

SUPPLEMENT NO. 2

HUMAN FACTORS CONTROL ROOM DESIGN REVIEW  
OF  
COMANCHE PEAK STEAM ELECTRIC STATION

JUNE 1984

8407100583 840629  
PDR ADOCK 05000445  
A PDR

## ABSTRACT

Supplement 2 to the Human Factors Control Room Design Review of Comanche Peak Steam Electric Station provides resolution to the only open issue following the submittal of Supplement 1 in March 1984. This issue is the environmental, lighting and noise surveys at the Hot Shutdown Panel. Revised resolutions are also provided for HED Control No. 335 and HED Control No. 62.

## TABLE OF CONTENTS

6.0	INCOMPLETE TASKS	6-1
6.2	NOISE, LIGHTING AND ENVIRONMENTAL SURVEYS	6-1
APPENDIX A	HED ORGANIZATION AND CROSS REFERENCES	A-1, A-2
APPENDIX B	HED SUMMARIES	B-1
2.0	WORKSPACE HEDS	
	HED 335 Revised	
	HED 354 New	
6.0	VISUAL DISPLAY HEDS	
	HED 62 Revised	
APPENDIX J	HOT SHUTDOWN PANEL ENVIRONMENT	J-1
1.0	METHODOLOGY	J-2
2.0	SURVEY RESULTS	J-2
	2.1 Noise Survey	J-2
	2.2 Lighting Survey	J-2
	2.3 Environmental Survey	J-2

## 6.0 INCOMPLETE TASKS

### 6.2 NOISE, LIGHTING AND ENVIRONMENTAL SURVEYS

All required surveys have been completed. In addition, noise, lighting and environmental surveys have been completed at the Hot Shutdown Panel (HSP). A discussion of the environment at the Hot Shutdown Panel is presented in Appendix J. All new HED's resulting from the HSP surveys are included in this supplement.

APPENDIX A

HED ORGANIZATION  
AND  
CROSS REFERENCES

APPENDIX A HED ORGANIZATION AND CROSS REFERENCES

HED CONTROL NO.	APPENDIX B SECTION								
	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
62 335 354	335 354				62				

APPENDIX B

HED SUMMARIES

SUPPLEMENT 2

2.0 WORKSPACE HEDS

SUPPLEMENT 2



A. HED DESCRIPTION

The oblique angle from the operator's line of sight to the plane of the outboard annunciators is less than 45° from several control stations. This contributes to poor readability, especially on panels CB-09, CB-11, and CV-01. In the case of CV-01, many annunciators cannot be read at all from the control station.

B. GUIDELINE REFERENCE

NUREG-0700: 6.1.2.2.e.(2)

C. LOCATION

CB-09,11,CV-01

D. POTENTIAL SAFETY CONSEQUENCES

1. Failure to respond to alarm
2. Possible equipment damage due to delayed response time.

E. ASSESSMENT PROCESS

1. Evaluated readability of far left/right annunciator tiles from annunciator control station.
2. Evaluated feasibility of relocating controls stations to increase viewing angle.
3. Evaluated feasibility of adding control stations in an area such that viewing angle would be 45°.
4. Evaluated feasibility of moving annunciator tiles to a more readily viewable position.

F. BACKFIT JUSTIFICATION

1. CPSES realizes that the viewing angles are acute and that it affects the operators ability to read the legends on the outboard columns of the annunciator matrices of the annunciators on CB-09, CB-11, and CV-01 from their respective annunciator control stations.

The viewing angles on CB-09 and CB-11 were re-evaluated and, in particular, operators were consulted. It is our conclusion that the problem does not affect the operator's ability to respond to those alarms in a timely manner.

2. For CV-01, a second annunciator control station will be added for the control of X-ALB-11C. The original control station will control 1-ALB-11A and 1-ALB-11B.

A. HED DESCRIPTION

The effective temperature at the HSP was not maintained within the comfort range.

B. GUIDELINES REFERENCE

NUREG-0700: 6.1.5.1.a

C. LOCATION

Hot Shutdown Panel

D. POTENTIAL SAFETY CONSEQUENCES

None

E. ASSESSMENT PROCESS

Environmental Survey

F. BACKFIT

None

G. JUSTIFICATION

Since the Hot Shutdown Panel (HSP) is not a normally manned panel, the design criteria applied is not the same as the Main Control Room. Per the design criteria, the peak temperature is 104°F and an average temperature of 90°F can be maintained over a 24 hour period. The estimated length of time that will require operators at the HSP is 30 hours. Since the data taken during the environmental survey supports this original design, CPSES feels that the HVAC at the HSP is sufficient.

6.0 VISUAL DISPLAY HEDS

A. HED DESCRIPTION

The scales of two related meters do not have compatible numerical progression and scale range. Scale increments are different and number of graduations are different.

B. GUIDELINE REFERENCE

NUREG-0700: 6.5.1.5.d.

C. LOCATION

CB-08

D. POTENTIAL SAFETY CONSEQUENCES

1. Failure to identify causes for loss of feedwater.
2. Inability to control feedwater.
3. Plant shutdown.

E. ASSESSMENT PROCESS

The meters' function and their relationships were evaluated.

F. BACKFIT

Meters will be changed to 200-1500 PSIG linear displays.

APPENDIX J

HOT SHUTDOWN PANEL  
ENVIRONMENT

## HOT SHUTDOWN PANEL ENVIRONMENT

### 1.0 METHODOLOGY

The environmental surveys at the Hot Shutdown Panel were conducted in accordance with the methodology, as appropriate, of Appendix H.

### 2.0 SURVEY RESULTS

#### 2.1 Noise Survey

The background noise levels at the Hot Shutdown Panel were in the range of 70 dB(A) and did not exceed 90 dB(A). No HED's resulted from this survey.

#### 2.2 Lighting Survey

With one train of AC lights and the DC lights on (the lighting expected in this emergency situation), light levels of at least 32 footcandles were recorded. No HED's resulted from this survey.

#### 2.3 Environmental Survey

The Hot Shutdown Panel is an emergency operating station which is not normally manned. As such, it is not necessary to maintain the environment of the Hot Shutdown Panel within the comfort zone required for the Control Room. The environment should be maintained at a level that will allow the operator to adequately perform his remote shutdown tasks.

The area where the Hot Shutdown Panel is located is a normally air conditioned electrical area with very few

heat sources. The peak temperature in this area is 92°F (based on the outdoor summer design temperature of 102°F). An average temperature of 90°F can be maintained over a 24 hour period. These numbers are based on conservative, worst-case type analyses. In reality, the temperatures in the vicinity of the Hot Shutdown Panel are expected to be much less and the humidity is expected to be relatively low, as is characteristic of North-Central Texas summer.

In the worst case fire, ventilation in the area of the Hot Shutdown Panel could be lost but several of the few heat sources would also be lost. In this situation, during the summers, temperatures at the panel are expected to remain in the eighties or possibly the low nineties with fairly low humidities. Considering the nature of the emergency (a fire requiring evacuation of the control room and plant shutdown/cooldown), which will keep the constant attention of the operator, and the short duration of the event (completion expected in about 30 hours), these environmental conditions are considered adequate to allow the operator to perform his required tasks.

The expectation temperatures are supported by our survey results. Some of these results are tabulated below.

<u>DATE</u>	<u>TIME</u>	<u>REL. HUMIDITY</u>	<u>TEMPERATURE</u>	<u>OUTSIDE</u>	<u>COMMENT</u>
5-11-84	3PM,	50%	88°	Peak	HVAC status Not recorded
	6PM	44%	89°	5:50 PM - 92°	
	9PM	44%	89°	5-11-84	
5-12-84	3AM	54%	88°		↓
	9AM	56%	86°	6:20 PM - 92°	
	3PM	50%	90°	5-12-84	

SUPPLEMENT 2



6-18-84	12 (Noon)	44%	93°	3PM - 97°	HVAC OFF
	3PM	40%	94°		
	6PM	39%	93°		
	9PM	40%	92°		
6-19-84	12 (Mid)	41%	92°	4:30PM - 98°	
	3AM	44%	94°		
	6AM	44%	94°		
	9AM	42%	94°		
	12 (Noon)	39%	94°		
	3PM	40%	94°		
	6PM	40%	93°		
	9PM	41%	93°		
6-20-84	12 (Mid)	42%	93°	4:00PM - 98°	
	3AM	43%	94°		
	6AM	43%	94°		
	9AM	44%	94°		
	12 (Noon)	40%	94°		
	3PM	38%	94°		
	6PM	36%	94°		
	9PM	37%	94°		
6-21-84	12 (Mid)	41%	94°	4:00PM - 100°	
	3AM	45%	94°		
	6AM	46%	93°		
	9AM	46%	94°		
	12 (Noon)	36%	94°		



HVAC ON

