PUMP 1B TRIP		CNTRM SPR PUMP 1C TRIP	
D		CNTRM ELEC PENETR EL 30 LEAK HI		CNTRM SPR PUMP 1A DISCH FLOW LO		CNTRM SPR PUMP 1B DISCH FLOW LO		CNTRM SPR PUMP 1C DISCH FLOW LO	
E	CNTRM P2 MOTR PAM 1 TRBL	CNTRM ELEC PENETR EL 10 LEAK HI							
F	CNTRM P2 MOTR PAM 11 TRBL		SPR ADD TK 1A LVL H/LO	SPR ADD TK 1A PRESS H/LO	SPR ADD TK 1B LVL H/LO	SPR ADD TK 1B PRESS H/LO	SPR ADD TK 1C LVL H/LO	SPR ADD TK 1C PRESS H/LO	

ILB 002M2





HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	FWB SLUMP LVL HI HI	MEAB ECW SLUMP LVL HI HI	MEAB ELVTR & SLUMP LVL HI	MTR AIR CLR CCW FLOW LO	CCW PUMP 1A TRIP	HCP 1A THERM BAR CCM FLOW TEMP HI		ECW SCRIN WASH PUMP 1A TRIP
B			MEAB CNTMT PERETR SLUMP LVL HI HI					ECW TRN A TRAV SCRIN STOPPED
C		ECW INTK STRUC SLUMP LVL HI HI	MEAB RAD PIPE CHASE FLR DRN FLOW		CCW HX 1A OUTL FLOW HI/LO		ECW PUMP 1A TRIP	ECW TRN A TRAV SCRIN DP HI
D		CCW SLUMP LVL HI	HWST SLUMP LVL HI		CCW HX 1A OUTL TEMP HI/LO	CCW SHG TK COMPART A LVL LO	ECW PUMP 1A DISCH PRESS LO	ECW PUMP 1A BAY LVL LO
E		CCW PUMP AREA LVL HI			CCW HX 1A OUTL PRESS LO			ECW PUMP 1A DISCH STRN TRIP
F			KEER CART AREA SLUMP LVL HI				ECW PUMP 1A SEAL WTR STRN FLOW LO	ECW PUMP 1A SEAL WTR STRN DP HI

ILB002M3



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	CCW PUMP 1B TRIP	RCP 1B THE RM BAR CON FLOW/TEMP HI		ECW SCRN WASH PUMP 1B TRIP	CCW PUMP 1C TRIP	RCP 1C THE RM BAR CON FLOW/TEMP HI	RCP 1D THE RM BAR CON FLOW/TEMP HI	ECW SCRN WASH PUMP 1C TRIP
B				ECW TRIN B TRAV SCRN STOPPED				ECW TRIN C TRAV SCRN STOPPED
C	CCW HX 1B OUTL FLOW HI/LO		ECW PUMP 1B TRIP	ECW TRIN H TRAV SCRN DP HI	CCW HX 1C OUTL FLOW HI/LO		ECW PUMP 1C TRIP	ECW TRIN C TRAV SCRN DP HI
D	CCW HX 1B OUTL TEMP HI	CCW SRG 1A COMPART B LVL HI/LO	ECW PUMP 1B DISCH PRESS LO	ECW PUMP 1B BAY LVL LO	CCW HX 1C OUTL TEMP HI/LO	CCW SRG 1A COMPART C LVL HI/LO	ECW PUMP 1C DISCH PRESS LO	ECW PUMP 1C BAY LVL LO
E	CCW HX 1B OUTL PRESS LO			ECW PUMP 1B DISCH STN TRIP	CCW HX 1C OUTL PRESS LO			ECW PUMP 1C DISCH STN TRIP
F	CCW STB: TRAIN NOT SELECTED	ECW POND LVL LO	ECW PUMP 1B SEAL WTR FLOW LO	ECW PUMP 1B SEAL WTR STN DP HI			ECW PUMP 1C SEAL WTR FLOW LO	ECW PUMP 1C SEAL WTR STN DP HI

ILB002M4



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	125V DC BUS E1A11 TRBL	125VDC E1A11 INVERTER 100 KVA TRBL	125VDC E1A11 INVERTER 7.5 KVA TRBL	120 VAC CHANNEL I DP1201 TRBL	120 VAC CHANNEL I DP1201 TRBL	250 VDC SMBD TRBL		LIGHTING E1 TRBL
B	125V DC BUS E1B11 TRBL	125VDC E1B11 INVERTER TRBL		120 VAC CHANNEL II DP1202 TRBL		125 VDC SMBD 1A TRBL	125 VDC SMBD 1A INVERTER TRBL	
C	125V DC BUS E1C11 TRBL	125VDC E1C11 INVERTER TRBL		120 VAC CHANNEL III DP1203 TRBL		125 VDC SMBD 1B TRBL	125 VDC SMBD 1B TRBL INVERTER V001	125 VDC SMBD 1B TRBL INVERTER V002
D	125V DC BUS E1D11 TRBL	125 VDC E1D11 INVERTER 100 KVA TRBL	125 VDC E1D11 INVERTER 7.5 KVA TRBL	120 VAC CHANNEL IV DP1204 TRBL	120 VAC CHANNEL IV DP1204 TRBL	40 VDC BUS TRBL		
E						80P DC TRBL		
F								

ILB003M2



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	EAB BATT RM SUMP LVL HI			DG 13 TRBL		DG 12 TRBL		DG 13 TRBL
B			DG 11 SEGR MODE ONE NOT RESET	DG 11 FO GUARD PIPE LVL HI	DG12 SEGR MODE ONE NOT RESET	DG 12 FO GUARD PIPE LVL HI	DG13 SEGR MODE ONE NOT RESET	DG 13 FO GUARD PIPE LVL HI
C			4KV E1A SUPP BKR TRIP	4KV E1A UNDERVOLT ALERT	4KV E1B SUPP BKR TRIP	4KV E1B UNDERVOLT ALERT	4KV E1C SUPP BKR TRIP	4KV E1C UNDERVOLT ALERT
D			4KV E1A GND	DG FO STOR TK 11 LVL HI/LO	4KV E1B GND	DG FO STOR TK 12 LVL HI/LO	4KV EK GND	DG FO STOR TK13 LVL HI/LO
E			480V LC E1A1 TRBL	DG FO STOR TK 11 LVL LO/LO	480V LC E1B1 TRBL	DG FO STOR TK12 LVL LO/LO	480V LC E1C1 TRBL	DG FO STOR TK13 LVL LO/LO
F			480V LC E1A2 TRBL	DG BLDG SUMP 1 LVL HI HI	480V LC E1B2 TRBL	DG BLDG SUMP 2 LVL HI HI	480V LC E1C2 TRBL	DG BLDG SUMP 3 LVL HI HI

ILB003M3



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	RCPTA SEAL WTR INJ FLOW LO	RCPTA NO 1 SEAL DP LO	RCPTB SEAL WTR INJ FLOW LO	RCPTB NO 1 SEAL DP LO	RCPTC SEAL WTR INJ FLOW LO	RCPTC NO 1 SEAL DP LO	RCPTD SEAL WTR INJ FLOW LO	RCPTD NO 1 SEAL DP LO
B	RCPTA NO 1 SEAL LKF FLOW HI/LO	RCPTA STD PIPE LVL P-1	RCPTB NO 1 SEAL LKF FLOW HI/LO	RCPTB STD PIPE LVL HI	RCPTC NO 1 SEAL LKF FLOW HI/LO	RCPTC STD PIPE LVL HI	RCPTD NO 1 SEAL LKF FLOW HI/LO	RCPTD STD PIPE LVL HI
C	RCPTA NO 2 SEAL LKF FLOW HI	RCPTA STD PIPE LVL LO	RCPTB NO 2 SEAL LKF FLOW HI	RCPTB STD PIPE LVL LO	RCPTC NO 2 SEAL LKF FLOW HI	RCPTC STD PIPE LVL LO	RCPTD NO 2 SEAL LKF FLOW HI	RCPTD STD PIPE LVL LO
D	PRT PRESS HI	RCDT PRESS HI	RHT NO 1 COMPART SUMP LVL HI	RHT NO 2 COMPART SUMP LVL HI	BTR CHLR SRG TK LVL HI/LO	BTR CHLR PKG TRBL	TOT M/U FLOW DEV	AUTOM/U RECD
E	PH T TEMP HI	RCDT TEMP HI	RCDT LEVEL HI/LO-LO	RMM STOR TK SUMP LVL HI	RMM STOR TK LVL HI/LO	RMM STOR TK LVL HI/LO	BA FLW TO BLENDER DEV	
F	PRT LEVEL HI/LO		RCDT PUMP G/SC-H FLOW LO	EX/S I TON HX TL MP HI	BA TK LVL HI/LO	BA TK LVL LO/EMPTY	BA TK TEMP HI/LO	BA POL DEMIN TRBL

ILB004M7





HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A		BTR DEMIN INL TEMP HI	JTR RET HEAT TEMP HI			PRZR LEVEL HI RX TRIP ALERT	PRZR PRESS HI RX TRIP ALERT	PRZR VPR LIQ TEMP HI
B		BTR DEMIN INL TEMP HI DEMIN OVRT	HEGEN HX LETDN TEMP HI	LETDN G/IF RLF VLV DISCH TEMP HI		PRZR LEVEL HI	PRZR PRESS HI	PRZR SFTY RLFV TEMP HI
C	SEAL WTR INJ TEMP HI	BTR DEMIN DP HI	LETDN HX OUTL TEMP HI	LETDN HX OUTL PRESS HI		PRZR LEVEL DEV HI BIU HTS ON	PRZR PRESS DEV HI	PRZR PORV DISCH TEMP HI
D	SEAL WTR INJ FLTR DP HI		LETDN HX TEMP HI DEMIN OVRT	LETDN HX OUTL FLOW HI/LO	PRZR PORV BLK VLV NOT OPEN	PRZR LEVEL DEV LO	PRZR PRESS DEV LO BIU HTS ON	PRZR SURGE LINE TEMP LO
E		VCT LEVEL HI/LO	VCT PRESS HI/LO		PRZR PORV OPEN COMMAND	PRZR LVL LO BIU HTS OFF LETDN ISOL	PRZR PRESS LO RX TRIP ALERT	PRZR SPRAY LINE TEMP LO
F		VCT LEVEL LO/LO	CHG FLOW HI/LO	CHG RUCP COMPART TEMP LVL HI HI	BIU HTS LOCAL CONTROL	PRZR HTS TRIP	PRZR PRESS LO SI ALERT	PRZR PRESS LO PORV BLKD

ILB004M8



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	RC LOOP 1 FLOW LO RX PRE TRIP	RC LOOP 2 FLOW LO RX PRE TRIP	RC LOOP 3 FLOW LO RX PRE TRIP	RC LOOP 4 FLOW LO RX PRE TRIP	OT DT RX PRE TRIP	OP DT RX PRETRIP		
B	RC LOOP 1 RTD BYP FLOW LO	RC LOOP 2 RTD BYP FLOW LO	RC LOOP 3 RTD BYP FLOW LO	RC LOOP 4 RTD BYP FLOW LO	AUCT T AVG HI	OP ACTUATION ALERT		
C	RCP 1A UPPER OIL RSVR LVL HI/LO	RCP 1B UPPER OIL RSVR LVL HI/LO	RCP 1C UPPER OIL RSVR LVL HI/LO	RCP 1D UPPER OIL RSVR LVL HI/LO		TAVG/ AUCT TAVG DEV		
D	RCP 1A LOWER OIL RSVR LVL HI/LO	RCP 1B LOWER OIL RSVR LVL HI/LO	RCP 1C LOWER OIL RSVR LVL HI/LO	RCP 1D LOWER OIL RSVR LVL HI/LO	COLD OP BLOCKED NEW	DT/ AUCT DT DEV		
E	RCP LO CON FLOW LO	RCP TRIP	RX VSL FLNGR LEAK TEMP HI		TURB IMP PRESS ROD WITHDRWL BLKD	T REF/ AUCT TAVG DEV		
F	RCP 125 VDC CONT UNDERVOLT	RCP BUS UNDERVOLT RX PRETRIP	RCP BUS UNDERVOLT RX PRETRIP		T AVG LO LO NORM STM DUMP BLKD			PRPTO NOT SATISFIED

ILB005M2



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	SR SHUTDOWN FLUX HI	PR HI SETPT FLUX HI RX TRIP ALERT	PR UP-R DET FLUX DEV HI/ AUTO DEF	OVER POWER ROD WITHDRAWL BLKD	RPI TRBL		BYP BKR TRN R CLOSE	BYP BKR TRN S CLOSE
B	SR SHUTDOWN FLUX HI ALM BLKD	PR LO SETPT RX TRIP ALERT	PR LOWR DET FLUX DEV HI/ AUTO DEF	BANK D FULL ROD WITHDRAWL	ROD CONT URGENT ALARM		SSPS DC PWR LOSS TRN R	SSPS DC PWR LOSS TRN S
C	SR TRIP BYPASS	PR FLX RATE HI RX TRIP ALERT	PR CHANNEL DEV		ROD CONT NON-URGENT ALARM		CNTMT PRESS HI-3 TEST	
D	IR TRIP BYPASS			BANK INSERT LO	ROD DEVIATION		CNTMT SPR ACT	CNTMT NORM SUMP LVL HI HI
E	IR FLUX HI ROD WITHDRAWL BLKD	SR HI VOLT FAIL	PR HI VOLT FAIL	BANK INSERT LO LO		POST ACCID SMPL SYS TRBL	CNTMT PRESS HI-3 SPR ALERT	CNTMT SEC NORM SUMP LVL HI HI
F	IR COMP VOLT FAIL	IR HI VOLT FAIL	NIS CHNL TEST	ROD BOTTOM	ROD DRIVE MG SET TRBL		CNTMT PRESS HI-1 SI ALERT	CNTMT ISOL PHASE B

ILB005M3



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7
A	SG1A LVL LO-LO	LOOP 1 LO-LO TC/LO STM PRESS SI		MANUAL TRIP	RC LOOP FLOW LO	PRZR PRESS LO	PR RATE CHANGE TRIP
B	SG1B LVL LO-LO	LOOP 2 LO-LO TC/LO STM PRESS SI		TURB TRIP		PRZR PRESS HI	PR HI SETPOINT TRIP
C	SG1C LVL LO-LO	LOOP 3 LO-LO TC/LO STM PRESS SI		OT DT	RCP UNDERVOLT	PRZR LEVEL HI	PR LO SETPOINT TRIP
D	SG1D LVL LO-LO	LOOP 4 LO-LO TC/LO STM PRESS SI		OPDT	RCP UNDERFREQ		IR HI FLUX TRIP
E		CNMT PRESS HI 1 SI	PRZR PRESS LO SI				SR HI FLUX TRIP
F		MANUAL TRIP SI					

ILB005M4





HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	SG PORV NOT CLOSE	SG1A LVL HI HI ALERT		FW FLOW HI		SG1B LVL HI HI ALERT		
B	MSIV NOT FULL OPEN	SG1A LVL DEV HI/LO	AFWP 11 TRIP	SG1 STM PRESS RATE HI ALERT	SGFPT 11 TRIP	SG1B LVL DEV HI/LO	AFWP 12 TRIP	SG2 STM PRESS RATE HI ALERT
C		SG1A LVL LO	AFWP 11 DISCH PRESS LO		SGFPT 11 CONT OIL PRESS LO	SG1B LVL LO	AFWP 12 DISCH PRESS LO	
D	SG BLWDN FLOW HI	SG1A LVL LO-LO ALERT	AFW STORTK LVL HI/LO	SG 1 STM PRESS LO ALERT	SGFPT 11 SUCTION PRESS LO	SG1B LVL LO-LO ALERT		SG2 STM PRESS LO ALERT
E	SG BLW FLSHTK PRESS HI/LO	FWIV FV 714 HYD PRESS LO	SG1A STG/FW FLOW MSMATCH	LOOP 1 TC LO ALERT	SGFPT 11 SEAL WTR DP LO	FWIV FV 7142 HYD PRESS LO	SG1B STM/FW FLOW MSMATCH	LOOP 2 TC LO ALERT
F	SG BLWDN FLSHTK LVL HI/LO	FWIV FV 7141 N2 PRESS LO		LOOP 1 TC LO-LO ALERT	SGFPT 11 TRBL	FWIV FV 7142 N2 PRESS LO		LOOP 2 TC LO-LO ALERT

ILB006M3





HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A		SG1C LVL HI HI ALERT				SG1D LVL HI HI ALERT		
B	SGFPT 12 TRIP	SG1C LVL DEV HI/LO	AFWP 13 TRIP	SG3 STM PRESS RATE HI ALERT	SGFPT 13 TRIP	SG1D LVL DEV HI/LO	AFWP 14 T & T VLV TRIP	SG4 STM PRESS RATE HI ALERT
C	SGFPT 12 CONT OIL PRESS LO	SG1C LVL LO	AFWP 13 DISCH PRESS LO		SGFPT 13 CONT OIL PRESS LO	SG1D LVL LO	AFWP 14 DISCH PRESS LO	
D	SGFPT 12 SUCTION PRESS LO	SG1C LVL LO LO ALERT		SG3 STM PRESS LO ALERT	SGFPT 13 SUCTION PRESS LO	SG1D LVL LO LO ALERT		SG 4 STM PRESS LO ALERT
E	SGFPT 12 SEAL WTR DP LO	FWIV FV 7143 HYD PRESS LO	SG1C STM/FW FLOW MSMTC	LOOP3 TC LO ALERT	SGFPT 13 SEAL WTR DP LO	FWIV FV 7144 HYD PRESS LO	SG1D STM/FW FLOW MSMTC	LOOP4 TC LO ALERT
F	SGFPT 12 TRBL	FWIV FV 7143 N2 PRESS LO		LOOP3 TC LO LO ALERT	SGFPT 13 TRBL	FWIV FV 7144 N2 PRESS LO		LOOP4 TC LO LO ALERT

ILB006M4



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4
A	REACTOR TRIP	TURBINE OVER/SP TRIP	EXCS CLDN FW ISOL	
B	SGTA LVL HI HI ISOL	MAIN COND VAC		
C	SGTB LVL HI HI ISOL	TURB THR BRG TRIP		
D	SGTC LVL HI HI ISOL	TURB BRG OIL TRIP		
E	SGTD LVL HI HI ISOL	ENG SPLY PRESS LO	MAIN XFMR LOCKOUT REL TRIP	
F	STM PRESS RATE HI ISOL		GEN LOCKOUT REL TRIP	

ILB006M5



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A				GEN/EXCT FLD GND	GEN VOLTREG TRIP	GEN BKR TRIP Y510	GEN BKR TRIP Y520	
B			GEN FLD BKR TRIP		GEN INSTR POT LOSS	GEN BKR TRBL Y510	GEN BKR TRBL Y520	
C				GEN MAX EXCT	GEN/EXCT GND DET BRUSH FAIL			
D			GEN VOLTREG VOLT/HZ RUNBK	GEN MAX EXCT TIMING				
E			VOLT REG SYS TRBL	GEN VOLT REG FIELD FORCING				
F			GEN VOLT REG POT LOSS	GEN/M XPMR VOLT/HZ TRIP				

ILB007M1



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A		EHF SPLY PUMP TRIP			TURB L.O. SYS TRBL	STATR CLG SYS TRBL	GEN H <sub>2</sub> -S. O. SYS TRBL	FW BOOST PUMP TRIP
B		EHF SUPP PUMP LOCKOUT	TURB AUTO STOP PRESS RX PRETRIP		TURB BRG OIL PRESS LO	STATR CLG CONDUCT HI HI	GEN H <sub>2</sub> LIQUID LVL HI	FW BOOST PUMP OUTL FLOW LO
C			TURB STM STOP VLV RX PRETRIP	HP TURB BASE COVER OT HI	TURB L.O. RSVR LVL HI/LO			FW BOOST PUMP SEAL WTR OP LO
D	EHF RET PRESS HI	EHF RSVR LVL HI/LO LG		LP TURB EXH HOOD TEMP HI	TURB L.O. RSVR LVL LO LO		DEAER STOR TANKS LVL HI HI	DEAER STOR TANK 1 LVL HI/LO
E	EHF PUMP FILTER OP HI	EHF RSVR LVL LO LO	DC SEAL OIL PUMP RUN	TURB GEN BRG VIB HI	TURB AUX PUMP SW IN STOP		MAIN COND VACUUM LO	DEAER STOR TANK 2 LVL HI/LO
F	EHF AUTO STOP PILOT PRESS LO	EHF RSVR TEMP HI/LO	DC L.O. PUMP RUN	TURB TURNING NOT OPER	TURB ZERO SPEED			SEAL LEAKOFF TANK LVL HI

ILB007M3



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	TURB BRG 3 STM SEAL PRESS HI/LO		MSR DRIP TK PUMP TRIP	LP HOP TRIP	RHTR DRIP TK 11A LVL HI	RHTR DRIP TK 12A LVL HI	FLS TK 11 LVL HI/LO	
B	TURB BRG 4 STM SEAL PRESS HI/LO	MS BYP DRIP LEG LVL HI HI	MSR DRIP TK PUMP SUCT PRESS LO	LP HOP 11 SEAL WTR PRESS LO	RHTR DRIP TK 11B LVL HI	RHTR DRIP TK 12B LVL HI	FLS TK 12 LVL HI/LO	
C	TURB BRG 5 STM SEAL PRESS HI/LO	MS CHEST DRIP LEG LVL HI HI		LP HOP 12 SEAL WTR PRESS LO	MSR DRIP TK 11A LVL HI	MSR DRIP TK 12A LVL HI	FLS TK 13 LVL HI/LO	
D	TURB BRG 6 STM SEAL PRESS HI/LO	MSR TRBL	IAS HDR PRESS LO	LP HOP 13 SEAL WTR PRESS LO	MSR DRIP TK 11B LVL HI	MSR DRIP TK 12B LVL HI	FW HTR 15A LVL HI	FW HTR 16A LVL HI
E	TURB BRG 7 STM SEAL PRESS HI/LO	GL STM HDR PRESS LO	SAS HDR PRESS LO	FW HTR 11A LVL HI	FW HTR 13A LVL HI	FW HTR 14A LVL HI	FW HTR 15B LVL HI	FW HTR 16B LVL HI
F	TURB BRG 8 STM SEAL PRESS HI/LO	GL STM CHDR VAC LO	SAS/IAS XOVER VLV OPEN	FW HTR 11B LVL HI	FW HTR 13B LVL HI	FW HTR 14B LVL HI	FW HTR 15C LVL HI	FW HTR 16C LVL HI

ILB008M3





HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	COND PMP 11 PMP TRIP		CWP TRIP/FAIL START	POL DEMIN SYS TRBL		CMPT BATT/CHGR TRBL		VIBR MNTN SYS TRBL
B	COND PMP 11 SEAL PRESS LO		CWS TRBL	MUD SYS TRBL				LOOSE PARTS SYS TRBL
C	COND PMP 12 SEAL PRESS LO					CMPT FAIL		AUX BOILER TRBL
D	COND PMP 13 SEAL PRESS LO		ACW OPEN LOOP PUMP TRIP	ACW CLOSE LOOP PUMP TRIP		CMPT INVTN FAIL		RESERVOIR MAKEUP TRBL
E	HOTWEL STOPPIPE LVL HI/LO			ACW CLOSE LOOP SRCTK LVL LO/LO		ANNUNC GND	BLU: K CO <sub>2</sub> SPLY HDR PRESS LO	SEISMIC MNTN SYS TRBL
F						BULK H2 SUPPLY HDR PRESS LO	BULK LP H2 SPLY HDR PRESS LO	BASEMENT SHELTER PANEL TRBL

ILB009M1



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	MAIN XFMR 1A SUDDEN PRESS REL	MAIN XFMR 1B SUDDEN PRESS REL		AUX XFMR SUDDEN PRESS REL	AUX XFMR LOCKOUT REL TRIP	STBY XFMR1 SUDDEN PRESS REL	STBY XFMR2 SUDDEN PRESS REL	STBY XFMR LOCKOUT REL TRIP
B	MAIN XFMR 1A TBL	MAIN XFMR 1B TBL		AUX XFMR TBL		STBY XFMR1 TBL	STBY XFMR2 TBL	
C	13KV 1F SPLY BKR P120 TRIP	13KV 1F SPLY BKR ST120 TRIP	13KV 1F SPLY BKR ST140 TRIP	13KV 1G SPLY BKR P140 TRIP	13KV 1G SPLY BKR ST160 TRIP	13KV 1G SPLY BKR ST180 TRIP	13KV 1H SPLY BKR P130 TRIP	13KV 1H SPLY BKR ST130 TRIP
D		13KV 1F TIE BKR T120 TRIP	13KV 1F XFMR E1A FOR BKR TRIP	13KV 1G XFMR 101 FOR BKR TRIP	13KV 1G TIE BKR T140 TRIP	13KV 1G XFMR E1B FOR BKR TRIP		13KV 1H XFMR 1J1 1L1 1S FOR BKR TRIP
E	13KV 1F XFMR 12F3 FOR BKR TRIP	13KV 1F XFMR 1F1 1T FOR BKR TRIP	13KV 1F XFMR 1J2 1K2 1N FOR BKR TRIP		13KV 1G XFMR 1F2 FOR BKR TRIP	13KV 1G XFMR 1K1 1L2 1P FOR BKR TRIP	13KV 1H XFMR 1G1 FOR BKR TRIP	13KV 1H XFMR 12G1 FOR BKR TRIP
F	480V 1F LC TROUBLE	480V 1G LC TROUBLE	480V 1H LC TROUBLE	480V 1J LC TROUBLE	480V 1K LC TROUBLE	480V 1L LC TROUBLE	480V 1N LC TROUBLE	480V 1P LC TROUBLE

LBO10M1



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	EMER XFMR SUDDEN PRESS REL	EMER XFMR LOCKOUT REL TRIP	345 KV NORTH BUS DIFF	345KV BKR Y500 TRIP				PILOT WIRE REL TRBL
B	EMER XFMR TRBL	LOCKOUT RELS CONT VOLT LOSS	345 KV SOUTH BUS DIFF					ISOL PHASE BUS TRBL
C	13KV 1H SPLY BKR ST150 TRIP		13KV 1J SPLY BKR PT150 TRIP	13KV 1J SPLY BKR ST170 TRIP	13KV 1J SPLY BKR ST190 TRIP	13KV 1L XFMR E1A FOR BKR TRIP	13KV 1L XFMR E1B FOR BKR TRIP	13KV 1L XFMR E1C FOR BKR TRIP
D	13KV 1H TIE BKR TT30 TRIP	13KV 1H XFMR ETC FOR BKR TRIP		13KV 1J XFMR 1221 12K2 FOR BKR TRIP				
E	13KV 1H XFMR 122 12K1 FOR BKR TRIP	13KV 1H XFMR 1222 12K1 FOR BKR TRIP	13KV 1J XFMR 122 12K1 FOR BKR TRIP	13KV 1J XFMR 1221 FOR BKR TRIP	13KV 1J XFMR 1222 FOR BKR TRIP	4KV 1D TRBL	480V 12L LOAD CENTER TROUBLE	480V 12K LC UNDERVOLT
F	480V 1H LC TROUBLE	480V 1S LC TROUBLE	480V 1T LC TROUBLE	480V 12U LC TROUBLE	480 12F LC TROUBLE	480V 12G LC TROUBLE	480V 12H LC TROUBLE	480V 12J LC TROUBLE

LB010M2



HOUSTON  
LIGHTING  
&  
POWER CO.

## CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8	
A	PROT CAB DOOR OPEN PS FAIL	CONT CAB PS FAIL				RAD MON SYS	RCB PERS AIRLOCK SEAL FAIL	AUX SHUTDOWN PNL ENTRY	
B						RAD MON SYS FAIL	DRY CASK HANDLING SEAL FAIL		
C									
D									
E									
F									

ILB000 CONSOLE 21M1



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A	CNTMT NORM PUR SPLY FAN TRIP	CNTMT NORM PUR EXH FAN TRIP		CNTMT CARBON UNIT FAN TRIP		MAB SUPPL FLTR DP HI	MAB SPLY/ EXH FAN TRIP	MAB MISC FAN TRIP
B	CNTMT SUPPL PUR SPLY FAN TRIP	CNTMT SUPPL PUR EXH FAN TRIP				MAB SPLY SYS TEMP HI/LO	MAB VALVE CUB TEMP HI	
C	CNTMT PUR FLTR DP HI	RCB CHLD WTR PUMP TRBL	CNTMT CARBON FLTR DP HI			MAB SUPPL EXH FAN TRIP	MAB CHLD WTR PUMP TRIP	
D	RCB TENDON GALLEY SUMP LVL HI HI	RCB CHLR TRBL	RCB CHLD WTR EXPTK LVL LO			CHR PMP CUB TEMP HI	MAB CHLD WTR EXPTK LVL HI/LO	
E	ISO VLV CUB ELEC VENT FAN TRBL	CNTMT CUB EXH FAN TRBL	RX CAV VENT FAN TRIP	ISO VLV CUB VENT FAN TRBL		CHR PMP CUB SPLY FAN TTB TRIP	MAB HVAC TRBL	
F	ISO VLV CUB TEMP HI	CROM VENT FAN TRBL					MAB CHLR TRBL	

ILB022M1





HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A		ECW PUMP BLDG TEMP HI	ESS CHLN AREA TEMP HI		ECCS PUMP CUB TEMP HI	FHB SPLY FLTR DP HI	FHB EXH FLTR DP HI	FHB EXH FAN TRBL
B	CCW PUMP BLDG TEMP HI					FHB SPLY SYS TEMP HI/LO	FHB EMER EXH HUM HI	
C		DG ROOM FLTR DP HI				FHB SPLY FAN TRIP		
D		DG OIL TK RM EXH FAN TRIP		CWS ELECT EQUIP ROOM TEMP HI/LO		FHB/ OUTSIDE DP LO	FHB EMER EXH FLOW LO	
E	RAD WASTE ROOM TEMP HI	DG ROOM TEMP HI	BA PUMP ROOM TEMP HI			SFP PUMP ROOM TEMP HI	SFP RECIRC VALVE ROOM TEMP HI	
F	RMS ROOM TEMP HI	DG ROOM EMER FAN FLOW LO						

ILB022M2



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

	1	2	3	4	5	6	7	8
A		EAB SPLY FLTR DP HI	EAB M/U FLTR DP HI		CR SPLY FLTR DP HI	CR CLEANUP FLTR DP HI		
B		EAB SPLY/ RET TEMP HI/LO			CR SPLY TEMP HI/LO	CR M/U AIR HUM HI		
C		EAB RTN FAN TRBL	BATT ROOM EXN FAN TRBL		CR SPLY FAN TRBL	CR M/U FAN TRBL		
D		EAB SPLY FAN TRBL	BATT ROOM SPLY FLOW LO		PLANT CMPTR FLOW LO	CR M/U FLOW HI/LO		
E		EAB HVAC SLUMP LVL HI HI			BREATHING AIR TRBL	CR CLEANUP SYS TRBL		
F	EAB CR INL AIR CHEM CONC HI	EAB CR INL SMOKE	EAB RET SMOKE		CR RET SMOKE			

ILB022M3



HOUSTON  
LIGHTING  
&  
POWER CO.

# CONTROL ROOM DESIGN REVIEW

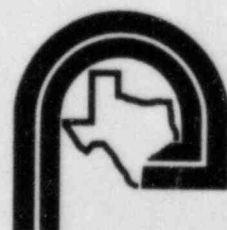
	1	2	3	4	5	6	7	8
A	TGB SUMP 1 LVL HI HI	ISO VLV CUR SUMP 1 LVL HI HI		CURD PUMP SUCTION STRN LO HI		IA SYS DRYR FLTR DP HI		
B	TGB SUMP 2 LVL HI HI	ISO VLV CUR SUMP 2 LVL HI HI		ACW OPEN LOOP DISCH STRN DP HI	ACW CLOSED LP HDR TEMP HI	IA/SA SYS COMPR DISCH TEMP HI	SGFPT L.O TEMP HI/LO	TURB L.O TEMP HI/LO
C	TGB SUMP 3 LVL HI HI	ISO VLV CUR SUMP 3 LVL HI HI		ACW OPEN LOOP HDR PRESS LO	ACW CLOSED LP HDR PRESS LO	IA SYS COMPR TRIP		TURB L.O STORTK LVL HI/LO
D	TGB SUMP 4 LVL HI HI	ISO VLV CUR SUMP 4 LVL HI HI		ACW OPEN LOOP SEAL WTR PRESS LO	ACW CLOSED LP SRG TK LVL HI/LO	SA SYS COMPR TRIP	SGFPT TURNING STOPPED	TURB L.O CONDITIONER TRBL
E	TGB UMP 5 LVL HI HI	ISO VLV CUR SUMP 5 LVL HI HI	MAIN COND VAC P'N TRBL	MAIN COND VAC PUMP TRIP	IA/SA SYS CLG WTR PRESS LO	BLDWN REGEN HX OUTL PREFLTR UP HI	CATION DEMIN DP HI	DEMIN OUTL STRN DP HI
F	TGB HVAC TRBL			CN'DSR HOTWELL LVL HI/LO	IA/SA SYS INL FLTR DP HI	BLDWN REGEN HX OUTL TRBY HI	MIX BED DEMIN DP HI	

ZLP150

# ***Control Room Design Review***

## ***System Function and Task Analysis Report***

**The South Texas Project**



**HOUSTON LIGHTING & POWER COMPANY**