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**NUCLEAR FACTORS ENGINEERING
CONTROL ROOM DESIGN REVIEW/AUDIT REPORT:**

**COHEN OPERATING STATION,
EDISON ELECTRIC COMPANY**

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HUMAN FACTORS ENGINEERING
CONTROL ROOM DESIGN REVIEW/AUDIT REPORT

BYRON GENERATING STATION
COMMONWEALTH EDISON COMPANY

Introduction

A human factors engineering design review/audit of the Byron Unit 1 control room was performed at the site on November 17 through November 19, 1981. This review was accomplished using the Unit 2 control room appropriately mocked-up to reflect design changes already committed to be incorporated in Unit 1. The report was prepared on the basis of the HFEB's audit of the applicant's Preliminary Design Assessment report and the human factors engineering design review performed at the site. This design review was carried out by a team from the Human Factors Engineering Branch, Division of Human Factors Safety. The review team was assisted by consultants from BioTechnology, Inc. (Falls Church, Virginia), and from Lawrence Livermore National Laboratory (University of California), Livermore, California.

Observed human factors design discrepancies were given a priority rating of 1, 2, or 3 (high, moderate or low), based on the increased potential for operator error and the possible consequences of that error. Priority rating 1 and 2 discrepancies should be corrected prior to issuance of an operating license. Priority rating 3 discrepancies should be evaluated and proposed actions reported as part of the long-term design review in accordance with the guidance provided in NUREG-0700. Note that some priority 3 ratings include a superscript 1 (i.e., 3¹). Since priority 3¹ discrepancies involve simple corrective actions relative to the potential for improving operator performance, they should be corrected prior to issuance of an operating license.

A list of those items that could not be evaluated is presented in Section A of this report. The condition of construction or installation of these items at the time of the site visit was not sufficiently finalized to permit review.

Section B of this report contains a list of items which the review team determined not to be valid discrepancies for the reasons stated, or were satisfactorily corrected prior to the audit.

The findings in Section C are numbered to conform to the guidelines of NUREG-0700 and summarize the team's observations of the control room design and layout and of the control room operators' interface with the control room environment. Throughout the report, an asterisk (*) following the finding number indicates a discrepancy that was also noted in either the Commonwealth Edison PDA report, submitted November 17, 1981, or in a preliminary draft of the Commonwealth Edison PDA. The numbers in parentheses correspond to sections and items of the PDA, (4.X.X), or a preliminary draft of the PDA, (2.X.X.X).

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

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A. SYSTEMS AND ITEMS NOT AVAILABLE FOR HFEB REVIEW

This section lists those systems and items which were not available for review during the HFEB site visit of November 17 through 19, 1981. These systems and items must be reviewed and evaluated by the applicant and any deficiencies that are identified must be corrected prior to issuance of an operating license.

1.0 CONTROL ROOM WORKSPACE

- A. Communications from desks/consales to other parts of the control room
- B. Communications between the control room and the shift supervisor's office
- C. Center desk design, function, and personnel interface
- D. Document organization and storage
- E. Organization and storage of spare parts, operating expendables, and tools
- F. Control room access control
- G. Control room furnishings
- H. Emergency equipment and its storage
- I. Environment (illumination, temperature, humidity, ventilation, and audition)

2.0 COMMUNICATIONS

All items except those listed in Section 2.0 of the HFEB Review/Audit Team Findings (part C of this report).

3.0 ANNUNCIATOR WARNING SYSTEM

Annunciator auditory alarms

4.0 CONTROLS

- A. All controls covered by or represented by mock-ups.
- B. The HFEB review did not include measurements of resistance and/or displacement or torque of round pushbuttons, legend pushbuttons, key operated controls, continuous adjustment rotary controls, rotary selector controls, thumbwheels, and toggle switches.

5.0 DISPLAYS

- A. All displays covered by or represented by mock-ups.
- B. Legend lights that were not engraved or activated, e.g.,
 - 1. ECCS
 - 2. Auxiliary feedwater
 - 3. By-pass permissive
 - 4. Trip status
 - 5. Loop stop-valve permissive

6.0 LABELS AND LOCATION AIDS

Tagging procedures.

7.0 PROCESS COMPUTERS

All items except data entry-keyboards, computer function controls, data point indices, CRT display controls, operator-display relationships, printer characteristics, and alarm messages.

8.0 PANEL LAYOUT and 9.0 CONTROL-DISPLAY INTEGRATION

- A. Panels 1PM01J and 1PM02J must be re-evaluated when they have been completed.
- B. The Remote Shutdown panel must be re-evaluated after the planned mimic is installed.

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B. ITEMS THAT ARE NOT VALID DISCREPANCIES, OR WERE SATISFACTORILY
CORRECTED PRIOR TO THE AUDIT

3.0 ANNUNCIATOR WARNING SYSTEMS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
	JD,RE	A055*	There is only one location for the display of first-out alarms. All first-out alarms should be available immediately above the associated panel. (4.3.2) <u>Reason</u> The first-out alarms are located above the associated panel.
	JD,RE	A056*	First, second, and third priority alarms are not displayed in the control room. (4.3.3) <u>Reason</u> First, second, and third level alarms are provided.
	JD,RE	A058*	Operator aids for annunciator lamp replacement are not available. (4.3.5) <u>Reason</u> A lamp tool is not needed for annunciator lights.
		BA037*	The first-out annunciators indication for reactor trip is reset when other annunciators on this panel are reset. (2.3.3.2-6) <u>Reason</u> A separate set of first-out annunciator controls has already been installed.

5.0 VISUAL DISPLAYS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u> <u>RATING</u>	<u>FINDING</u>
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RE,JD

A077*

All displays should indicate values in a form immediately usable by the operator without requiring mental conversion. The RCP Seal water flow, RHR-HX water flow, and RC Loop flow require the operator to mentally convert the information presented. (4.5.2)

Reason

Discussions with operators revealed that mental conversions were not a requirement in monitoring the displays.

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C. HFEB REVIEW/AUDIT TEAM FINDINGS

1.0 CONTROL ROOM WORKSPACE

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-1	JP,DS	3	A039* A001 The design of the control room does not facilitate unobstructed movement and communication. For example, an operator seated at the Center Desk must traverse approximately 30 feet around the desk to reach a position that is only 10 feet away on a straight line. The design of the Center Desk may impair performance of the reactor operator/ senior reactor operator stationed at the desk. (4.1.1) (2.1.1-1)
I-5, I-6 E-46	JP,DS	1	A040* A041 Some of the controls on the stand-up console are located out of the reach of the 5th% height operator. The highest control is located 65" from the floor (recommended maximum = 60"). (4.1.2)
I-4	JP,DS	3	BA042* The 30" depth of the benchboard (recommended maximum = 25.2") will force the 5th% height operator to lean over the panel. This depth increases the probability that the controls on the benchboard edge will be accidentally activated. (4.1.2)

1.0 CONTROL ROOM WORKSPACE (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-7, I-8, I-9	JP, DS	1	A044* A046 A047 Some controls on the common vertical panels are mounted above and below the recommended 34"-70" height range. The lowest controls are 12" from the floor. The highest controls are 87" from the floor. (4.1.3)
I-10, I-11	JP, DS	1	A046* Some displays on the common vertical panels are mounted above and below the recommended 41"-70" height range. The lowest display is located 23" from the floor. The highest display is located 92" from the floor. The top rows of the annunciators are located 90" from the floor. (4.1.3).
	JP, DS	1	A045* Annunciator response controls on the vertical panels are located 77" from the floor, making operation of these frequently used controls difficult. (4.1.4)
S-1, I-1	S	1	B127 The equipment located at OPM05J, Center Desk, and the desk's general location are inappropriate for the desk's primary function as the only senior reactor operator station. The desk has fire alarm annunciator panels on most sections and it is surrounded by shared and auxiliary panels.
I-13	JP, DS	3	C113 The design of OPM05J, Center Desk, prevents the seated operator from having full view of all of the controls and indicators on OPM02J.
I-12	JP, DS	1	C112 The copper pipes which will supply emergency breathing air currently stick out of the control room floor, and present a tripping hazard.

1.0 CONTROL ROOM WORKSPACE (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>		<u>FINDING</u>
		<u>RATING</u>		
I-14	JP,DS	3	B051	The leg openings in the wing sections of OPM05J, Center Desk, do not provide the recommended 30" lateral leg space for a seated operator. The lateral leg space provided is 23".
	JP,DS	1	B052	The annunciators on the vertical panels are oriented at less than the recommended minimum 45° angle to the line of site from the position of the associated response controls.
	JP,DS	1	BA109	Controls and displays on the Remote Shutdown panel are mounted outside the recommended height ranges. Controls are located 29"-68" from the floor (recommended range = 34"-70"). Displays are located 41"-88" from the floor (recommended range = 41"-70").
	DH	2	B028	No plans have been made to provide protective clothing for control room operators, except for full hood/face masks with air lines.

2.0 COMMUNICATIONS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
	HS	3	A052* The sound-powered phone headsets are A053 uncomfortable to wear for long A003 periods of time. (4.2.1) (2.1.2-1)
	HS	2	A050* Neither the PA system nor the conventional phone system handsets have cords long enough for use at all parts of the control board. (4.2.2)
H-20, k-21	HS	3 ¹	A051* The Press-to-talk and Channel Select A034 switches on the paging system are located too low to be operated effectively. (4.2.3) (2.3.3.2-3)

3.0 ANNUNCIATOR WARNING SYSTEMS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
E-39	JD,RE	2	<p>A054* A005 B096</p> <p>First-out indications occur on separate but undedicated panels for:</p> <ul style="list-style-type: none"> o Reactor Trip (24 tiles) o Turbine Trip (10 tiles) o Generator Trip (20 tiles) o Feedwater Pumps Trip (2 tiles) <p>The first-out tiles are intermixed with other tiles. (4.3.1)(2.1.3-2)</p>
1-2	JD,RE DS	1	<p>A043* A002</p> <p>Tiles on the following annunciator panels are not readable from acknowledge buttons:</p> <p>Annunciator Panels UL-AN026, 003, 007, 008 012, 014, and 015. (4.3.4) (2.1.1-2)</p>
	JD, RE	3 ¹	<p>B134</p> <p>No procedure exists to describe annunciator tiles which must be "on" for extended periods of time. (4.3.4)</p>

3.0 ANNUNCIATOR WARNING SYSTEMS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
	JD,RE	2	A057* Some annunciator alarm tiles are not located above related controls and displays and do not reflect proper functional grouping or axis labeling. (4.3.4)(2.1.3-7)
			A059
			A004
			Annunciator
			<u>Title</u> <u>Comment</u>
			2E02 Should be duplicated on 1PM01J
			2D07 Should be on 1PM01J
			2E07 Should be on 1PM01J
			3A05 Should be on 1PM01J
			6A06]
			6B06]
			6C06]
			6A07]
			6B07]
			6C07]
			6D07]
			6E07]
			15A10]
			15B10]
			15C10]
			15D10]
			15E07]
			15E08]
			17E01 Not located in a functional group on right of panel
			17D17 Unnecessary
			17E13 Not on common panel OPM01J
			18B03]
			18B16]
			19A06 Not located in the first out group
	JD,RE	1	A024* A separate alarm horn is needed for each section of the control board. (4.3.6)(2.3.3.1-2)

3.0 ANNUNCIATOR WARNING SYSTEMS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
	JD,RE	1	BA035* A manually initiated annunciator audio block is available for the Feedwater, Condensate and Turbine Control panels. Two red alternating flashing lights indicate when the block is in use. The annunciator silence buttons silence only a single audible alarm, whereas the guidelines state that it should be possible to silence an auditory alert signal from any set of annunciator response controls in the primary operating area. (2.3.3.2-4)
	RE,JD	3	B097 The annunciator flash rate is about 2 flashes/second instead of the recommended 3 to 5 flashes/second.
E-42	RE,JD	3	B098 Annunciator panels on 1PM01J, 1PM02J, and 1PM03J have more than 50 tiles, the recommended maximum number of tiles per panel.
E-38	RE	3 ¹	B157 Some annunciator tiles are not permanently engraved. Some annunciator tiles are labeled with temporary labels.

4.0 CONTROLS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
	HS	3 ¹	A060* Two controls have deficiencies which make adjustment to the required level of accuracy cumbersome. For third level accuracy adjustment of the Hagan M/A Station switches, the operator must lean over the board to read the meter scale. In addition, a right-handed operator will cover the linear scale of this control with his hand while operating the dial and pushbuttons that are located to the left of the scale. On the Hagan Control Station switches, the scale markings are difficult to read. Accumulation of dust and dirt in the scale window aggravates the problem. (4.4.1)
I-3 H-10	DS,HS	2	A062* A009 The J-handle switches close to the edge of the benchboard section on 1PM02J, the Heater Drain and Turbine Control areas, and all switches on the common vertical panels (OPM01J, OPM02J, and OPM03J) can be activated accidentally. (4.4.2)(2.2.1-2)
H-8 I-27	HS	3 ¹	A063* C638 Operation of the star handle discrete rotary switches involves covering the discrete position labels with the operator's hand. This could result in an erroneous setting. (4.4.3)
	HS	3	A067* A072 The fractional rotation knobs on the In-Core Vertical Instrumentation panel do not conform to the plant shape code convention. (4.4.7) (4.4.12)
H-2	RH	3	A069* There are no guards or barriers between the EGC (ADC) panel pushbuttons, which are contiguous. The likelihood of accidental/inadvertent actuation of a wrong pushbutton is thus increased. (4.4.9)

4.0 CONTROLS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
H-4	HS	3 ¹	A070* On Unit Two, the SAFETY INJECTION PUMPS DISCHARGE ISOLATION VALVE control is a keylock switch control. The keylock switch control was mounted upside down so that the open/close positions are at 4 o'clock and 8 o'clock. Two other keylock switch controls have the open/close positions at 10 o'clock and 2 o'clock. (This switch is properly installed on Unit One.) (4.4.10)
H-4	HS	3 ¹	A071* A011 The three keylock switch controls on both Units One and Two can be operated by the same key. In addition, the key can be inserted and removed regardless of the switch position. This could result in valves being accidentally left open or closed. (4.4.11) (2.2.2-2)
H-3	HS	3 ¹	A073* A010 There is no pointer on the NIS pen rotary selector switch. (4.4.13) (2.2.2-1)
H-9	HS	3	A074* A061 The BORIC ACID/PRIMARY WATER batch make-up thumbwheels on 1PM05J are much smaller than recommended, which could cause operating difficulty. (4.4.14)
	HS	3	A075* The IN-CORE THERMOCOUPLE toggle switches do not snap into position, and are not labeled to indicate either the direction of movement or of activation. (4.4.15)
H-8	HS	3 ¹	A033* The Tave and DELTA T defeat switches do not have to be pulled to actuate as do the corresponding switches at the Zion Station. (4.4.18)(2.3.3.2-2)
H-6	HS	3 ¹	A031* On 1PM06J the same type of control handles are used for valves with different functions. An operator cannot differentiate among throttleable, open/close, and throttle open-seal close valves. (4.4.19)(2.3.3.7-9)

4.0 CONTROLS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>		<u>FINDING</u>
		<u>RATING</u>		
H-7	HS	1	BA032*	The REACTOR TRIP and REACTOR RESET functions are on the same switch. (2.3.3.2-1)
	JP	2	B119	The J-handle control switches on the Remote Shutdown panel can be inadvertently activated.
N-2	JP	2	B120	The PLANT EVACUATION ALARM and plant-wide FIRE ALARM pushbuttons on the Remote Shutdown panel can be accidentally activated.
	JP	3 ¹	B121	The Remote Shutdown panel J-handle switches do not have the pointer arrows filled in with contrasting pigment for easy visibility.
H-25	RH	2	B188	Several controls on the RAMTEC CRT are not useful to the operator and might interfere with the display if activated.
H-24	RH	2	B187	The ALARM PRINTER CONSOLE control box has many keys and controls which the operator is not permitted to use. When locked "off" the printer keyboard is not available to the control room operator.
H-14	RH	3	B179	On 1PM08J the thermocouple toggle switch bank is subject to breakage because the switch handles extend into the traffic area.
H-13	RH	2	B178	The switch guards for the C-W MAKEUP EMERGENCY TRIP controls on OPM01J obscure the pushbuttons and their color coding when flipped open.
H-16	RH	1	B181	On OPM05J, the PLANT EVACUATION ALARM pushbutton guard has an ear for a padlock. If the ear was bent over, the guard could not be raised to operate the pushbutton.

4.0 CONTROLS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
H-11	JS	3 ¹	B126 On the reactor end of 1PM05J, Reactor and Chemical and Volume Control panel, and on 1PM06J, Engineered Safeguards panel, one switch in each string maintains trip contact position while all the rest are spring return.
H-19	RH	3	B183 On 1PM12J, Miscellaneous Instrumentation panel, three modules (POWER SUPPLY, ALARM AND TRIP RELAY, and VIBR PHASE ANGLE) have slotted non-locking selector controls which are flush with the panel. The slot serves both to turn the control and to indicate its selected position. It is not clear which end of the slot indicates the position selected.
S-2	JS	3 ¹	B128 On 1PM02J, Turbine panel, the legends on the REHEAT TURBINE controller pushbuttons do not relate to the system controlled: <ul style="list-style-type: none"> o GROUP 1 out of service corresponds to "Governor End" o GROUP 2 out of service corresponds to "Generator End".
H-17	RH	1	B182 On 1PM11J, Containment Isolation back panel, two rotary selector switches lack control position indications.
H-12	RH	3 ¹	B176 On 1PM08J, In-Core Instrumentation panel, the DETECTOR E, the knob pointer mark does not extend to the position indication mark because of the knob's black skirt.
H-15	RH	3 ¹	B180 On 1PM05J, the LAMP TEST control knob pointer mark does not extend to the position indication mark on the panel because of the high raised knob, which also causes parallax.
H-22	RH	3	B184 On 1PM08J, In-Core Instrumentation panel, it is difficult to read the switch position on the 261 PICO AMP source controls because the knob obscures the switch position window.

4.0 CONTROLS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u> <u>RATING</u>	<u>FINDING</u>
H-13	RH	3 ¹	C422 On OPM01J, two of the CW MAKE-UP PUMP EMERGENCY TRIP switches have red back plates while the third switch does not.

5.0 VISUAL DISPLAYS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
E-1, 1-17	HS	1	A065* A008 BA030 The 100% readings on some of the M/A Station Switches indicates valves are 100% open; on others it indicates that the valves are 100% closed. This could cause incorrect valve operation. (4.4.5) (2.2.1-1) (2.3.3.1-8)
	HS	3 ¹	A056* The ROD SPEED linear scale indicator increases down rather than up. This is inconsistent with other indicators and could lead to confusion. (4.4.6)
E-3, E-4, E-9, H-5	JD, RE, HS	1	A068* A084 A013 B076 All legend pushbuttons and indicator light lenses are removable from the front of the panel for bulb replacement, but they are also interchangeable within a particular panel or display. It is therefore possible that inadvertent changes can be made in the locations of the pushbutton/indicator light lenses when more than one bulb is replaced. (4.4.8)(2.2.3-1)
	RE, JD	3 ¹	A017* A 0-800 psi RCS pressure gauge by the LETDOWN/CHARGING system is needed for low pressure operations on RHR. (4.4.16)(2.2.3-5)
E-10	JD, RE	3	A078* A085 Inconsistent type styles are evident on the displays throughout the control room. (4.5.3) (4.5.6)
	JD, RE	3	A079* A080 A081 The meaning assigned to particular colors should be consistent across all applications within the control room, whether applied to panel surfaces, projected in red, green and amber colored lights, or on CRT's. Colors should be reserved for specific uses. Green board, RAD monitors, permissives, and system status are not in compliance. (4.5.4)

5.0 VISUAL DISPLAYS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
E-7	JD,RE	3	A082* Vertical meter pointer tips do not extend to within 1/16" of the smallest graduation marks on the scale. (4.5.5)
E-10	JD,RE	3 ¹	A016* The LUBE OIL RESERVOIR linear scale display has no label indicating what is being read (e.g., inches, lbs., percent, etc.). The scale range is 0 to 120. (4.5.6) (2.2.3-4)
E-13	RE	2	A087* The recorders are not all designed to permit monitoring of data without open-door operation. (4.5.7)
E-15	JD,RE	3	A088* The PRIMARY WATER CONTROL PRE-COUNT digital groupings are longer than four digits, but they are not separated by commas, decimal points, or additional spaces, as recommended. (4.5.8)
E-2	JD,RE	3 ¹	A015* The bus meters have too large a scale for accuracy of required reading. (4.5.9)(2.2.3-3)
	JD,RE	2	A022* The CENTRIFUGAL CHARGING PUMP mini-flow valves are required to be closed when reactor pressure falls below 2000 psig following a safety injection. With no mini-flow available, there is a possibility of overheating the pumps if system pressure increases. During this activity the operator is required to remember to monitor the REACTOR COOLANT SYSTEM pressure to assure it does not exceed a set point. (4.5.10)(2.3.2-2)

5.0 VISUAL DISPLAYS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
E-6	JD,RE	3 ¹	A023* Zion Station operating experience showed that a semi-gloss fluorescent orange pointer on the vertical meters appeared to improve pointer recognition when presented on a white or green band background. (4.5.11) (2.3.3.1-1)
	JD,RE	2	A026* A028 Zion Station operating experience indicated that the use of a green <i>normal operating band</i> would alert operators to abnormal conditions when the pointer was not in the appropriate range. (4.5.12) (2.3.3.1-4, 2.3.3.1-6)
E-8	JD,RE	2	BA083 Adequate tools are not present in the control room for indicator bulb replacement.
	JP	2	B112 On the Remote Shutdown panel, normal operating limits are not marked on the meters.
E-26	JD,RE	3	B086 The Westinghouse J-handle switches have incorporated indicator flags that originally indicated the status of the control. These flags have been made obsolete by the installation of a new system of NORMAL/ABNORMAL indicator lights. The colored flags are still visible, and may present confusing information to the operator.
H-1,E-10	HS,RE	2	A086 BA014 Illuminated legend pushbuttons are not readily distinguishable from illuminated legend indicators.
E-16	DS,JD,RE	3	B064 BA079 The COMPONENT COOLING ammeter on OPM02J and several meters on the Remote Shutdown panel lack a number at the top-most end of the display scale. In addition, the ammeter scale has an unconventional end-point.
N-3	JP	1	B122 All top-level curved face meters on the Remote Shutdown panel are very high, and have vertical labeling which is obscured by the meter curvature.

5.0 VISUAL DISPLAYS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
E-11	JD,RE	3 ¹	B151 On 1PM04J, Steam Generator and Feedwater panel, the legend indicator type is too small to read easily.
E-19, E-31 E-44	RE,JD	3 ¹	B081 B091 B100 Several meters have inconsistent unit labels. o On 1PM06J, some labels read only "%" with "xxx" on an external label, others read "%xxx" on the meter face. o On 1PM02J, the GENERATOR H ₂ TEMP reads °C. All others read °F. o On 1PM04J, different unit designations are used for identical units on the FEEDWATER FLOW meters: FW FLOW - PPH x 10 ⁶ FW PUMP DISFLOW - KLB/HR x 10 ³
E-23	JD,RE	1	B083 The CONTAINMENT PRESSURE recorder scale on 1PM06J shows no units.
	JD,RE	3 ¹	B090 Many abbreviations found on control room meters and annunciators are not in the standard abbreviation list. Many others are not consistent with the list.
E-29	JD,RE	1	B154 The A,B,C,D STEAM GENERATOR LEVEL meter faces on 1PM04J have incorrect % signs and Roman numeral labeling within groups of 4 meters. i.e., I,II,III,II should be I,II,III,IV.
E-35	JD,RE	3 ¹	B095 The CNDS STORAGE TK LEVEL indicator meter on 1PM01J has a temporary meter scale.
N-4	JP	3 ¹	B123 On the Remote Shutdown panel the SRI COUNT RATE meter has a log scale with very small intermediate graduation numerals.
E-27	JD,RE	2	B087 The green RODS IN and red RODS OUT indicator lights on 1PM05J are inconsistent with the plant color coding convention.

5.0 VISUAL DISPLAYS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>		<u>FINDING</u>
		<u>RATING</u>	<u>FINDING</u>	
H-20	S	3 ¹	B129	The Gaitronics paging system has a red MERGE pushbutton and a green ISOLATE pushbutton, which is an inappropriate use of these colors.
I-48	JP	3	BA111	On the Remote Shutdown panel the pointers on the Hagan Manual/Auto stations cover the numerals of the display.
E-14	RE	3	B078	On 1PM05J, there is severe parallax when reading the green pointer of the two pen recorders because it is behind the recorder scale.
E-33	RE	2	B093	The indicator light color coding convention used for the group of EXHAUST FANS controls on 1PM02J and the group of BOOSTER PUMPS controls on 1PM03J is green = off, blue = run, and amber = tripped. The normal condition for these lights is three blue (run) and one green (off, but in standby). This violates the control room color-coding convention of green = normal.
E-32	JD,RE	2	B155	On OPM02J, DIFFERENTIAL PRESSURE meters are not consistent in the use of (-) and (+) values. The (-) and (+) symbols should be on the meter face.
E-12	JD,RE	2	B077	There are incorrect bulbs of different brightness in some indicator lights. GE1819 should be for annunciators, GE1835 should be for indicators. When a GE1819 bulb is installed in an indicator, the indicator legend is too dim.
E-21	JD,RE	3 ¹	B082	There is an unknown and unlabeled indicator light on 1PM01J.
E-24	JD,RE	2	B084	Multiple red/green indicator lights have no integral labeling to describe their function on 1PM04J (DRAIN VALVES) and 1PM06J (SVAG VALVES).
E-30	JD,RE	2	B089	On 1PM04J there is inconsistent use of color for indicator lights, and some lights are not labeled.

5.0 VISUAL DISPLAYS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>	
E-45	RE,JD	1	B158	On 1PM04J, there are many cases of incorrect indicator legend caps, e.g., FW PUMP DISCHARGE valve open/close indicators are mounted opposite from the proper indication, and the red lights for the FW PUMP 2C OIL PUMPS should be blue.
E-20	JD,RE	3 ¹	B152	There is an inconsistent use of 2 different styles of red and green switch indicator lights on 1PM06J.
E-23	JD,RE	1	B153	There is inconsistent color coding of indicator lights for the REACTOR CONTAINMENT FAN switches on 1PM06J. They are green-amber-green instead of green-amber-blue. This may be a problem on other panels.

6.0 LABELS AND LOCATION AIDS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-16	JP,DS	1	BA012* A029 The labeling on some of the 3-way valves is unclear. (4.4.17) (2.2.2-3) (2.3.3.1-7)
I-18, E-29, S-3, I-38	JP,DS	1	A089* B102 B131 B109 Many controls, displays and other equipment items are unlabeled. (4.6.1)
	JP,DS	3 ¹	A090* A096 B124 BA027 Hierarchical and functional group labeling is not presently available on the control boards or on the Remote Shutdown panel to assist the operator and to simplify the component labeling. (4.6.2)(2.3.3.1-5)
	JP,DS	2	A091 The Hagan controllers have labeling that is inconsistent with the other labeling in the control room. The Hagan Manual/Auto stations have redundant labeling. (4.6.3)
I-19	JP,DS	3 ¹	AB053 On 1PM02J, display labels are generally placed below displays rather than above, as is recommended. (4.6.3)
I-15	JP,DS	1	A098* A006 The maintenance tags obscure adjacent labels, displays, and indicator lights. (4.6.4) (2.1.4-1)

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>		<u>FINDING</u>
		<u>RATING</u>		
I-20, I-21	JP, DS	3 ¹	A092* A099	Some of the labels and location aids in the control room can be easily removed. Demarcation lines also are not permanently attached. (4.6.5) (4.6.7)
I-22	JP, DS	3 ¹	A093* A094	Some control board labels use inconsistent abbreviations. (4.6.6)
	JP, DS	3 ¹	BA007*	Some control board labels use inconsistent color coding schemes. (2.1.4-2)
N-5	JP, DS	3 ¹	BA018** BA025	The Zion operators specifically mentioned the need for mimics on the Chemical and Volume Control System, Boric Acid, and Engineered Safeguards panels. (2.3.1-A, 2.3.3.1-3)
	JP, DS	3 ¹	BA029	There is a lack of background shading to enhance the operator's ability to differentiate among functional grouping of instruments and controls. (2.3.1-B)
I-20	JP, DS	3	AB054	The circular meter displays used throughout the control room have curved descriptive labels on their faces.
	JP, DS	3 ¹	B113	There are no panel number identification labels.
I-23, I-35	JP, DS	3 ¹	B055 B059	A label on OPM02J has a misspelled word; VAVLE is used instead of VALVE. Another label on OPM02J incorrectly reads CLAND instead of GLAND.
I-24	JP, DS	3 ¹	B056	Several three position J-handle controls in the control room have only two of the positions used. Mechanical stops have been provided to prevent moving the controls to the unused position, but the position indicator marks are still engraved and filled with dark pigment.

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-26	JP, DS	1	B057 The AUXILIARY BUILDING FILTER PLENUM B control on OPM02J is missing the position labeling.
E-48	RE, JD	1	B160 In the PHASE B CONTAINMENT ISOLATION on 1PM06J, manual actuation requires that two controls be activated simultaneously. There is no indication of this requirement on the controls.
I-331-42	JP, DS	3 ¹	B106 B061 There are several cases of labels being obscured by equipment in the control room, e.g., the label for the GENERATOR H ₂ COOLING WATER VALVE indicator lights is obscured by the recorder located above them, and some labels at the top of 1PM07J are obscured by their associated controls.
I-43	JP, DS	3 ¹	B114 The approximately 12x2 bank of CONDENSATE CONTROL controls on the vertical section of 1PM03J are not demarcated. This makes differentiation among the controls difficult.
I-44	JP, DS	3 ¹	B115 The proposed demarcation lines on 1PM04J do not clearly associate the two status light arrays on this panel with their functionally related controls and displays.

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-38	JP,DS	3 ¹	B109 The labels describing pen assignments on the ROD INSERTION LIMITS recorder and the CW COOLING TOWER TEMPERATURE recorder are placed on the glass face of the recorder where they obscure the chart paper.
I-39	JP,DS	3 ¹	B110 The recorder that displays the parameters selected by the process computer is not clearly labeled as to its function. The label for this recorder reads only COMPUTER.
D-8	JD,RE	2	B175 On OPM05J, Center Desk, engraved labels for TROUBLE, FIRE, and WIRE-TROUBLE are not specific enough to provide the necessary information. The same labels are used on 280 different legend light indicators.
I-34, I-36, N-6	JP,DS	1	AQ95 B060 B004 Many component labels do not indicate what is being displayed. For example, the labels for the WIDE RANGE RTD displays on the Remote Shutdown panel do not indicate that hot and cold leg temperatures are being displayed. Also, the labels for the meters on IPM02J, which display the inlet pressure from the moisture separator reheater to the three low pressure turbines, do not clearly identify what is being measured by the meters.

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>		<u>FINDING</u>
		<u>RATING</u>		
N-1	JP,DS	1	B118	The nomenclature on the Remote Shutdown panel transfer control switches is unclear. The two position choices are REMOTE and LOCAL. Although the panel is the "remote" panel, REMOTE means that control is located in the control room. LOCAL indicates that control is located at the Remote Shutdown panel.
I-34	JP,DS	2	B107	Grouped meters with different functions are not adequately differentiated by their component labels. For example, all six labels for the meters that display the inlet pressure from the moisture separator reheater to the three low pressure turbines are very similar, making differentiation between them difficult.
I-37	JP,DS	3 ¹	B108	The test positions on the SGFPT 2 C LUBE OIL RESERVOIR TEST control on 1PM04J are OLL for "oil level low" and OLH for "oil level high." Since these abbreviations are very similar, it is hard to differentiate between the two different meanings.
I-32, I-20	JP,DS	2	B105	The labeling, lettering, and terms used on the Westinghouse- provided panel inserts are not consistent with the other control room labeling.
I-40	JP,DS	3 ¹	B111	There are cases of adjacent controls of the same kind that have position labels with different size and style type face.

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-28	JP,DS	3 ¹	B101 The standard black-on-white labels used in the control room come in several different "shades" of white and off-white. The engraving styles and depths are also not consistent for all the labels.
I-25, I-41	JP,DS	3 ¹	BA097 B112 Some of the color combinations used do not provide adequate contrast. For example, the labeling on the 1530/ST101 SCALER TIMER panel insert on 1PM07J is beige-on-beige and is very difficult to read. The black-on-orange labels used for train differentiation are also of poor contrast.
I-31	JP,DS	3 ¹	B104 The annunciator response button legends and some of the control position label character heights are too small to be read by a 95th% height operator. The recommended character height (0.004 x viewing distance) is 0.15". The measured height was approximately 0.11". This finding applies to labels and legends on the lowest part of the sloping section of the benchboard.
E-18	JD,RE	3 ¹	B080 There are temporary caution notes on 1PM06J which should be removed or replaced prior to operation.
N-5	JP,DS	3 ¹	BA018* BA025 The Remote Shutdown panel lacks any demarcation or other location aids to identify functionally related groups of controls and displays.

6.0 LABELS AND LOCATION AIDS (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY RATING</u>	<u>FINDING</u>
I-46, I-47	JP, DS	3 ¹	B062 There is insufficient demarcation between the ACCUMULATOR, SAFETY INJECTION, and RESIDUAL HEAT REMOVAL mimics. These mimics are intermingled on 1PM05J and 1PM06J.
E-36	JD, RE	3 ¹	B156 On 1PM03J, the indicator lights for the HEATER DRAIN TANK VALVE need demarcation and label changes.
I-30	JP, DS	3 ¹	B103 Sections of mimic lines are missing between two circuit breaker controls and some indicator lights in the AUXILIARY POWER mimic.
I-46	JP, DS	3 ¹	B116 The BTRS DEMINERALIZER mimic and the REACTOR COOLANT PUMP SEALS mimic are designed around controls that are in one large array. It is very difficult to see where one mimic ends and where the other begins.
I-45	JP, DS	3 ¹	B117 The CVCS LETDOWN mimic does not have a label identifying the flow origination point.
	JP, DS	3 ¹	B058 None of the mimics have arrows to indicate the direction of each flow path.
S-4, S-5	S	3	B133 On the 69KV mimic on 1PM01J, the symbol for the DISCONNECT-GROUNDING switch does not depict the switch functions as clearly as do the corresponding symbols for the same switch which are used in the mimic on QPM03J.

7. PROCESS COMPUTERS

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>
H-23, S-3	RH	3	B186 The CRT terminal and the Sequence-of-Events printer have differently arranged keyboards.
S-3	S	3 ¹	B130 On ICX05J, Computer Operator Console, functions are now available to the control room staff that they do not need. Also, keys are available on the keyboard that control room operators do not need.
	S	2	C718 Procedures for cases where the process computer fails are not available to the operator.
	HS	2	C719 On ICX05J, data point addresses are not cross-indexed by program name, system/subsystem, and functional group.
	S	3 ¹	C724 Individual data groups or messages do not have descriptive titles which reflect the unique characteristics of the content of the data groups or messages.
	RH	3	B189 There is no hard copy facility available to print out displays which appear on the RAMTEC CRT.
	RH	2	B185 C731 The ICX05J Terminet 1200 printer prints at only 120 characters/second. The recommended speed is 300 lines/minute.
H-26	RH	3 ¹	B191 The Terminet printers do not have a paper take-up device for the printed record.
	RH	3	B190 The Sequence-of-Events recorder does not identify the associated annunciator tile which has alarmed.

8. PANEL LAYOUT

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>
H-1, H-2 E-1	HS,RE	2	A064* On 1PM04J, the FEEDWATER PUMP TURBINE CONTROL pushbuttons are not arranged in a natural, stereotypical, or logical sequence increasing the probability of inadvertent/accidental activation of the wrong control (e.g., valve OPEN button is to left of valve CLOSED button). (4.4.4)
H-30	RH	3	BA100* There is inadequate separation between groups of displays of 1PM01J, Power Generation panel. (4.8.1)
H-31, E-46	RH,RE	3	A101* Sets of controls and displays on 1PM01J, Power Generation panel, are not consistently layed out. Layouts of some repeated functions are mirror imaged, e.g., WATER ISOLATION VALVES, mini-flow valves for RHR PUMPS 2A and 2B, and ACTIVATED VALVES. (4.8.2)
	JP	1	BA036* To avoid leaving the Reactor panel unattended during startup, operators require another person to change the range and volume of the SOURCE RANGE nuclear instrument. (2.3.3.2.-5)
D-5	JD,RE	3	B164 On 1PM06J, Essential Service Water panel, the meters are aligned PA PB-T1A T1B T2A T2B. Pressures and temperatures are not to be compared. Better grouping would be PA T1A T2A-PB T1B T2B.
D-7	JD,RE	3	B165 On OPM05J, the Center Desk, DETECTOR and SUPPRESSION indicators are on separate panels. Better grouping might be if all indicators for a given zone were in one area.
H-2B	RH	3	BA027* On 1PM01J, Generator and Auxiliary POWER panel, grouped meters have different functions but are not differentiated. (2.3.3.1-5)

8. PANEL LAYOUT (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>
D-2	JD,RE	3	B174 On 1PM06J, the AUXILIARY F.W., CONT, indicator lights for SG1, SG2, SG3 and SG4 valves are not functionally grouped.
	JP	3 ¹	B006 Because of the almost total lack of demarcation, it is not obvious that 1PM03J is well layed out and functionally grouped. Demarcation is specifically needed to separate the Condensate section of 1PM03J from the Turbine section of 1PM02J. There is presently no board break or demarcation between the closely spaced equipment.
N-11	JP	3 ¹	B008 On 1PM05J, demarcation has not been used to separate intermingled groups of equipment, e.g., NIS instrumentation and CVCS controls and displays.
N-12	JP	3 ¹	B009A On 1PM05J, the REACTOR COOLANT DRAIN TANK PUMP controls are located about four feet away from other functionally related controls.
N-12	JP	3 ¹	B009B On 1PM05J, the REACTOR COOLANT DRAIN TANK PUMP controls appear to be functionally grouped with the RANGE MANUAL BLOCK controls located directly above them. Both groups use the same model switch, but there is no demarcation between them.
N-9	DS	3 ¹	B065 The REACTOR COOLANT SEALS mimic and the BTRS mimic are both on 2PM05J, Reactor and Chemical and Volume Control panel. Several controls which are not in either mimic are associated with one of the mimics. A third mimic intrudes, also, on the BTRS mimic. It is difficult to tell what is in one mimic, what is in the other mimic, and what is not in either mimic.
D-6	JD,RE	3 ¹	B172 Functionally grouped systems are not adequately distinguishable on 1PM01J.

8. PANEL LAYOUT (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>
	JP,DS	3 ¹	B007 On 1PM03J, Condensate panel, associated controls and displays are presently separated by unassociated controls and displays.
	DS	3 ¹	B002 On the Remote Shutdown panel, the STEAM GENERATOR controls and meters are separated by the AUXILIARY FEEDWATER controls.
E-25	JD,RE	1	B085 The legend light groups on 1PM06J, Engineered Safeguards panel, are misoriented by 90°.
	JP,DS	3	B010 On OPM02J, HVAC panel, the UNIT 1 and UNIT 2 CONTAINMENT and VENTILATION controls and displays are laid out identically except for the pressure meters, which are mirror imaged.
E-28	JD,RE	2	B088 There is an inconsistent layout on 1PM05J, Reactor and Chemical and Volume Control panel. The ROD BANK COUNTER groups have SHUTDOWN on left and CONTROL on right, whereas DIGITAL ROD POSITION indicator shows the reverse: SHUTDOWN on right, and CONTROL on left.
S-3	JD,RE	3	B092 The DIGITAL ELECTRO HYDRAULIC TURBINE CONTROL numeric pad (telephone type) is different from the computer numeric panels (adding machine type).
D-1	RE,JD	3	B161 On 1PM06J, the STEAM GENERATOR and AUXILIARY FEEDWATER PUMP controls are mirror imaged, but the remainder of the panel is not.
D-4	RE,JD	3	B162 The CONTAINMENT SPRAY system on 1PM06J is mirror imaged for no apparent reason.
	JP	1	B003 On the Remote Shutdown panel, the TRAIN A and B displays and controls are mirror imaged over a total distance of 12 to 13 feet.

9. CONTROL DISPLAY INTEGRATION

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>
	HS	2	A076* The RCP SEAL FLOW control is adjusted while monitoring HEADER PRESSURE indicators, 1PM05J. The displays and controls are not located within reasonable proximity. (4.5.1) (4.9.1).
	JP	2	A104* The SEAL INJECTION FLOW indicators are located on the left panel at the top of 1PM05J. The HCV 182 controller is on A076 the left front diagonal panel at the A021 bottom of the vertical display panel on 1PM05J. When adjusting the controller and simultaneously reading the SEAL INJECTION FLOW indicators the operator places himself in an awkward position. This position can readily lead to a parallax problem. (4.9.1)(2.3.2-1) (4.5.1).
H-29	RH	3	A106* Displays should read off-scale (not zero) when not selected, especially if zero is a possible parameter to be displayed. The Power Distribution panel displays do not reflect this requirement. (4.9.2)
	S	2	AB173* On 1PM05J and 1PM06J, the controls and displays required to stop the REACTOR COOLANT PUMPS in conjunction with the CENTRIFUGAL CHARGING or SAFETY INJECTION PUMPS and REACTOR COOLANT SYSTEM WIDE RANGE PRESSURE indicators (1300 psig) are not located conveniently close to one another. (4.9.3)
	JP	1	BA038* On 1PM05J, switching of by-pass breakers during surveillance testing can cause operator errors. (2.3.3.2-7)

9. CONTROL DISPLAY INTEGRATION (Continued)

<u>PHOTO ID</u>	<u>REVIEWER</u>	<u>PRIORITY</u>	<u>FINDING</u>									
H-27	RH	3	BA020* Functionally related controls and displays on 1PM01J, Generator and Auxiliary Power panel, and on 1PM02J, Turbine panel, should be rearranged so that they are vertically aligned. Consideration should also be given to demarcation lines and/or color shading. (2.3.1-C)									
D-3	RE,JD	3	B163 The control-display relationship for CONTAINMENT SPRAY TRAIN A and B on 1PM06J is unnecessarily complex and unclear.									
H-32	RH	3	B192 On 1PM01J, Electrical Distribution panel, the normal switch position is "Auto" but there is no such indicating light. If either MAN. TEST or MAN. EMERGENCY is selected the associated red indicator will light.									
I-47	RH	3	B063 There are several cases where displays associated with mimics are separated from the mimics by unrelated controls, e.g., on 1PM01J, ACCUMULATOR, SAFETY INJECTION, and RESIDUAL HEAT REMOVAL display meters.									
H-33	RH	3	B193 On 1PM01J, Electrical Distribution PANEL, the EXCITER VOLTAGE REG. TRANSF. NULL meter rests on "0" both when unpowered, and when MANUAL and AUTO are in "SYNCH". No provision is made for it to (a) be off scale when unpowered or (b) provide a procedure to exercise it before closing the PERMANENT MAGNET supply.									
E-43	RE,JD	1	B099 On 1PM04J, the STEAM GENERATOR ATMOSPHERIC RELIEF VALVE controls (4) and the FEEDWATER SHUTOFF VALVE controls (4) do not have OPEN/CLOSED, NORMAL/ABNORMAL indicator lights.									
N-8	JP	2	B005 On 1PM03J, there is a reversed control-display relationship: <table style="margin-left: 40px; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;"><u>LEFT</u></td> <td style="text-align: center;"><u>RIGHT</u></td> </tr> <tr> <td style="text-align: right;"><u>Meters</u></td> <td style="text-align: center;">GSC</td> <td style="text-align: center;">CNDS-CB</td> </tr> <tr> <td style="text-align: right;"><u>Controls</u></td> <td style="text-align: center;">CNDS Booster</td> <td style="text-align: center;">GSC</td> </tr> </table>		<u>LEFT</u>	<u>RIGHT</u>	<u>Meters</u>	GSC	CNDS-CB	<u>Controls</u>	CNDS Booster	GSC
	<u>LEFT</u>	<u>RIGHT</u>										
<u>Meters</u>	GSC	CNDS-CB										
<u>Controls</u>	CNDS Booster	GSC										

D. BYRON PHOTO LOG

BYRON PHOTO LGG

#	ID NUMBER	LABEL
1	D-1	Mirror imaging.
2	D-2	Lights not in functional columns.
3	D-3	Control/display relationship.
4	D-3	"
5	D-4	Mirror imaging.
6	D-5	Meters should be 1,2,3/1,2,3.
7	D-6	Needs demarcation.
8	D-7	Suppression and detection fire zones are on separate panels.
9	D-7	"
10	D-8	Confusing labels.

#	ID NUMBER	LABEL
12	E-1	Linear scale indicators inconsistent.
13	E-2	Meter operating bands will be installed.
14	E-3	Legend pushbuttons can be interchanged.
15	E-4	Legend pushbuttons can be interchanged.
16	E-6	Orange or black pointers should be used.
17	E-7	Pointer obscures the scale.
18	E-8	Bulb replacement tool needed.
19	E-8	"
20	E-8	"
21	E-9	Interchangeable lenses on legend displays.
22	E-9	"
23	E-10	Legend lights and pushbuttons are too similar.
24	E-10	"
25	E-11	Type is too small on legend.
26	E-12	Lights with different brightness can be interchanged.
27	E-13	Recorder door has to be opened to read both scales.
28	E-13	"
29	E-14	Parallax on recorder pointers.
30	E-14	"
31	E-15	Decimal numbers.
32	E-16	Scale ends without numbers.
33	E-18	Caution type should be removed.
34	E-19	Inconsistent labels on meter face and label. Sargeant Lundy v.s. Westinghouse.
35	E-19	"
36	E-20	Two styles of lights.

#	ID NUMBER	LABEL
37	E-21	Unlabeled lights.
38	E-23	Inconsistent legend lights - both green.
39	E-24	No label on legend lights.
40	E-25	Legend lights should be horizontal, not vertical.
41	E-26	Flags are not used with indicator lights.
42	E-27	Rods in - Rods out indicator should be another color, i.e., white.
43	E-28	Control/shutdown banks indications are reversed on displays.
44	E-28	"
45	E-29	Inconsistent labels on meter faces.
46	E-30	Blue light should be labeled or changed.
47	E-31	Degrees Centigrade requires conversion to degrees Fahrenheit.
48	E-32	Inconsistent use of "+" and "-".
49	E-33	Inconsistent use of blue and green.
50	E-35	<i>Temporary scales on meters.</i>
51	E-36	Indicator lights need labels.
52	E-38	Temporary labels.
53	E-39	First out panel with red tiles.
54	E-42	80 tiles on one window.
55	E-43	No open/close indication included with switch.
56	E-44	KLB/HR x 10 ³ or PPH x 10 ⁶ .
57	E-45	Reversed indicators.
58	E-45	"
59	E-46	Controls should be in mimic.
60	E-48	Two containment isolation switches.

#	ID NUMBER	LABEL
62	H-1	Pushbutton sequence illogical
63	H-2	Mixed pushbuttons and indicator lights.
64	H-3	Switch pointer is missing.
65	H-4	Same key operates all switches.
66	H-5	Interchangeable legends and pushbutton labels.
67	H-6	Different functions controlled by switches with identical handles.
68	H-7	Trip and Reset on single switch.
69	H-8	Substitute colored handles for pull-to-lock.
70	H-8	"
71	H-9	Thumbwheels too small.
72	H-10	J-handles near edge of board.
73	H-10	"
74	H-11	One switch different from other five in room.
75	H-12	Pointer distance from setting mark.
76	H-13	Inconsistent color code on controls
77	H-13	Switch guards obstruct switch.
78	H-14	Toggle switches subject to damage.
79	H-15	Pointer mark doesn't meet position mark.
80	H-15	"
81	H-16	Potential switch obstructed by guard.
82	H-17	Position indications missing.
83	H-19	1PM012J. Back panel.
84	H-20	Paging system phone and control (existing installation).
85	H-21	Paging system phone and control (mockup).
86	H-22	Unreadable position indications.

#	ID NUMBER	LABEL
87	H-23	Keyboards have different arrangement.
88	H-24	Controls not available to control room operator.
89	H-25	Unneeded controls on CRT.
90	H-26	No takeup on printer.
91	H-27	Layout needs rearrangement.
92	H-28	Differentiation needed for group of meters.
93	H-29	Meters don't read off-scale.
94	H-30	2PM01J. Generator and Auxiliary Power.
95	H-31	2PM02J. Turbine.
96	H-32	2PM01J. Generator and Auxiliary Power.
97	H-33	Meter at zero instead of off-scale.

#	ID NUMBER	LABEL
99	I-1	Access to OPM02J from OPM05J is restricted.
100	I-2	Viewing angle is too great between annunciators and acknowledge controls.
101	I-3	J-handles are subject to inadvertent operation.
102	I-4	Operator must lean against J-handles due to excessive board depth.
103	I-5	Controls too high for <u>50%</u> operator.
104	I-6	Controls too high for <u>50%</u> operator.
105	I-7	Control too close to floor.
106	I-8	Controls too high from floor.
107	I-9	Controls too close to floor.
108	I-10	Displays too close to floor.
109	I-11	Displays too high from floor.
110	I-12	Tripping hazard.
111	I-13	Cannot see lower panel indicator lights from seated position.
112	I-13	"
113	I-14	Lateral space less than 30".
114	I-15	Tags obscure controls.
115	I-16	Control labeling unclear - three-way valve.
116	I-17	Manual/Auto station (Hagen) labels are confusing.
117	I-17	"
118	I-18	Unlabeled.
119	I-19	Labels below displays.
120	I-20	Westinghouse circular meters use curved labels.

#	ID NUMBER	LABEL
121	I-21	Temporary labels can be removed.
122	I-21	"
123	I-22	Fan control position labels inconsistent.
124	I-23	Mispelled word - "vavle" instead of "valve."
125	I-24	Non-used position indication.
126	I-25	Poor contrast on orange/black labels.
127	I-26	Position labels missing.
128	I-27	Handle obscures position labels.
129	I-27	"
130	I-28	Different engraving on adjacent labels.
131	I-29	Missing labels.
132	I-30	Missing mimic line.
133	I-31	Letter height too small for 95th% operator.
134	I-31	"
135	I-31	"
136	I-32	Inconsistent labeling on Westinghouse panel inserts.
137	I-33	Label obscured by recorder.
138	I-33	"
139	I-34	Labels similar and unclear.
140	I-35	Incorrect label.

#	ID NUMBER	LABEL
2-1	I-36	Label lacking indication that flow is being displayed.
2-2	I-37	Position legends hard to differentiate.
2-3	I-38	Label will obscure paper in recorder.
2-4	I-38	"
2-5	I-39	Label unclear.
2-6	I-40	Different size type.
2-7	I-41	Poor label contrast.
2-8	I-41	"
2-9	I-42	Obscured labels.
2-10	I-43	No demarcation.
2-11	I-43	"
2-12	I-43	"
2-13	I-43	"
2-14	I-43	"
2-15	I-44	Association of status lights unclear from demarcation.
2-16	I-44	"
2-17	I-44	"
2-18	I-44	"
2-19	I-45	No origination label.
2-20	I-46	Cannot differentiate between two mimics.
2-21	I-46	"
2-22	I-47	Insufficient demarcation.
2-23	I-48	Pointer covers display markers
2-24	I-48	"

#	ID NUMBER	LABEL
2-26	N-1	Confusing nomenclature.
2-27	N-2	Unprotected alarm pushbuttons.
2-28	N-3	Meters too high - unit labels can't be seen.
2-29	N-4	Logarithmic scale with small numerals.
2-30	N-5	Functional relationship unclear.
2-31	N-6	Missing measurement information on label.
2-32	N-8	Controls/displays in reverse sequence; 17 overall, 18 displays, 19 controls left, 20 controls right.
2-33	N-8	"
2-34	N-8	"
2-35	N-8	"
2-36	N-9	Contiguous mimics not clear demarcated.
2-37	N-9	"
2-38	N-9	"
2-39	N-10	Poor control/display relationship.
2-40	N-10	"
2-41	N-10	"
2-42	N-11	Lack of functional group demarcation
2-43	N-11	"
2-44	N-11	"
2-45	N-12	No demarcation between unrelated controls
2-46	N-12	"
2-47	N-12	"

#	ID NUMBER	LABEL
2-49	S-1	Inappropriate panel layout vs. operator duties.
2-50	S-1	"
2-51	S-1	"
2-52	S-2	Pushbutton legend not clear.
2-53	S-3	B-130 unneeded function keys; B-131 unlabeled controls.
2-54	S-4	Mimics clear.
2-55	S-4	"
2-56	S-5	Mimics not clearly understood.