



PSE&G Public Service
Electric and Gas
Company

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Robert L. Mittl General Manager
Nuclear Assurance and Regulation

September 28, 1984

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20814

Attention: Mr. Albert Schwencer, Chief
Licensing Branch 2
Division of Licensing

Gentlemen:

HOPE CREEK GENERATING STATION
DOCKET NO. 50-354
DRAFT SAFETY EVALUATION REPORT
OPEN ITEM STATUS

Attachment 1 is a current list which provides a status of the open items identified in Section 1.7 of the Draft Safety Evaluation Report (SER). Items identified as "complete" are those for which PSE&G has provided responses and no confirmation of status has been received from the staff. We will consider these items closed unless notified otherwise. In order to permit timely resolution of items identified as "complete" which may not be resolved to the staff's satisfaction, please provide a specific description of the issue which remains to be resolved.

Attachment 2 is a current list which identifies Draft SER Sections not yet provided.

Enclosed for your review and approval (see Attachment 4) are the resolutions to the Draft SER open items and FSAR Questions listed in Attachment 3.

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9/28/84

In addition, pursuant to discussions with the Containment Systems Branch, enclosed (see Attachment 5) is a copy of revised FSAR Section 6.2.5.2.1 previously transmitted on September 27, 1984.

PSE&G will provide an augmented inservice inspection program for the HCGS outboard feedwater check valves (F074 A&B). This inspection program will include a magnetic partical or dye penetrant examination of the outlet and inner valve body surfaces at the first refueling outage and at other times when the valve is completely disassembled for maintenance. This surface examination will be sufficient sensitivity to detect a minimum crack length of 5 inches.

A signed original of the required affidavit is provided to document the submittal of these items.

Should you have any questions or require any additional information on these items, please contact us.

Very truly yours,



Attachments/Enclosure

C D. H. Wagner
USNRC Licensing Project Manager (w/attach.)

W. H. Bateman
USNRC Senior Resident Inspector (w/attach.)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
DOCKET NO. 50-354

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

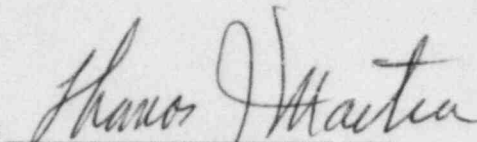
Public Service Electric and Gas Company hereby submits the enclosed responses to DSER open items and FSAR Questions, and revised FSAR Section 6.2.5.2.1 for the Hope Creek Generating Station.

The matters set forth in this submittal are true to the best of my knowledge, information, and belief.

Respectfully submitted,

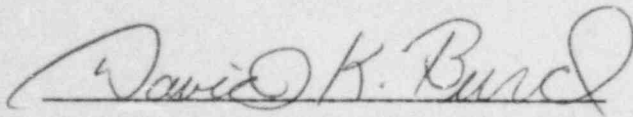
Public Service Electric
and Gas Company

By:



Thomas J. Martin
Vice President -
Engineering and Construction

Sworn to and subscribed
before me, a Notary Public
of New Jersey, this 28th day
of September 1984.



DAVID K. BURD
NOTARY PUBLIC OF NEW JERSEY
My Comm. Expires 10-23-85

DATE: 9/28/84

ATTACHMENT 1

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
1	2.3.1	Design-basis temperatures for safety-related auxiliary systems	Complete	8/15/84
2a	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 1)
2b	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 1)
2c	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 2)
2d	2.3.3	Accuracies of meteorological measurements	Complete	8/15/84 (Rev. 2)
3a	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	Complete	8/15/84 (Rev. 2)
3b	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	Complete	8/15/84 (Rev. 2)
3c	2.3.3	Upgrading of onsite meteorological measurements program (III.A.2)	NRC Action	
4	2.4.2.2	Ponding levels	Complete	8/03/84
5a	2.4.5	Wave impact and runup on service Water Intake Structure	Complete	9/13/84 (Rev. 3)
5b	2.4.5	Wave impact and runup on service water intake structure	Complete	9/13/84 (Rev. 3)
5c	2.4.5	Wave impact and runup on service water intake structure	Complete	7/27/84
5d	2.4.5	Wave impact and runup on service water intake structure	Complete	9/13/84 (Rev. 3)
6a	2.4.10	Stability of erosion protection structures	Complete	8/20/84
6b	2.4.10	Stability of erosion protection structures	Complete	8/20/84
6c	2.4.10	Stability of erosion protection structures	Complete	8/03/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
7a	2.4.11.2	Thermal aspects of ultimate heat sink	Complete	8/3/84
7b	2.4.11.2	Thermal aspects of ultimate heat sink	Complete	8/3/84
8	2.5.2.2	Choice of maximum earthquake for New England - Piedmont Tectonic Province	Complete	8/15/84
9	2.5.4	Soil damping values	Complete	6/1/84
10	2.5.4	Foundation level response spectra	Complete	6/1/84
11	2.5.4	Soil shear moduli variation	Complete	6/1/84
12	2.5.4	Combination of soil layer properties	Complete	6/1/84
13	2.5.4	Lab test shear moduli values	Complete	6/1/84
14	2.5.4	Liquefaction analysis of river bottom sands	Complete	6/1/84
15	2.5.4	Tabulations of shear moduli	Complete	6/1/84
16	2.5.4	Drying and wetting effect on Vincentown	Complete	6/1/84
17	2.5.4	Power block settlement monitoring	Complete	6/1/84
18	2.5.4	Maximum earth at rest pressure coefficient	Complete	6/1/84
19	2.5.4	Liquefaction analysis for service water piping	Complete	6/1/84
20	2.5.4	Explanation of observed power block settlement	Complete	6/1/84
21	2.5.4	Service water pipe settlement records	Complete	6/1/84
22	2.5.4	Cofferdam stability	Complete	6/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
23	2.5.4	Clarification of FSAR Tables 2.5.13 and 2.5.14	Complete	6/1/84
24	2.5.4	Soil depth models for intake structure	Complete	6/1/84
25	2.5.4	Intake structure soil modeling	Complete	8/10/84
26	2.5.4.4	Intake structure sliding stability	Complete	8/20/84
27	2.5.5	Slope stability	Complete	6/1/84
28a	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28b	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28c	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28d	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28e	3.4.1	Flood protection	Complete	8/30/84 (Rev. 1)
28f	3.4.1	Flood protection	Complete	7/27/84
28g	3.4.1	Flood protection	Complete	7/27/84
29	3.5.1.1	Internally generated missiles (outside containment)	Complete	8/3/84 (Rev. 1)
30	3.5.1.2	Internally generated missiles (inside containment)	Closed (5/30/84- Aux.Sys.Mtg.)	6/1/84
31	3.5.1.3	Turbine missiles	Complete	7/18/84
32	3.5.1.4	Missiles generated by natural phenomena	Complete	7/27/84
33	3.5.2	Structures, systems, and components to be protected from externally generated missiles	Complete	7/27/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
34	3.6.2	Unrestrained whipping pipe inside containment	Complete	7/18/84
35	3.6.2	ISI program for pipe welds in break exclusion zone	Complete	6/29/84
36	3.6.2	Postulated pipe ruptures	Complete	6/29/84
37	3.6.2	Feedwater isolation check valve operability	Complete	8/20/84
38	3.6.2	Design of pipe rupture restraints	Complete	8/20/84
39	3.7.2.3	SSI analysis results using finite element method and elastic half-space approach for containment structure	Complete	8/3/84
40	3.7.2.3	SSI analysis results using finite element method and elastic half-space approach for intake structure	Complete	8/3/84
41	3.8.2	Steel containment buckling analysis	Complete	6/1/84
42	3.8.2	Steel containment ultimate capacity analysis	Complete	8/20/84 (Rev. 1)
43	3.8.2	SRV/LOCA pool dynamic loads	Complete	6/1/84
44	3.8.3	ACI 349 deviations for internal structures	Complete	6/1/84
45	3.8.4	ACI 349 deviations for Category I structures	Complete	8/20/84 (Rev. 1)
46	3.8.5	ACI 349 deviations for foundations	Complete	8/20/84 (Rev. 1)
47	3.8.6	Base mat response spectra	Complete	8/10/84 (Rev. 1)
48	3.8.6	Rocking time histories	Complete	8/20/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
49	3.8.6	Gross concrete section	Complete	8/20/84 (Rev. 1)
50	3.8.6	Vertical floor flexibility response spectra	Complete	8/20/84 (Rev. 1)
51	3.8.6	Comparison of Bechtel independent verification results with the design- basis results	Complete	8/20/84 (Rev. 2)
52	3.8.6	Ductility ratios due to pipe break	Complete	8/3/84
53	3.8.6	Design of seismic Category I tanks	Complete	8/20/84 (Rev. 1)
54	3.8.6	Combination of vertical responses	Complete	8/10/84 (Rev. 1)
55	3.8.6	Torsional stiffness calculation	Complete	6/1/84
56	3.8.6	Drywell stick model development	Complete	8/20/84 (Rev. 1)
57	3.8.6	Rotational time history inputs	Complete	6/1/84
58	3.8.6	"O" reference point for auxiliary building model	Complete	6/1/84
59	3.8.6	Overturning moment of reactor building foundation mat	Complete	8/20/84 (Rev. 1)
60	3.8.6	BSAP element size limitations	Complete	8/20/84 (Rev. 1)
61	3.8.6	Seismic modeling of drywell shield wall	Complete	6/1/84
62	3.8.6	Drywell shield wall boundary conditions	Complete	6/1/84
63	3.8.6	Reactor building dome boundary conditions	Complete	6/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTEL TO A. SCHWENCER LETTER DATED
64	3.8.6	SSI analysis 12 Hz cutoff frequency	Complete	8/20/84 (Rev. 1)
65	3.8.6	Intake structure crane heavy load drop	Complete	6/1/84
66	3.8.6	Impedance analysis for the intake structure	Complete	8/10/84 (Rev. 1)
67	3.8.6	Critical loads calculation for reactor building dome	Complete	6/1/84
68	3.8.6	Reactor building foundation mat contact pressures	Complete	6/1/84
69	3.8.6	Factors of safety against sliding and overturning of drywell shield wall	Complete	6/1/84
70	3.8.6	Seismic shear force distribution in cylinder wall	Complete	6/1/84
71	3.8.6	Overturning of cylinder wall	Complete	6/1/84
72	3.8.6	Deep beam design of fuel pool walls	Complete	6/1/84
73	3.8.6	ASHSD dome model load inputs	Complete	6/1/84
74	3.8.6	Tornado depressurization	Complete	6/1/84
75	3.8.6	Auxiliary building abnormal pressure	Complete	6/1/84
76	3.8.6	Tangential shear stresses in drywell shield wall and the cylinder wall	Complete	6/1/84
77	3.8.6	Factor of safety against overturning of intake structure	Complete	8/20/84 (Rev. 1)
78	3.8.6	Dead load calculations	Complete	6/1/84
79	3.8.6	Post-modification seismic loads for the torus	Complete	8/20/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DGER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
80	3.8.6	Torus fluid-structure interactions	Complete	6/1/84
81	3.8.6	Seismic displacement of torus	Complete	8/20/84 (Rev. 1)
82	3.8.6	Review of seismic Category I tank design	Complete	8/20/84 (Rev. 1)
83	3.8.6	Factors of safety for drywell buckling evaluation	Complete	6/1/84
84	3.8.6	Ultimate capacity of containment (materials)	Complete	8/20/84 (Rev. 1)
85	3.8.6	Load combination consistency	Complete	6/1/84
86	3.9.1	Computer code validation	Complete	8/20/84
87	3.9.1	Information on transients	Complete	8/20/84
88	3.9.1	Stress analysis and elastic-plastic analysis	Complete	6/29/84
89	3.9.2.1	Vibration levels for NSSS piping systems	Complete	6/29/84
90	3.9.2.1	Vibration monitoring program during testing	Complete	7/18/84
91	3.9.2.2	Piping supports and anchors	Complete	6/29/84
92	3.9.2.2	Triple flued-head containment penetrations	Complete	6/15/84
93	3.9.3.1	Load combinations and allowable stress limits	Complete	6/29/84
94	3.9.3.2	Design of SRVs and SRV discharge piping	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
95	3.9.3.2	Fatigue evaluation on SRV piping and LOCA downcomers	Complete	6/15/84
96	3.9.3.3	IE Information Notice 83-80	Complete	8/20/84 (Rev. 1)
97	3.9.3.3	Buckling criteria used for component supports	Complete	6/29/84
98	3.9.3.3	Design of bolts	Complete	6/15/84
99a	3.9.5	Stress categories and limits for core support structures	Complete	6/15/84
99b	3.9.5	Stress categories and limits for core support structures	Complete	6/15/84
100a	3.9.6	10CFR50.55a paragraph (g)	Complete	6/29/84
100b	3.9.6	10CFR50.55a paragraph (g)	Complete	9/12/84 (Rev. 1)
101	3.9.6	PSI and ISI programs for pumps and valves	Complete	9/12/84 (Rev. 1)
102	3.9.6	Leak testing of pressure isolation valves	Complete	9/12/84 (Rev. 1)
103a1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEB SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
103a5	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a6	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103a7	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b5	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103b6	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c1	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c2	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c3	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
103c4	3.10	Seismic and dynamic qualification of mechanical and electrical equipment	Complete	8/20/84
104	3.11	Environmental qualification of mechanical and electrical equipment	NRC Action	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
105	4.2	Plant-specific mechanical fracturing analysis	Complete	8/20/84 (Rev. 1)
106	4.2	Applicability of seismic andd LOCA loading evaluation	Complete	8/20/84 (Rev. 1)
107	4.2	Minimal post-irradiation fuel surveillance program	Complete	6/29/84
108	4.2	Gadolina thermal conductivity equation	Complete	6/29/84
109a	4.4.7	TMI-2 Item II.F.2	Complete	8/20/84
109b	4.4.7	TMI-2 Item II.F.2	Complete	8/20/84
110a	4.6	Functional design of reactivity control systems	Complete	8/30/84 (Rev. 1)
110b	4.6	Functional design of reactivity control systems	Complete	8/30/84 (Rev. 1)
111a	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
111b	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
111c	5.2.4.3	Preservice inspection program (components within reactor pressure boundary)	Complete	6/29/84
112a	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112b	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
112c	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112d	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
112e	5.2.5	Reactor coolant pressure boundary leakage detection	Complete	8/30/84 (Rev. 1)
113	5.3.4	GE procedure applicability	Complete	7/18/84
114	5.3.4	Compliance with NB 2360 of the Summer 1972 Addenda to the 1971 ASME Code	Complete	7/18/84
115	5.3.4	Drop weight and Charpy v-notch tests for closure flange materials	Complete	9/5/84 (Rev. 1)
116	5.3.4	Charpy v-notch test data for base materials as used in shell course No. 1	Complete	7/18/84
117	5.3.4	Compliance with NB 2332 of Winter 1972 Addenda of the ASME Code	Complete	8/20/84
118	5.3.4	Lead factors and neutron fluence for surveillance capsules	Complete	8/20/84
119	6.2	TMI item II.E.4.1	Complete	6/29/84
120a	6.2	TMI Item II.E.4.2	Complete	8/20/84
120b	6.2	TMI Item II.E.4.2	Complete	8/20/84
121	6.2.1.3.3	Use of NUREG-0588	Complete	7/27/84
122	6.2.1.3.3	Temperature profile	Complete	7/27/84
123	6.2.1.4	Butterfly valve operation (post accident)	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
124a	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
124b	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
124c	6.2.1.5.1	RPV shield annulus analysis	Complete	8/20/84 (Rev. 1)
125	6.2.1.5.2	Design drywell head differential pressure	Complete	6/15/84
126a	6.2.1.6	Redundant position indicators for vacuum breakers (and control room alarms)	Complete	8/20/84
126b	6.2.1.6	Redundant position indicators for vacuum breakers (and control room alarms)	Complete	8/20/84
127	6.2.1.6	Operability testing of vacuum breakers	Complete	8/20/84 (Rev. 1)
128	6.2.2	Air ingestion	Complete	7/27/84
129	6.2.2	Insulation ingestion	Complete	6/1/84
130	6.2.3	Potential bypass leakage paths	Complete	9/13/84 (Rev. 1)
131	6.2.3	Administration of secondary contain- ment openings	Complete	7/18/84
132	6.2.4	Containment isolation review	Complete	6/15/84
133a	6.2.4.1	Containment purge system	Complete	8/20/84
133b	6.2.4.1	Containment purge system	Complete	8/20/84
133c	6.2.4.1	Containment purge system	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
134	6.2.6	Containment leakage testing	Complete	6/15/84
135	6.3.3	LPCS and LPCI injection valve interlocks	Complete	8/20/84
136	6.3.5	Plant-specific LOCA (see Section 15.9.13)	Complete	8/20/84 (Rev. 1)
137a	6.4	Control room habitability	Complete	8/20/84
137b	6.4	Control room habitability	Complete	8/20/84
137c	6.4	Control room habitability	Complete	8/20/84
138	6.6	Preservice inspection program for Class 2 and 3 components	Complete	6/29/84
139	6.7	MSIV leakage control system	Complete	6/29/84
140a	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140b	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140c	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
140d	9.1.2	Spent fuel pool storage	Complete	9/7/84 (Rev. 2)
141a	9.1.3	Spent fuel cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141b	9.1.3	Spent fuel cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141c	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
141d	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141e	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141f	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
141g	9.1.3	Spent fuel pool cooling and cleanup system	Complete	8/30/84 (Rev. 1)
142a	9.1.4	Light load handling system (related to refueling)	Complete	8/15/84 (Rev. 1)
142b	9.1.4	Light load handling system (related to refueling)	Complete	8/15/84 (Rev. 1)
143a	9.1.5	Overhead heavy load handling	Complete	9/7/84
143b	9.1.5	Overhead heavy load handling	Complete	9/13/84
144a	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
144b	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
144c	9.2.1	Station service water system	Complete	8/15/84 (Rev. 1)
145	9.2.2	ISI program and functional testing of safety and turbine auxiliaries cooling systems	Used 8/30/84- SAI Sys.Mtg.	6/15/84
146	9.2.6	Switches and wiring associated with HPCI/RCIC torus suction	Used 8/30/84- SAI Sys.Mtg.	6/15/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEB SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
147a	9.3.1	Compressed air systems	Complete	9/21/84 (Rev. 2)
147b	9.3.1	Compressed air systems	Complete	9/21/84 (Rev. 2)
147c	9.3.1	Compressed air systems	Complete	9/21/84 (Rev. 2)
147d	9.3.1	Compressed air systems	Complete	9/21/84 (Rev. 2)
148	9.3.2	Post-accident sampling system (II.B.3)	Complete	9/12/84 (Rev. 1)
149a	9.3.3	Equipment and floor drainage system	Complete	7/27/84
149b	9.3.3	Equipment and floor drainage system	Complete	7/27/84
150	9.3.6	Primary containment instrument gas system	Complete	8/3/84 (Rev. 1)
151a	9.4.1	Control structure ventilation system	Complete	8/30/84 (Rev. 1)
151b	9.4.1	Control structure ventilation system	Complete	8/30/84 (Rev. 1)
152	9.4.4	Radioactivity monitoring elements	Closed (5/30/84- Aux.Sys.Mtg.)	6/1/84
153	9.4.5	Engineered safety features ventila- tion system	Complete	8/30/84 (Rev 2)
154	9.5.1.4.a	Metal roof deck construction classification	Complete	6/1/84
155	9.5.1.4.b	Ongoing review of safe shutdown capability	NRC Action	
156	9.5.1.4.c	Ongoing review of alternate shutdown capability	NRC Action	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEB SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
157	9.5.1.4.e	Cable tray protection	Complete	8/20/84
158	9.5.1.5.a	Class B fire detection system	Complete	6/15/84
159	9.5.1.5.a	Primary and secondary power supplies for fire detection system	Complete	6/1/84
160	9.5.1.5.b	Fire water pump capacity	Complete	8/13/84
161	9.5.1.5.b	Fire water valve supervision	Complete	6/1/84
162	9.5.1.5.c	Deluge valves	Complete	6/1/84
163	9.5.1.5.c	Manual hose station pipe sizing	Complete	6/1/84
164	9.5.1.6.e	Remote shutdown panel ventilation	Complete	6/1/84
165	9.5.1.6.g	Emergency diesel generator day tank protection	Complete	6/1/84
166	12.3.4.2	Airborne radioactivity monitor positioning	Complete	9/13/84 (Rev. 2)
167	12.3.4.2	Portable continuous air monitors	Complete	7/18/84
168	12.5.2	Equipment, training, and procedures for inplant iodine instrumentation	Complete	6/29/84
169	12.5.3	Guidance of Division B Regulatory Guides	Complete	7/18/84
170	13.5.2	Procedures generation package submittal	Complete	6/29/84
171	13.5.2	TMI Item I.C.1	Complete	6/29/84
172	13.5.2	PGP Commitment	Complete	6/29/84
173	13.5.2	Procedures covering abnormal releases of radioactivity	Complete	6/29/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
174	13.5.2	Resolution explanation in FSAR of TMI Items I.C.7 and I.C.8	Complete	6/15/84
175	13.6	Physical security	Open	
176a	14.2	Initial plant test program	Complete	8/13/84
176b	14.2	Initial plant test program	Complete	8/13/84
176c	14.2	Initial plant test program	Complete	7/27/84
176d	14.2	Initial plant test program	Complete	8/24/84 (Rev. 2)
176e	14.2	Initial plant test program	Complete	7/27/84
176f	14.2	Initial plant test program	Complete	8/13/84
176g	14.2	Initial plant test program	Complete	8/20/84
176h	14.2	Initial plant test program	Complete	8/13/84
176i	14.2	Initial plant test program	Complete	7/27/84
177	15.1.1	Partial feedwater heating	Complete	8/20/84 (Rev. 1)
178	15.6.5	LOCA resulting from spectrum of postulated piping breaks within RCP	NRC Action	
179	15.7.4	Radiological consequences of fuel handling accidents	NRC Action	
180	15.7.5	Spent fuel cask drop accidents	NRC Action	
181	15.9.5	TMI-2 Item II.K.3.3	Complete	6/29/84
182	15.9.10	TMI-2 Item II.K.3.18	Complete	6/1/84
183	18	Hope Creek DCRDR	Complete	8/15/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
184	7.2.2.1.e	Failures in reactor vessel level sensing lines	Complete	8/1/84 (Rev 1)
185	7.2.2.2	Trip system sensors and cabling in turbine building	Complete	6/1/84
186	7.2.2.3	Testability of plant protection systems at power	Complete	8/13/84 (Rev. 1)
187	7.2.2.4	Lifting of leads to perform surveillance testing	Complete	8/3/84
188	7.2.2.5	Setpoint methodology	Complete	8/1/84
189	7.2.2.6	Isolation devices	Complete	8/1/84
190	7.2.2.7	Regulatory Guide 1.75	Complete	6/1/84
191	7.2.2.8	Scram discharge volume	Complete	6/29/84
192	7.2.2.9	Reactor mode switch	Complete	8/15/84 (Rev. 1)
193	7.3.2.1.10	Manual initiation of safety systems	Complete	8/1/84
194	7.3.2.2	Standard review plan deviations	Complete	8/1/84 (Rev 1)
195a	7.3.2.3	Freeze-protection/water filled instrument and sampling lines and cabinet temperature control	Complete	8/1/84
195b	7.3.2.3	Freeze-protection/water filled instrument and sampling lines and cabinet temperature control	Complete	8/1/84
196	7.3.2.4	Sharing of common instrument taps	Complete	8/1/84
197	7.3.2.5	Microprocessor, multiplexer and computer systems	Complete	8/1/84 (Rev 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
198	7.3.2.6	TMI Item II.K.3.18-ADS actuation	Complete	8/20/84
199	7.4.2.1	IE Bulletin 79-27-Loss of non-class IE instrumentation and control power system bus during operation	Complete	8/24/84 (Rev. 1)
200	7.4.2.2	Remote shutdown system	Complete	8/15/84 (Rev 1)
201	7.4.2.3	RCIC/HPCI interactions	Complete	8/3/84
202	7.5.2.1	Level measurement errors as a result of environmental temperature effects on level instrumentation reference leg	Complete	8/3/84
203	7.5.2.2	Regulatory Guide 1.97	Complete	8/3/84
204	7.5.2.3	TMI Item II.F.1 - Accident monitoring	Complete	8/1/84
205	7.5.2.4	Plant process computer system	Complete	6/1/84
206	7.6.2.1	High pressure/low pressure interlocks	Complete	7/27/84
207	7.7.2.1	HELBs and consequential control systems failures	Complete	8/24/84 (Rev. 1)
208	7.7.2.2	Multiple control system failures	Complete	8/24/84 (Rev. 1)
209	7.7.2.3	Credit for non-safety related systems in Chapter 15 of the FSAR	Complete	8/1/84 (Rev 1)
210	7.7.2.4	Transient analysis recording system	Complete	7/27/84
211a	4.5.1	Control rod drive structural materials	Complete	7/27/84
211b	4.5.1	Control rod drive structural materials	Complete	7/27/84
211c	4.5.1	Control rod drive structural materials	Complete	7/27/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
211d	4.5.1	Control rod drive structural materials	Complete	7/27/84
211e	4.5.1	Control rod drive structural materials	Complete	7/27/84
212	4.5.2	Reactor internals materials	Complete	7/27/84
213	5.2.3	Reactor coolant pressure boundary material	Complete	7/27/84
214	6.1.1	Engineered safety features materials	Complete	7/27/84
215	10.3.6	Main steam and feedwater system materials	Complete	7/27/84
216a	5.3.1	Reactor vessel materials	Complete	7/27/84
216b	5.3.1	Reactor vessel materials	Complete	7/27/84
217	9.5.1.1	Fire protection organization	Complete	8/15/84
218	9.5.1.1	Fire hazards analysis	Complete	6/1/84
219	9.5.1.2	Fire protection administrative controls	Complete	8/15/84
220	9.5.1.3	Fire brigade and fire brigade training	Complete	8/15/84
221	8.2.2.1	Physical separation of offsite transmission lines	Complete	8/1/84
222	8.2.2.2	Design provisions for re-establish- ment of an offsite power source	Complete	9/14/84 (Rev. 1)
223	8.2.2.3	Independence of offsite circuits between the switchyard and class IE buses	Complete	9/26/84 (Rev. 3)
224	8.2.2.4	Common failure mode between onsite and offsite power circuits	Complete	9/26/84 (Rev. 2)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
225	8.2.3.1	Testability of automatic transfer of power from the normal to preferred power sources	Complete	9/21/84 (Rev. 1)
226	8.2.2.5	Grid stability	Complete	8/13/84 (Rev. 1)
227	8.2.2.6	Capacity and capability of offsite circuits	Complete	8/1/84
228	8.3.1.1(1)	Voltage drop during transient conditions	Complete	8/1/84
229	8.3.1.1(2)	Basis for using bus voltage versus actual connected load voltage in the voltage drop analysis	Complete	8/1/84
230	8.3.1.1(3)	Clarification of Table 8.3-11	Complete	8/1/84
231	8.3.1.1(4)	Undervoltage trip setpoints	Complete	8/1/84
232	8.3.1.1(5)	Load configuration used for the voltage drop analysis	Complete	8/1/84
233	8.3.3.4.1	Periodic system testing	Complete	9/21/84 (Rev. 2)
234	8.3.1.3	Capacity and capability of onsite AC power supplies and use of administrative controls to prevent overloading of the diesel generators	Complete	8/1/84
235	8.3.1.5	Diesel generators load acceptance test	Complete	9/21/84 (Rev. 2)
236	8.3.1.6	Compliance with position C.6 of RG 1.9	Complete	8/1/84
237	8.3.1.7	Description of the load sequencer	Complete	9/21/84 (Rev. 1)
238	8.2.2.7	Sequencing of loads on the offsite power system	Complete	9/21/84 (Rev. 1)

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENGER LETTER DATED
239	8.3.1.8	Testing to verify 80% minimum voltage	Complete	8/15/84
240	8.3.1.9	Compliance with BTP-PSB-2	Complete	8/1/84
241	8.3.1.10	Load acceptance test after prolonged no load operation of the diesel generator	Complete	9/21/84 (Rev. 3)
242	8.3.2.1	Compliance with position 1 of Regula- tory Guide 1.128	Complete	9/13/84 (Rev. 1)
243	8.3.3.1.3	Protection or qualification of Class 1E equipment from the effects of fire suppression systems	Complete	9/13/84 (Rev. 1)
244	8.3.3.3.1	Analysis and test to demonstrate adequacy of less than specified separation	Complete	9/28/84 (Rev. 2A)
245	8.3.3.3.2	The use of 18 versus 36 inches of separation between raceways	Complete	9/28/84 (Rev. 2B)
246	8.3.3.3.3	Specified separation of raceways by analysis and test	Complete	8/1/84
247	8.3.3.5.1	Capability of penetrations to with- stand long duration short circuits at less than maximum or worst case short circuit	Complete	9/13/84 (Rev. 1)
248	8.3.3.5.2	Separation of penetration primary and backup protections	Complete	8/1/84
249	8.3.3.5.3	The use of bypassed thermal overload protective devices for penetration protections	Complete	8/1/84
250	8.3.3.5.4	Testing of fuses in accordance with R.G. 1.63	Complete	8/1/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL A. SCHWENGER LETTER DATED
251	8.3.3.5.5	Fault current analysis for all representative penetration circuits	Complete	9/24/84 (Rev. 3)
252	8.3.3.5.6	The use of a single breaker to provide penetration protection	Complete	9/21/84 (Rev. 2)
253	8.3.3.1.4	Commitment to protect all Class 1E equipment from external hazards versus only class 1E equipment in one division	Complete	9/28/84 (Rev. 3A)
254	8.3.3.1.5	Protection of class 1E power supplies from failure of unqualified class 1E loads	Complete	9/14/84 (Rev. 1)
255	8.3.2.2	Battery capacity	Complete	8/1/84
256	8.3.2.3	Automatic trip of loads to maintain sufficient battery capacity	Complete	9/13/84 (Rev. 1)
257	8.3.2.5	Justification for a 0 to 13 second load cycle	Complete	9/13/83 (Rev. 1)
258	8.3.2.6	Design and qualification of DC system loads to operate between minimum and maximum voltage levels	Complete	8/1/84
259	8.3.3.3.4	Use of an inverter as an isolation device	Complete	9/26/84 (Rev. 2)
260	8.3.3.3.5	Use of a single breaker tripped by a LOCA signal used as an isolation device	Complete	9/13/84 (Rev. 1)
261	8.3.3.3.6	Automatic transfer of loads and interconnection between redundant divisions	Complete	9/13/84 (Rev. 1)
262	11.4.2.d	Solid waste control program	Complete	8/20/84

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSER SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
263	11.4.2.e	Fire protection for solid radwaste storage area	Complete	8/13/84
264	6.2.5	Sources of oxygen	Complete	8/20/84
265	6.8.1.4	ESF Filter Testing	Complete	8/13/84
266	6.8.1.4	Field leak tests	Complete	8/13/84
267	6.4.1	Control room toxic chemical detectors	Complete	8/13/84
268		Air filtration unit drains	Complete	9/13/84 (Rev. 1)
269	5.2.2	Code cases N-242 and N-242-1	Complete	8/20/84
270	5.2.2	Code case N-252	Complete	8/20/84
TS-1	2.4.14	Closure of watertight doors to safety-related structures	Open	
TS-2	4.4.4	Single recirculation loop operation	Open	
TS-3	4.4.5	Core flow monitoring for crud effects	Complete	6/1/84
TS-4	4.4.6	Loose parts monitoring system	Open	
TS-5	4.4.9	Natural circulation in normal operation	Open	
TS-6	6.2.3	Secondary containment negative pressure	Open	
TS-7	6.2.3	Inleakage and drawdown time in secondary containment	Open	
TS-8	6.2.4.1	Leakage integrity testing	Open	
TS-9	6.3.4.2	ECCS subsystem periodic component testing	Open	

ATTACHMENT 1 (Cont'd)

OPEN ITEM	DSEI SECTION NUMBER	SUBJECT	STATUS	R. L. MITTL TO A. SCHWENCER LETTER DATED
TS-10	6.7	MSIV leakage rate		
TS-11	15.2.2	Availability, setpoints, and testing of turbine bypass system	Open	
TS-12	15.6.4	Primary coolant activity		
LC-1	4.2	Fuel rod internal pressure criteria	Complete	6/1/84
LC-2	4.4.4	Stability analysis submitted before second-cycle operation	Open	

ATTACHMENT 2

DATE: 9/28/84

DRAFT SER SECTIONS AND DATES PROVIDED

<u>SECTION</u>	<u>DATE</u>	<u>SECTION</u>	<u>DATE</u>
3.1			
3.2.1		11.4.1	See Notes 1&5
3.2.2		11.4.2	See Notes 1&5
5.1		11.5.1	See Notes 1&5
5.2.1		11.5.2	See Notes 1&5
6.5.1	See Notes 1&5	13.1.1	See Note 4
8.1	See Note 2	13.1.2	See Note 4
8.2.1	See Note 2	13.2.1	See Note 4
8.2.2	See Note 2	13.2.2	See Note 4
8.2.3	See Note 2	13.3.1	See Note 4
8.2.4	See Note 2	13.3.2	See Note 4
8.3.1	See Note 2	13.3.3	See Note 4
8.3.2	See Note 2	13.3.4	See Note 4
8.4.1	See Note 2	13.4	See Note 4
8.4.2	See Note 2	13.5.1	See Note 4
8.4.3	See Note 2	15.2.3	
8.4.5	See Note 2	15.2.4	
8.4.6	See Note 2	15.2.5	
8.4.7	See Note 2	15.2.6	
8.4.8	See Note 2	15.2.7	
9.5.2	See Note 3	15.2.8	
9.5.3	See Note 3	15.7.3	See Notes 1&5
9.5.7	See Note 3	17.1	8/3/84
9.5.8	See Note 3	17.2	8/3/84
10.1	See Note 3	17.3	8/3/84
10.2	See Note 3	17.4	8/3/84
10.2.3	See Note 3		
10.3.2	See Note 3		
10.4.1	See Note 3		
10.4.2	See Notes 3&5		
10.4.3	See Notes 3&5		
10.4.4	See Note 3		
11.1.1	See Notes 1&5		
11.1.2	See Notes 1&5		
11.2.1	See Notes 1&5		
11.2.2	See Notes 1&5		
11.3.1	See Notes 1&5		
11.3.2	See Notes 1&5		

Notes:

1. Open items provided in letter dated July 24, 1984 (Schwencer to Mittl)
2. Open items provided in June 6, 1984 meeting
3. Open items provided in April 17-18, 1984 meeting
4. Open items provided in May 2, 1984 meeting
5. Draft SER Section provided in letter dated August 7, 1984 (Schwencer to Mittl)

CT:db

Attachment 3

<u>DSER ITEM</u>	<u>DSER SECTION</u>	<u>SUBJECT</u>
244	8.3.3.3.1	Analysis and test to demonstrate adequacy of less than specified separation
245	8.3.3.3.2	The use of 18 versus 36 inches of separation between raceways
253	8.3.3.1.4	Commitment to protect all Class 1E equipment from external hazards versus only Class 1E equipment in one division

Question No.

FSAR Section

421.10	7.1 & 7.2
430.65	9.5.2
430.75	9.5.3
430.81	9.5.4
430.101	9.5.5

ATTACHMENT 4

DSEI Open Item No. 244 (DSEI Section 8.3.3.3.1)**ANALYSIS AND TEST TO DEMONSTRATE ADEQUACY OF LESS THAN SPECIFIED SEPARATION**

The applicant, by Amendment 4 to the PSAR, provided a description of physical separation between redundant enclosed raceways (covered trays and open top raceways, and between non-Class 1E trays and Class 1E conduit, as follows:

1. In the cable spreading rooms, the main control room, relay room, and control equipment room, the separation is twelve inches (12") horizontal, and eighteen inches (18") vertical.
2. In all other plant areas, the separation is three feet horizontal and five feet vertical.

The applicant further stated that where the separation distances specified above can not be maintained, cable trays shall either be covered with metal tray covers or an analysis, based on test results, will be performed.

The staff concludes that the above separation meets the guidelines of Regulatory Guide 1.75 and is acceptable except for the following:

- (1) The use of 18 versus 36 inches of separation between raceways is evaluated in Section 8.3.3.3.2 of this report, and
- (2) The use of an analysis to justify less than specified separation will be pursued with the applicant.

RESPONSE

The response to Question 430.52 has been revised to provide the requested analysis. *One copy of each of the following reports were attached for your use: on August 30, 1984*

- 1) Wyle Laboratories, Test Report No. 56719, Dated November 20, 1980, prepared for Susquehanna Steam Electric Station for electrical wire and cable isolation barrier ~~test~~ materials test.
- 2) Franklin Institute Research Laboratories, ~~for~~ Dated March 20, 1977, prepared for Toledo Edison Company for Conduit Separation test Program.

QUESTION 430.52 (SECTION 8.3.1 and 8.3.2)

Provide a description of separation between redundant enclosed raceways or conduit and open top raceways and between Non Class 1E trays and Class 1E conduit.

RESPONSE

Refer to Section 8.1.4.14 and revised Section 1.8.1.75 for a description of HCGS separation provisions and a discussion of HCGS compliance to Regulatory Guide 1.75.

1.8.1.74 Conformance to Regulatory Guide 1.74, Revision 0,
February 1974: Quality Assurance Terms and Definitions

HCGS complies with ANSI N45.2.10-1973, as interpreted in Regulatory Guide 1.74.

See Section 17.2 for further discussion of quality assurance and Section 1.8.2 for the NSSS assessment of this Regulatory Guide.

1.8.1.75 Conformance to Regulatory Guide 1.75, Revision 2,
September 1978: Physical Independence of Electric
Systems

HCGS complies with IEEE 384-1974, as modified and endorsed by Regulatory Guide 1.75, with the clarifications and exceptions outlined below.

Position C.1 separation is accomplished in general by supplying non-Class 1E loads connected to a Class 1E bus through a single breaker with a shunt trip device tripped by a LOCA signal. All non-Class 1E loads will be tripped automatically by LOCA signal. Provisions for restoring certain of these loads from the main control room are provided.

Insert
A →

Position C.12 states that redundant cable spreading areas should be provided. HCGS has only a single cable spreading area.

Position C.12 endorses IEEE 384-1974, Paragraph 5.1.3, which indicates that in cable spreading areas the minimum separation distance between redundant Class 1E cable trays should be 1 foot between trays separated horizontally and 3 feet between trays separated vertically. The separation criteria used on HCGS for cable spreading areas is a minimum of 1-foot horizontal distance and 18-inch vertical distance between redundant Class 1E cable trays. The configurations, for which the redundant cable trays can not be separated by distances specified above, will either be analyzed or tested to demonstrate the compliance with the intent of Regulatory Guide 1.75.

Position C.15 specifies that redundant Class 1E batteries be located in separate safety class structures and be served by independent ventilation systems. The 250-V Class 1E batteries for electrical divisions A and B, located on elevation 163 feet of the auxiliary building, are served by a common ventilation

HCGS FSAR

(Question 430.52/Item 25)

INSERT A

Position C.6 states that all analyses to justify lesser separation distances shall be identified. The following are the HCGS exceptions to the IEEE 384 separation distances.

There are only three generic cases where analysis is used to justify lesser separation distances. These are identified and analyzed as follows:

- Conduit-to-conduit less than one (1) inch apart.

Because of space limitations in some areas of the plant, the minimum separation distance of one inch between rigid steel conduits can not be maintained. The use of the conduits is limited to instrumentation to instrumentation control to control, and instrumentation to power feeder with maximum 120 Vac or 125 Vdc cables only. Wyle Test Report No. 56719, prepared for Susquehanna Steam Electric Station, showed that rigid steel conduits in contact with each other are acceptable barriers. The testing demonstrated that shorting of conductors in one conduit until failure did not affect the performance of the conductors in the other conduit or damage the conduit. In addition, Franklin Institute Research Laboratories (FIRL) performed similar testing for the Toledo Edison Company in 1977 with successful results. The test configuration and cables used conservatively bound the HCGS conditions; therefore, the limited cases where the HCGS separation has not been met in the installation are justified. The two reports referenced have been submitted under separate cover, by letter from R. L. Mittl, PSE&G, to A. Schwencer, NRC, dated August 30, 1984.

Based on the results of this test and analysis program, separation criteria for Class 1E conduit has been established which assures that (1) any failure or occurrence in a Class 1E conduit will not degrade a redundant essential Class 1E circuit in adjacent Class 1E conduits, (2) a failure or occurrence in a non-Class 1E conduit will not degrade redundant essential Class 1E circuits in adjacent Class 1E conduits.

The criteria established are as follows:

1. Circuits carrying control, instrumentation, or power

Insert A (Cont'd)

- cable (where the power cable is limited to 480 volt or lower and No. 12 AWG or smaller) are allowed to touch each other.
2. Conduit carrying essential Class 1E 4.16 kV power cables or 480 volt load center power cables will have a one inch minimum separation from conduits carrying Class 1E circuits of a redundant channel.
 3. Conduit carrying non-essential 13.8 kV, 4.16 kV, or 480 volt load center cables that bridge conduits carrying essential Class 1E circuits of redundant channels will be separated from conduit carrying circuits of the redundant channel to give a minimum separation of one inch.
 4. Conduit carrying essential Class 1E power cable of 480 volt or lower voltage with conductor size larger than number 12 AWG, and not covered by 2. above, will meet the following criteria:
 - a. Will have a minimum of 1/8-inch separation from the surface of any conduit crossing above which contains an essential Class 1E circuit of the redundant channel.
 - b. Are allowed to touch conduits containing an essential Class 1E circuit of the redundant channel when installed in a horizontal, side-by-side configuration.
 - c. Will have a minimum separation of one inch from conduits containing an essential Class 1E circuit of the redundant channel mounted directly above and running parallel.
 5. Conduit carrying non-essential power cable of 480 volt or lower voltage with conductor size larger than number 12 AWG, and not covered by 3. above, that bridge conduits carrying essential Class 1E circuits of redundant channels will be treated as in 4.a, b, and c for proper separation from the redundant channel.
- Non-Class 1E conduit separation from Class 1E tray.

In safety-related areas of the plant there are non-Class 1E rigid steel conduits within one inch of Class 1E tray. The non-Class 1E conduit contains only control, instrumentation or 120 Vac/125 Vdc power cables. The testing performed

Insert A (Cont'd)

for the above projects demonstrated that the rigid steel conduit is an effective barrier for protection of any cabling. Therefore, the HCGS cases where the non-Class 1E conduit is not installed as required is justified by the previous testing.

- Metal-clad cable separation from Class 1E raceways.

Metal-clad cables, type MC, are used in non-Class 1E circuits only. The minimum separation between the metal-clad cable and Class 1E raceways (open top trays or conduits) is one (1) inch. The type MC cable is a factory assembly of one or more conductors, each individually insulated, covered with an overall insulating jacket and all enclosed in a metallic sheath of interlocking galvanized steel. The cable has passed the vertical flame test of IEEE 383-1974.

The above analysis identified the cases on a generic level. The installation and inspection of raceways are ongoing and the specific cases where the analysis appoes are documented on nonconformance reports that are part of the QA/QC program.

DSER Open Item No. 245 (DSER Section 8.3.3.3.2)

THE USE OF 18 VERSUS 36 INCHES OF SEPARATION BETWEEN RACEWAYS

In Sections 1.8.1.73 and 5.1.4.14.3.1 of the PSAR it is stated that separation between redundant cable trays in the cable spreading area, control equipment room, relay room, and main control room are separated by 18 inches vertically as opposed to the recommended 36 inches of separation required by IEEE Standard 384-1974.

The applicant, by Amendment 4 to the PSAR, indicated that this 18 inches of separation was approved by the staff during the preliminary design review of the Hope Creek plant. The staff's preliminary safety evaluation report for this item stated that:

"The applicant claims these separation distances are adequate because a high grade type cabling will be specified and results of extensive testing show that no cable degradation or flame propagation occurs when the lower tray, separated by 12 inches from the upper tray, is exposed to a gas flame for 15 minutes."

The results of these tests, that demonstrate no degradation to cables located in the trays 12 inches above the tray exposed to the gas flame, will be pursued with the applicant.

RESPONSE

Section 8.1.4.14.3.1 and the response to Question 430.51 have been revised to provide additional justification for the separation distance.

HCGS FSAR

QUESTION 430.51 (SECTION 8.3.1 and 8.3.2)

In Sections 1.8.1.75 and 8.1.4.14.3.1 of the FSAR you state that separation between redundant cable trays in the cable spreading area, control equipment room, relay room, and main control room are separated by 18 inches of separation required by IEEE Standard 384-1974. Provide analysis substantiated by test that demonstrates the adequacy of 18 inches of separation.

RESPONSE

The HCGS PSAR was approved with 18 inch vertical separation between redundant cable trays.

A copy of the test report that substantiated the use of this vertical separation has been submitted under separate cover (letter from R. L. Mitt, PSE&G, to A. Schwencer, NRC, dated August 15, 1984).

Revised section 8.1.4.14.3.1 provides the analysis based on this test to demonstrate the adequacy of 18 inches separation.

In addition to the above test, an additional cable tray test will be performed that tests electrical shorting of electrical cabling utilizing the 18 inch vertical separation. This test plan is being submitted under separate cover.

If the test is unsuccessful, then cable tray covers will be added to the trays in accordance with IEEE Std 384-1974.

ECCS PSAR

8.1.4.14.3.1 Cable Spreading Area, Control Equipment Room^{and} ~~Relay Room~~ ^{and mezzanine} and Main Control Room ~~Mezzanine~~

The cable spreading area, control equipment room, ~~relay room~~, and main control room do not contain high energy equipment such as switchgear, transformer, rotating equipment, or potential sources of missiles or pipe whip, and are not used for storing flammable materials. Power supply circuits are limited to those serving these areas and their instrument systems. These 208/120-V power cables are installed in conduits. Conduits containing redundant cables are separated by a minimum of 1 inch. Conduit couplings, clamps, locknuts, bushings, etc, shall not be considered in determining the required separation distances. For conduits carrying redundant neutron monitoring cables, boxes also shall not be considered in determining the required separation. Redundant cable trays are separated by at least 18 inches vertically and 12 inches horizontally. The configurations, for which the redundant ~~cable trays~~ can not be separated by distances specified above, will either be analyzed or tested to demonstrate the compliance with the intent of Regulatory Guide 1.75. Separation distance requirements between Class 1E and non-Class 1E raceways are the same as for the separation among redundant channels. ^{raceways}

> INSERT A

Strict administrative control of operations and maintenance activities is developed to control and limit the introduction of potential hazards into these areas.

8.1.4.14.3.2 Limited Hazard Areas

Limited hazard areas are the general plant areas from which potential nonelectrical hazards such as missiles, pipe whip, and exposure fires are excluded. The hazards in this area are limited to failures or faults internal to the electrical equipment or cables. These areas include elevations 77, 102, 124, 130, and 137 feet in the auxiliary building wing areas and elevation 87 feet in the radwaste area. Minimum separation in these ~~nonhazardous~~ areas is as follows:

- a. Conduits containing redundant cables are separated by a minimum of 1 inch, unless consideration of hazards indicates greater separation is required. Conduit couplings, clamps, locknuts, bushings, etc, shall not be considered in determining the required separation distances. For conduits carrying redundant neutron

INSERT A TO 8.1.4.14.3.1

IEEE 384-1974 requires a minimum vertical separation of 3 feet between trays. The HCS minimum vertical separation distance is 18 inches. The following analysis provides the justification for the lesser separation distance:

A. All cables are flame retardant and meet or exceed the flame test specified in IEEE 383-1974 as demonstrated by tests. Cable test reports are on file and available for audit.

B. As indicated in the above paragraph, high energy equipment and potential sources of missiles or pipe whip are excluded from the areas. Power circuits in the areas are installed in conduits that qualify as barriers; the maximum potential of the power circuits is limited to 208/120 volts AC or 125 volts DC. There are no power cables of higher potential serving equipment in the areas.

C. The cable tray test report performed for Salem showed that a fire in a cable tray located 12" directly below another tray did not propagate to the upper cable tray nor degrade the cables in the upper cable tray. The test configuration and cables were representative of the HCS design and installation except that the test configuration used a 12 inch vertical separation. Because the Salem test demonstrated that the 12 inch vertical separation was adequate, the HCS separation distance is justified. The Salem test report, entitled "Basis For Cable System Design Power Generating Stations", dated July 16, 1971, has been submitted under separate cover (letter from R.L. Mittl, PSEG, to A. Schwencer, NRC, dated August 15, 1984).

ABSTRACT-PHYSICAL SEPARATION TEST PLAN

1.0 SCOPE

This document is a test plan for the purpose of testing physical separation between redundant Class 1E cables and Class 1E and non-Class 1E cables with respect to electrical faults in configurations representative of HCGS.

1.1 OBJECTIVE

The purpose of this procedure is to present the requirements, procedures, and sequence for testing the design adequacy of the Hope Creek cable tray-to-cable tray separation. Figure 1 identifies the tray-to-tray separation test configuration.

1.2 APPLICABLE DOCUMENTS

- ° IEEE Std 384-1981
- ° IPCEA S19-81
- ° HCGS FSAR Section 8.1

1.3 EQUIPMENT DESCRIPTION

This test procedure encompasses testing of control cable and instrumentation cable as described below:

<u>Item No.</u>	<u>Description</u>
1.0	Okonite 600VAC, two conductor, size # 14 AWG (HCGS No. C02)
2.0	Okonite 600VAC, two conductor, size # 12 AWG (HCGS No. P12)
3.0	Eaton 600VAC, two conductor, size # 16 AWG (HCGS No. I02)

2.0 TEST REQUIREMENTS

2.1 Acceptance Criteria

2.1.1 Insulation Resistance Test

Measured insulation resistance on all "target" cables and any other cable, in the target raceway, that might sustain significant damage to its insulation system shall be greater than 1.6×10^6 ohms with an applied potential of 500 VDC for sixty seconds.

2.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with an applied potential of 2200 VAC for sixty seconds on all "target" cables and any other cable, in the target raceway, that might sustain significant damage to its insulation system.

2.1.3 Cable Continuity Test

Energized non-fault specimens in the "target" raceway shall conduct 100% rated current at 120 VAC throughout the overcurrent test.

2.1.4 Cable Temperature

The cabling in the upper cable tray shall be monitored for cable jacket temperature and it shall not exceed the qualified parameter in the environmental qualification of the cable.

3.0 TEST PROGRAM

3.1 Test Configuration

These tests shall consist of a series of tests with two vertically separated horizontal cable trays (see Figure 1). The test setup shall be identical for each test with the exception of the location of the faulted cable.

3.1.1 Purpose

The purpose of the tests is to demonstrate the adequacy of design where two horizontal cable trays are physically separated by eighteen inches vertically when an electrical fault occurs in the lower cable tray.

3.1.2 Test Specimen Preparation

The test specimens shall be placed in the cable tray assembly as shown in Figure 1. This apparatus shall be assembled to the indicated dimensions. The following guidelines shall be observed with regard to the materials and construction of the cable tray assembly:

1. The cable trays shall be ladder rung trays 72" by 24" by 4" (horizontal tray) from PSE&G stock.
2. The cable trays shall be supported with unistrut hangers and shall be mounted such that the bottom of the upper horizontal cable tray is eighteen inches above the top of the upper horizontal cable tray.

3. The upper and lower cable trays shall be filled to a 50% fill level (by area) using an assortment of six ft unpowered control and instrumentation cables from PSE&G stock.
4. One energized 2/C Size 16 AWG cable and one energized 3/C Size 14 AWG cable shall be placed inside the cable trays that do not have the faulted cable. The energized "target" cables shall be located in the worst case locations (directly above, underneath or next to the faulted cable) as shown in Figure 1. (NOTE: Figure 1 shows the fault and "target" cable locations for the two tests).

3.1.3 Instrumentation Setup

3.1.3.1 Thermocouple Locations

For the test, five thermocouples are to be mounted to the upper and lower cable tray on the edge closest to the faulted cable in the horizontal cable tray.

These thermocouples shall be monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger shall be operated at its maximum rate throughout the overcurrent test.

- #### 3.1.3.2 Electrical Monitoring -- All voltages and phase currents of the energized cables and the fault cable current shall be fed to oscillograph recorders. The oscillographs shall be operated at the 0.1 inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified below:

Oscillograph #1 Channels

<u>Channel No.</u>	<u>Test No.</u>	<u>Signal</u>	<u>Location</u>
1	1	Current	16 AWG Upper Cable Tray
1	2	Current	14 AWG Lower Cable Tray
2	1	Current	12 AWG Upper Cable Tray
2	2	Current	16 AWG Lower Cable Tray
3	1	Current	16 AWG Upper Cable Tray
3	2	Current	14 AWG Lower Cable Tray
4	1	Voltage	16 AWG Upper Cable Tray
4	2	Voltage	12 AWG Lower Cable Tray
5	1	Voltage	12 AWG Upper Cable Tray
5	2	Voltage	16 AWG Lower Cable Tray
6	1	Voltage	16 AWG Upper Cable Tray
6	2	Voltage	14 AWG Lower Cable Tray

Oscillograph #2 Channels

<u>Channel No.</u>	<u>Test No.</u>	<u>Signal</u>	<u>Location</u>
1	1,2	Current	Faulted Cable

A digital multimeter shall be utilized to measure all phase-to-phase voltages and all phase currents prior to, during, and after the overcurrent test. These data shall be recorded to provide accurate evidence of the energized specimens' ability to conduct rated current and 120 VAC throughout the overcurrent test.

3.1.4 Baseline Functional Tests for Cabling in Upper Tray

The baseline functional tests shall consist of insulation resistance and high potential tests on the "target" cables.

3.1.4.1 Insulation Resistance Test

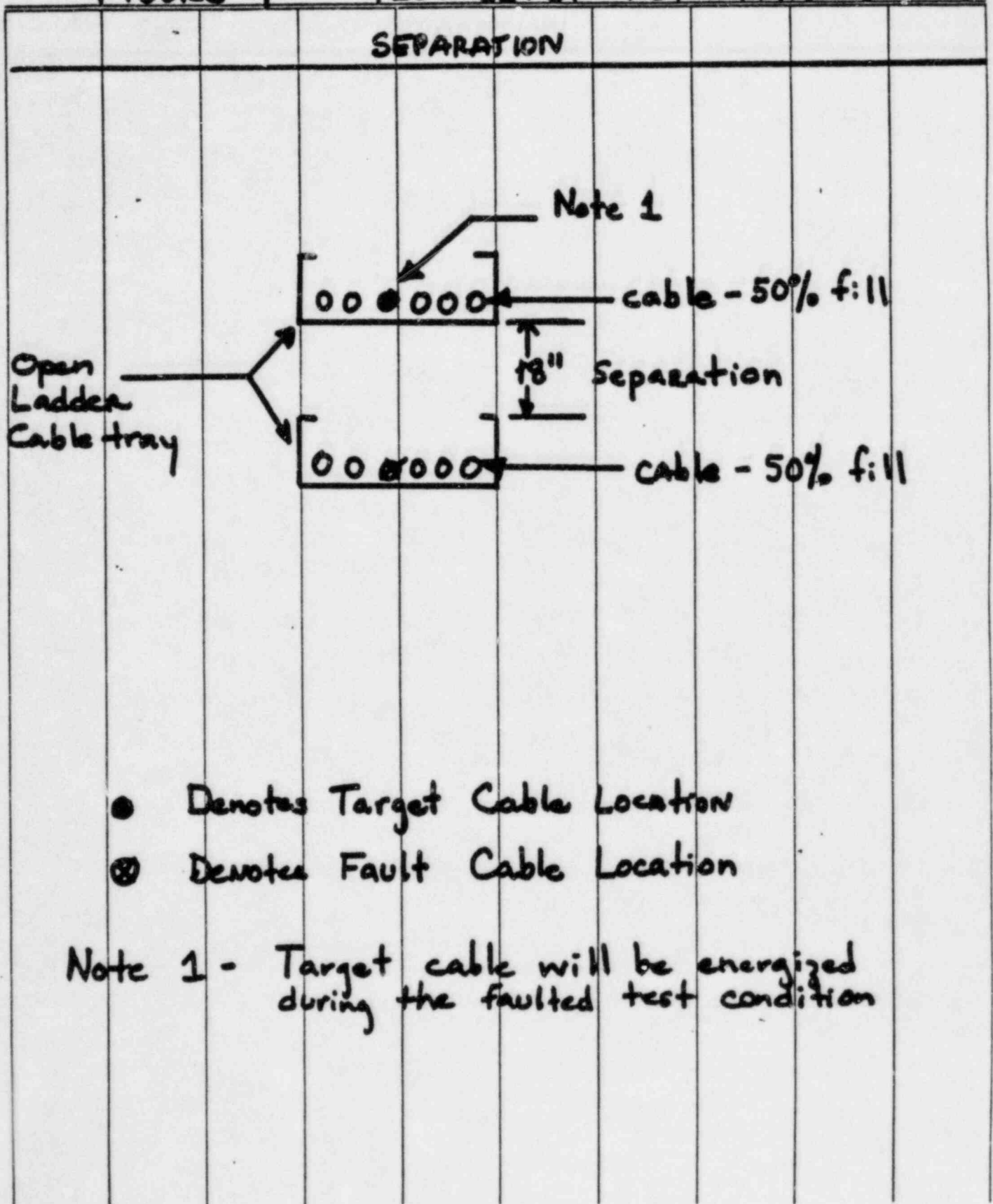
1. Using a megohmmeter, apply a potential of 500 VDC and record the minimum insulation resistance indicated over a period of 60 seconds on the "target" cables.
2. Perform a high potential test on the "target" cable.

3.1.5 Overcurrent Test

1. Connect the worst case cable (WCC) size to the copper bus bars per Figure 3.
2. Energize the two 3/C Size 14 AWG cables with 120 VAC and 15 amperes.
3. Energize the two 3/C Size 12 AWG cables with 120 VAC and 90 amperes.
4. Energize the worst case cable size with rated current (90 amps).
5. Record "target" cable voltages and currents and the fault cable current.
6. Allow the worst case cable size to conduct rated current for 15 minutes.
7. Increase the Multi-Amp Test Set output to 660 amperes in increments of 50 amperes. Hold at each level until cable failure occurs or until thermocouple readings stabilize.
8. Record "target" cable voltages and currents and the fault cable current and temperatures.

9. De-energize the Multi-Amp Test Set output.
10. Record Multi-Amp Test Set time to failure of the faulted cable.
11. Record "target" cable voltages and currents.
12. De-energize the "target" cables.
13. Photograph the post-test damage.
14. Remove the faulted cable and any other cables that were significantly damaged.
15. Repeat the applicable portions of Paragraphs 3.1.2 (Test Specimen Preparation), 3.1.3 (Instrumentation Setup) and 3.1.4 (Baseline Functional Tests).

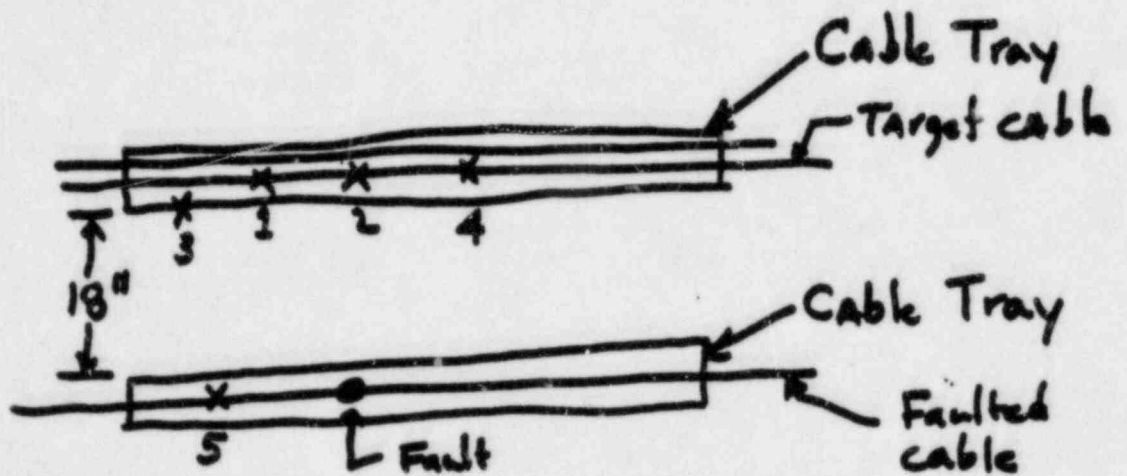
FIGURE 1 - TEST SETUP FOR TRAY-TO-TRAY SEPARATION



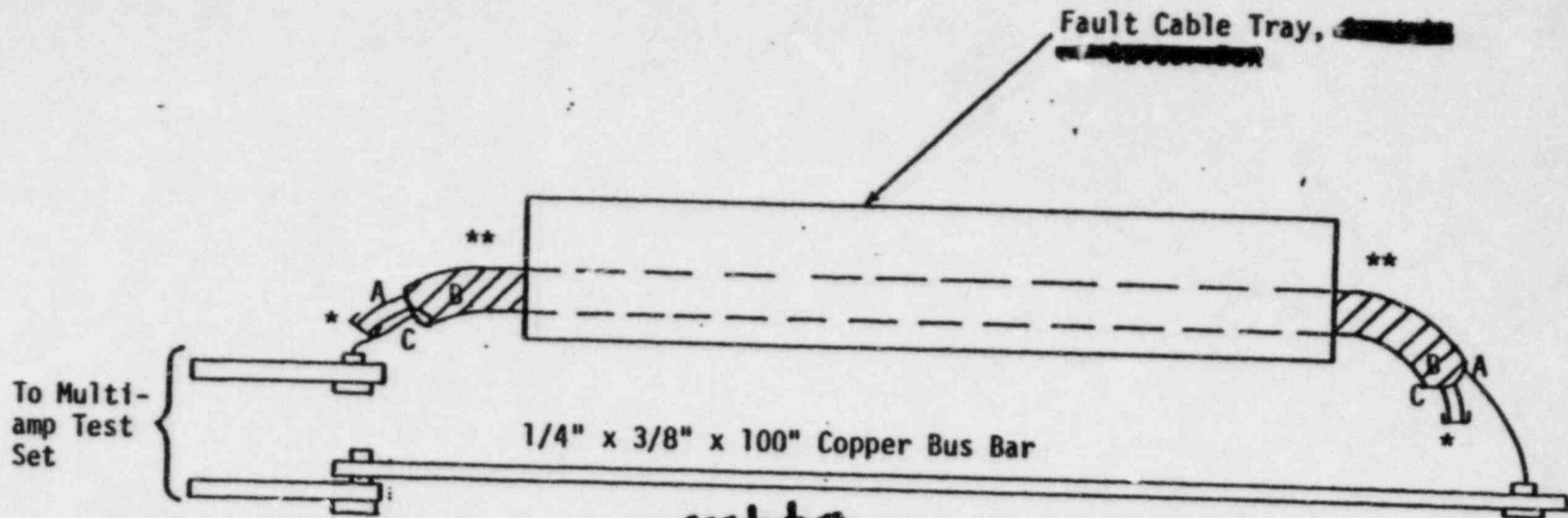
- Denotes Target Cable Location
- ⊗ Denotes Fault Cable Location

Note 1 - Target cable will be energized during the faulted test condition

Figure 2 - Thermocouple Locations



X - Type "k" thermocouple mounted on the target cable jacket and cable adjacent to the target cable and the cable rungs.



* The three ~~phases~~ ^{conductors} of the fault cable shall be connected in series.

** The fault cable shall be wrapped with a single layer of siltemp wide tape No. 65 from the edge of the test area to the bus bar.

FIGURE 3. TYPICAL FAULT CABLE CONNECTIONS

DSER Open Item No. 253 (DSER Section 8.3.3.1.4)**COMMITMENT TO PROTECT ALL CLASS 1E EQUIPMENT FROM EXTERNAL HAZARDS VERSUS ONLY CLASS 1E EQUIPMENT IN ONE DIVISION**

In Section 8.1.14.3.3 of the PSAR, it is stated that where neither compartmentalization nor the construction of barriers is possible (to protect Class 1E circuits or equipment from hazards such as pipe break, flooding, missiles, and fires) an analysis is performed to demonstrate that none of the hazards disables redundant equipment, conduits, or trays. Based on this statement, the staff concludes that at least one of the redundant Class 1E systems and components at Hope Creek need not be protected from external hazards. The design, thus, does not meet the protection requirement of Criteria 2 and 4, nor the single failure requirement of Criterion 17 of Appendix A to 10 CFR 50. Justification for non-compliance with Criteria 2, 4, and 17 will be pursued with the applicant.

RESPONSE

The response to Question 430.38, and Section 8.1.4.14.3.3, have been revised to provide a discussion of protection of Class 1E systems and components against external hazards.

HCGS FSAR

QUESTION 430.38 (SECTION 8.3.1 and 8.3.2)

In Sections 8.1.4.14.3.3 of the FSAR you state that where neither compartmentalization nor the construction of barriers is possible (to protect Class 1E circuits or equipment from hazards such as pipe break, flooding, missiles, and fires) an analysis is performed to demonstrate that none of the hazards disables redundant equipment, conduits, or trays. Based on this statement it appears that at least one of the redundant Class 1E systems and components at Hope Creek may not be protected from external hazards. The design, thus, does not meet the protection requirement of Criteria 2 and 4 nor the single failure requirement of Criterion 17 of Appendix A to 10CFR50. Justify non-compliance with Criteria 2, 4, and 17.

RESPONSE

Section 3.5 indicates that Class 1E equipment is protected from postulated missiles by use of plant arrangement or suitable physical barriers such that a single missile cannot simultaneously damage a critical system component and its backup system. This is accomplished by locating redundant systems in different areas of the plant or separation by missile-proof walls. There are no Class 1E electrical equipment and components that can be damaged by missiles generated externally to the plant.

Section 3.6.1.1 indicates that, as part of the design basis for protection against dynamic effects associated with the postulated rupture of piping, a single active component failure is assumed to occur in systems used to mitigate the consequences of the postulated piping rupture and to shut down the reactor. A thorough review of the plant using the design bases provided in Section 3.6.1.1 was conducted and no cases were found where the piping failure would prevent safe shutdown (Reference: Question/Response 410.23).

Section 8.1.4.14.3.3 has been revised to *INCLUDE THE FOLLOWING STATEMENTS:*
INSERT "A"

INSERT A (Question 430.38/Item 34)

A separation analysis has been performed which addresses protection of all Class 1E electrical equipment from external hazards generated by a non-safety system or component. It has been concluded that in certain areas, a break in a fire protection system could affect some Class 1E electrical equipment. HCGS has committed to protect all Class 1E equipment from this hazard. In addition, the flooding hazard in the main steam tunnel which results from a feedwater line break could cause the failure of some Class 1E motor operated valves and some Class 1E temperature elements (RTDs). These devices are protected from short circuit damage by Class 1E overcurrent protective devices located in hazard free areas. These primary overcurrent protective devices are backed up by additional Class 1E overcurrent protective devices also located in hazard free areas. HCGS will complete an analysis to verify that after the back-up isolation device clears the flooded devices, the plant can be safely shutdown with the worst case single failure in a redundant train. If this is not the case flood protection will be provided. Other external hazards were also analyzed and it is concluded that no other Class 1E electrical equipment can be damaged by external hazards originating from a non-safety system or component.

HCGS FSAR

~~1/84~~

monitoring cables, boxes also shall not be considered in determining the required separation.

- b. In case of open ventilated trays, redundant trays are separated by 3 feet horizontally and 5 feet vertically, respectively. If the redundant trays cannot be separated by the distances specified above, solid covers for trays are provided as designated in Section 6.1.4 of IEEE 384-1981.

Separation requirements between Class 1E and non-Class 1E circuits are the same as those required between redundant circuits.

8.1.4.14.3.3 Hazardous Areas

These are areas where one or more of hazards such as pipe break, flooding, missile, and fire can be postulated.

Routing of redundant Class 1E circuits or the locating of redundant Class 1E equipment in hazardous areas is avoided. The preferred separation between redundant Class 1E circuits or equipment in these areas is by a wall, floor, or barrier that is structurally adequate to shield redundant raceways from potential hazards in the area.

Where neither compartmentalization nor the construction of barriers is possible, an analysis is performed to demonstrate that no missile, fire, jet stream impingement, or pipe whip hazard disables redundant equipment, conduits, or trays. In no case, regardless of the distance of physical separation, are redundant equipment cable trays located in the direct line of sight of the same potential missile source.

The plant design for fire protection separation of electrical cables and equipment is reviewed against 10 CFR 50, Appendix R, which is discussed in Section 9.5.1.

INSERT "A"

INSERT A INTO SECTION 8.1.4.14.3.3

A separation analysis has been performed which addresses protection of all Class 1E electrical equipment from external hazards generated by a non-safety system or component. It has been concluded that in certain areas, a break in a fire protection system could affect some Class 1E electrical equipment. HCGS has committed to protect all Class 1E equipment from this hazard. In addition, the flooding hazard in the main steam tunnel which results from a feedwater line break could cause the failure of some Class 1E motor operated valves and some Class 1E temperature elements (RTDs). These devices are protected from short circuit damage by Class 1E overcurrent protective devices located in hazard free areas. These primary overcurrent protective devices are backed up by additional Class 1E overcurrent protective devices also located in hazard free areas. HCGS will complete an analysis to verify that after the back-up isolation device clears the flooded devices, the plant can be safely shutdown with the worst case single failure in a redundant train. If this is not the case flood protection will be provided. Other external hazards were also analyzed and it is concluded that no other Class 1E electrical equipment can be damaged by external hazards originating from a non-safety system or component.

QUESTION 421.10 (SECTION 7.1 & 7.2)

The staff believes that the physical separation provided in the design of the RPS cabinets may not satisfy the requirements of Regulatory Guid 1.75 or the plant separation criteria and is, therefore, unacceptable. As an example, it has been noted on similar plants that the cabinet lighting and power circuits (which are not treated as associated circuits) becomes associated with Class 1E circuits inside the RPS cabinets. Section 8.1.4.14 includes a brief discussion on the physical separation provided within panels, instrument racks and control boards for the instrumentation and control circuits of different divisions. Review the design of all Class 1E cabinets for separation between non-Class 1E and Class 1E circuits. Provide the staff with a listing of the cabinets which were reviewed and describe in detail how physical separation is maintained within the panels, racks and boards for those cases where a 6 inch air space cannot be maintained. Provide a summary of the analysis and testing performed to support this lesser separation. Include in the discussion the separation provided for associated circuits, internal wiring identification and the use of common terminations.

RESPONSE

The HCGS RPS cabinets (10C609, 10C611, 10C622 and 10C623) meet the requirements of IEEE Standard 384 as modified and endorsed by Regulatory Guide 1.75, as stated in Section 1.8.1.75. Cabinet lighting and receptacle power circuits are physically separated from RPS circuits by being routed in metallic conduit or by structural steel barriers.

Physical separation between non-Class 1E and Class 1E instrumentation and control circuits is provided in panels, instrument racks and control boards in accordance with IEEE Standard 384, as modified and endorsed by Regulatory Guide 1.75 as stated in Section 1.8.1.75. The following is a listing of Class 1E panels, instrument racks and control boards reviewed for the separation requirements of IEEE Standard 384:

Panels

1AC200	H ₂ /O ₂ Analyzer A Panel
1BC200	H ₂ /O ₂ Analyzer B Panel
1CC200	H ₂ /O ₂ Analyzer Heat Trace Panel
1DC200	H ₂ /O ₂ Analyzer Heat Trace Panel
1AC201	SACS Control Panel A
1BC201	SACS Control Panel B
1CC201	SACS Control Panel C
1DC201	SACS Control Panel D
1OC202	RACS Heat Exchanger and Pumps Control Panel

1AC213 Instrument Gas Compressor A Control Panel
 1BC213 Instrument Gas Compressor B Control Panel
 1AC215 H₂ Recombiner A Power Distribution Panel
 1BC215 H₂ Recombiner B Power Distribution Panel
 1AC281 Reactor Building Unit Cooler Control Panel
 1BC281 Reactor Building Unit Cooler Control Panel
 1CC281 Reactor Building Unit Cooler Control Panel
 1DC281 Reactor Building Unit Cooler Control Panel
 1AC285 Reactor Building FRVS Control Panel
 1BC285 Reactor Building FRVS Control Panel
 1CC285 Reactor Building FRVS Control Panel
 1DC285 Reactor Building FRVS Control Panel
 1OC286 Reactor Building Equipment Lock Ventilation
 1OC399 Remote Shutdown Panel
 1OC401 Diesel Generator Area Battery Room Panel
 1OC402 Diesel Generator Area Battery Room Panel
 1AC420 Diesel Generator A Exciter Panel
 1BC420 Diesel Generator B Exciter Panel
 1CC420 Diesel Generator C Exciter Panel
 1DC420 Diesel Generator D Exciter Panel
 1AC421 Diesel Generator A Local Engine Control Panel
 1BC421 Diesel Generator B Local Engine Control Panel
 1CC421 Diesel Generator C Local Engine Control Panel
 1DC421 Diesel Generator D Local Engine Control Panel
 1AC422 Diesel Generator A Remote Control Generator Panel
 1BC422 Diesel Generator B Remote Control Generator Panel
 1CC422 Diesel Generator C Remote Control Generator Panel
 1DC422 Diesel Generator D Remote Control Generator Panel
 1AC423 Diesel Generator A Remote Engine Control Panel
 1BC423 Diesel Generator B Remote Engine Control Panel
 1CC423 Diesel Generator C Remote Engine Control Panel
 1DC423 Diesel Generator D Remote Engine Control Panel
 1AC428 Diesel Generator A Load Sequencer Panel
 1BC428 Diesel Generator B Load Sequencer Panel
 1CC428 Diesel Generator C Load Sequencer Panel
 1DC428 Diesel Generator D Load Sequencer Panel
 1AC482 Electric Heater Control Panel 1AVH403
 1BC482 Electric Heater Control Panel 1BVH403
 1AC483 Diesel Area HVAC Control Panel
 1BC483 Diesel Area HVAC Control Panel
 1CC483 Diesel Area HVAC Control Panel
 1DC483 Diesel Area HVAC Control Panel
 1AC485 Control Area HVAC Control Panel
 1BC485 Control Area HVAC Control Panel
 1AC486 Diesel Area Panel Room Supply System
 1BC486 Diesel Area Panel Room Supply System
 1AC487 Water Chiller Panel
 1BC487 Water Chiller Panel
 1AC488 Chiller AK403 Power Panel
 1BC488 Chiller BK403 Power Panel
 1AC489 Electric Heater Control Panel 1AVH407
 1BC489 Electric Heater Control Panel 1BVH407

1AC490	Water Chiller A Control Panel
1BC490	Water Chiller B Control Panel
1AC491	Water Chiller A Power Panel
1BC491	Water Chiller B Power Panel
1AC492	Electric Heater Control Panel
1BC492	Electric Heater Control Panel
1AC493	Control Panel - Auxiliary Building Diesel
1AC494	Control Panel - Auxiliary Building Diesel
1AC495	Control Panel - Auxiliary Building Diesel
1BC495	Control Panel - Auxiliary Building Diesel
1CC495	Control Panel - Auxiliary Building Diesel
1DC495	Control Panel - Auxiliary Building Diesel
1AC515	Traveling Screen Control Panel
1BC515	Traveling Screen Control Panel
1CC515	Traveling Screen Control Panel
1DC515	Traveling Screen Control Panel
1AC516	Service Water Pump Panel
1BC516	Service Water Pump Panel
1CC516	Service Water Pump Panel
1DC516	Service Water Pump Panel
1AC581	Intake Structure HVAC Control Panel
1BC581	Intake Structure HVAC Control Panel
1CC581	Intake Structure HVAC Control Panel
1DC581	Intake Structure HVAC Control Panel
1OC601	RRCS Division 1 Panel
1OC602	RRCS Division 2 Panel
1OC604	Class 1E Radiation Monitoring Instrumentation Cabinet
1OC617	Division 1 RHR and Core Spray Relay Vertical Board
1OC618	Division 2 RHR and Core Spray Relay Vertical Board
1OC620	HPCI Relay Vertical Board
1OC621	RCIC Relay Vertical Board
1OC622	Inboard Isolation Valve Relay Vertical Board
1OC623	Outboard Isolation Valve Relay Vertical Board
1OC628	ADS Division 2 Relay Vertical Board
1OC631	ADS Division 4 Relay Vertical Board
1AC633	Post LOCA H ₂ Recombiner A Control Cabinet
1BC633	Post LOCA H ₂ Recombiner B Control Cabinet
1OC640	Division 4 RHR and Core Spray Relay Vertical Board
1OC641	Division 3 RHR and Core Spray Relay Vertical Board
1OC650	Main Control Room Vertical Board
1OC651	Unit Operators Console
1AC652	1E Solid State Logic Cabinet Channel A
1BC652	1E Solid State Logic Cabinet Channel B
1CC652	1E Solid State Logic Cabinet Channel C
1DC652	1E Solid State Logic Cabinet Channel D
1AC655	1E Analog Logic Cabinet Channel A
1BC655	1E Analog Logic Cabinet Channel B
1CC655	1E Analog Logic Cabinet Channel C
1DC655	1E Analog Logic Cabinet Channel D
1AC657	1E Digital Termination Cabinet Channel A
1BC657	1E Digital Termination Cabinet Channel B
1CC657	1E Digital Termination Cabinet Channel C

1DC657	1E Digital Termination Cabinet Channel D
1AC680	1E Electrical Auxiliary Cabinet Channel A
1BC680	1E Electrical Auxiliary Cabinet Channel B
1CC680	1E Electrical Auxiliary Cabinet Channel C
1DC680	1E Electrical Auxiliary Cabinet Channel D

Instrument Racks

1OC002	Reactor Water Clean-up Rack
1OC004	Reactor Vessel Level and Pressure A Rack
1OC005	Reactor Vessel Level and Pressure C Rack
1OC009	Jet Pump Rack A
1OC014	HPCI A/HPCI Leak Detection A Rack
1OC015	Main Steam C/D and Recirc A Flow Rack
1OC018	RHR A and ADS Rack
1OC021	RHR B and ADS Rack
1OC025	Main Steam C/D and Recirc A Flow Rack
1OC026	Reactor Vessel Level and Pressure D Rack
1OC027	Reactor Vessel Level and Pressure B Rack
1OC037	RCIC D/RCIC Leak Detection D Rack
1OC041	Main Steam A/B and Recirc B Flow Rack
1OC042	Main Steam A/B and Recirc B Flow Rack
1OC069	RHR D and ADS Rack
1OC208A	RCIC/Reactor Cooling
1OC211	RCIC Pump
1OC212	RCIC Pump

Instrument racks are separated into channels. No two redundant piped or tubed safety-related instruments are located on the same rack.

Where a 6-inch air space cannot be maintained between instrumentation and control circuits of different channels (both Class 1E to Class 1E and Class 1E to non-Class 1E), barriers are provided in accordance with IEEE Standard 384. These barriers are metallic conduit, structural steel barriers, or non-metallic wrap (Havey Industries Siltemp Sleeving Type S or Siltemp Woven Tape Type WT65). The metallic conduit and structural steel barriers are noncombustible materials. The nonmetallic wrap (Siltemp) was successfully tested for use as an isolation barrier (reference Wyle Laboratories Test Report Number 56669).

For certain types of isolation devices, barriers of the type noted above are not feasible. For these cases, requirements of Section 7.2.2.1 of IEEE Standard 384 are met, as follows:

"The separation of the wiring at the input and output terminals of the isolation device may be less than 6 inches (0.15 m) as required in 6.6.2 provided that it is not less than the distance between input and output terminals.

Add Insert A

At HCGS, three isolation devices are used which do not satisfy the 6 inch air space requirement and, by design, barriers of the type identified above are not feasible. The 6 inch air space requirement is maintained for wiring associated with these devices except at the device itself where the separation is maintained not less than the physical distance between the input and output terminals of the isolation device. These devices are:

- a) TEC analog isolator, model 156 - provides class 1E to non-class 1E isolation for low level analog inputs to the plant computer.
- b) Struthers Dunn type 219 relay - provides class 1E to non-class 1E isolation for inputs to the plant annunciator (125 vdc contact interrogation voltage is used by the plant annunciator),
- c) Allen Bradley model 700-200A12P relay - provides class 1E to non-class 1E isolation for inputs to the plant annunciator.

These devices are fully qualified for their application as described in part (d) of the response to question 47J.12

Minimum separation requirements do not apply for wiring and components within the isolation device; however, separation shall be provided wherever practicable.

Testing, in accordance with IEEE Standard 472 (Surge Withstand Capability) will be performed to ensure that the Class 1E inputs to the isolation devices are not affected by short-circuit failures, ground faults or voltage surges on the output side of the isolation devices.

Single Failure

were
~~The only analysis that will be performed to support air spaces less than 6 inches, since the requirements of IEEE Standard 384 are satisfied, is for the Neutron Monitoring System Panel (10C608) and the Process Radiation Monitoring System Panels (10C635 and 10C636). This report was submitted under separate cover (K.L.M.H. to A. Schwencer dated September 7, 1984.)~~

No associated circuits have been identified in the non-NSSS panels, instrument racks, or control boards. Internal wiring identification is done using color coded insulation or insulation marked with color coded tape. For panel sections of one channel only, internal wiring identification may not be done. Where common terminations are used, the requirements of IEEE Standard 384 are satisfied as stated above.

Electrical equipment and wiring for the reactor protection system (RPS), the nuclear steam supply shutoff systems (NSSSS) and the engineered safeguards subsystems (ESS) are segregated into separate divisions designated I and II, etc., such that no single credible event is capable of disabling sufficient equipment to prevent reactor shutdown, removal of decay heat from the core, or closure of the NSSSS valves in the event of a design basis accident.

No single control panel section (or local panel section or instrument rack) includes wiring essential to the protective function of two systems that are backups for each other (Division I and Division II) except as allowed below:

- a. If two panels containing circuits of different separation divisions are less than 3 feet apart, there shall be a steel barrier between the two panels. Panel ends closed by steel end plates are considered to be acceptable barriers provided that terminal boards and wireways are spaced a minimum of one inch from the end plate.
- b. Floor-to-panel fire proof barriers must be provided between adjacent panels having closed ends.
- c. Penetration of separation barriers within a subdivided panel is permitted, provided that such penetrations are sealed or otherwise treated so that an electrical fire could not

reasonably propagate from one section to the other and destroy the protective function.

- d. Where, for operational reasons, locating manual control switches on separate panels is considered to be prohibitively (or unduly) restrictive to normal functioning of equipment, then the switches may be located on the same panel provided no single event in the panel can defeat the automatic operation of the equipment.

With the exception of panels 10C608, 10C635 and 10C636, internal wiring of the NSSS panels and racks has color-coded insulation. Associated circuits are treated within a panel or rack in the same manner as the essential circuits. Where common terminations are used, the requirements of IEEE Standard 384 are satisfied.

Electrical protection assemblies have been added between the power range NMS panel (10C608) and its two 120V ac UPS power feeders as described in revised Section 7.6.1.4.2.

CHAPTER 7

FIGURES (Cont)

<u>Figure No.</u>	<u>Title</u>
7.6-2	NMS IED
7.6-3	Detector Drive System
7.6-4	Functional Block Diagram - IRM Channel
7.6-5	APRM Circuit Arrangement - Reactor Protection System Input
7.6-6	Power Range Monitor Detector Assembly Location
7.6-7	NMS FCD
7.6-8	Redundant Reactivity Control System Initiation Logic
7.6-9	HCGS Redundant Reactivity Control System ARI Valves
7.6-10	Deleted
7.6-11	Deleted
7.7-1	CRD FCD
7.7-2	RMCS Block Diagram
7.7-3	Reactor Manual Control System Operation
7.7-4	Reactor Manual Control Self-Test Provisions
7.7-5	Eleven-Wire Position Probe
7.7-6	Recirculation Flow Control
7.7-7	Feedwater Control System
7.7-8	Simplified Diagram Turbine Pressure & Speed Load Control Requirements
7.7-9	Deleted

Electrical Protection Assemblies (EPAs)
The Power Range Neutron Monitoring System

coaxial cable. The amplifier is a linear current amplifier whose voltage output is proportional to the current input and therefore proportional to the magnitude of the neutron flux. Low level output signals are provided that are suitable as an input to the computer, recorders, etc. The output of each LPRM amplifier is isolated to prevent interference of the signal by inadvertent grounding or application of stray voltage at the signal terminal point.

Power for the LPRM is supplied ^{from} ~~by~~ two non-Class 1E ^(see Figure 8.3-11, Skt) uninterruptible power sources. Approximately half of the LPRMs are supplied from each bus. Each LPRM amplifier has a separate power supply in the main control room, which furnishes the detector polarizing potential. The LPRM amplifier cards are mounted into pages in the NMS cabinet, and each page is supplied operating voltages from a separate low voltage power supply.

- INSERT A -

The trip circuits for the LPRM provide signals to actuate lights and annunciators. Table 7.6-3 lists the LPRM trips.

Each LPRM may be individually bypassed via a switch on the LPRM amplifier card. Placing an LPRM in "bypass" sends a signal to the assigned APRM, electronically causing it to adjust its averaging amplifier's gain to allow for one less LPRM input. In this way, each APRM can continue to produce an accurate signal representing average core power even if some of the assigned LPRMs fail during operation. If the number of functional assigned LPRMs drops to 50% of the normal number, the APRM automatically goes inoperative and a half scram (one trip logic channel deenergized), rod block, and appropriate annunciation are generated. Administrative controls ensure that a minimum number of LPRMs at each level (A, B, C, and D) in the core are maintained or the APRM is declared inoperative and manually placed in the tripped state.

In addition to the signals supplied to the APRMs, the LPRMs also send flux signals to the rod block monitor (RBM). When a central control rod is selected for movement, the output signals from the amplifiers associated with the nearest 16 LPRM detectors are displayed on the main control room vertical board meters and sent to the RBM. The four LPRM detector signals from each of the four detector assemblies are displayed on 16 separate meters. The operator can readily obtain readings from all the LPRM detectors by selecting the control rods in order. These signals from the

INSERT A

8.3-14 and

Electrical protection assemblies (EPAs) identical to those used in the reactor protection system (RPS) (described in Section 8.3.1.5.4) are installed between the power range NMS and the two 120V AC feeders from the UPS power sources (see Figures 7.6-11). The EPAs ensure that the power range NMS never operates under degraded bus voltage or frequency conditions (undervoltage, overvoltage, underfrequency). The power range NMS panel (10C608) was analyzed with this power supply configuration to ensure that no single failure of the power range NMS could inhibit the proper operation of the reactor protection system or any other safety system required for the safe operation of the plant. The interfaces between the power range NMS and the RPS have adequate provisions for separation. The RPS cabling external to the NMS panel conforms to the separation guidelines of Regulatory Guide 1.75, which the RPS must satisfy. Within the panel, where the cable and wiring runs to the different RPS divisions do not conform to the Regulatory Guide 1.75 separation criteria, fire-resistant "Sil-Temp" tape is wrapped around the cables and wires. This eliminates the possibility of fault propagation between the RPS divisions. In accordance with paragraph 5.6.2 of IEEE Standard 384, this tape has been demonstrated to be acceptable.

HCGS FSAR

four LPRM strings (16 detectors) surrounding the selected rod are used in the RBM to provide protection against local fuel overpower conditions.

7.6.1.4.3 Average Power Range Monitor Subsystem

The APRM subsystem monitors neutron flux from approximately 1% to above 100% power. There are six APRM channels, each receiving core flux level signals from 21 or 22 LPRM detectors. Each APRM channel averages the 21 or 22 separate neutron flux signals from the LPRMs assigned to it, and generates a signal representing core average power.

This signal is used to drive a local meter and a remote recorder located on the main control room vertical board. It is also applied to a trip unit to provide APRM downscale, inoperative and upscale alarms, and upscale reactor trip signals for use in the RPS or RMCS.

Refer to Section 7.2.1.1 for a description of the APRM inputs to the RPS, and Figure 7.6-5 for the RPS trip circuit input arrangement. APRM trips are summarized in Table 7.6-2.

The APRM scram units are set for a reactor scram at 15% core power in "refuel" and "startup" modes. When the mode switch is in "run," the APRM trip reference signal is provided by a signal that varies with recirculation flow. This provides a power following reactor scram setpoint. As power increases, the reactor scram setpoint also increases up to a fixed setpoint above 100%. Reactor power is always bounded with a reactor scram, yet the change in power required to generate the reactor scram does not vary greatly with the operating power level.

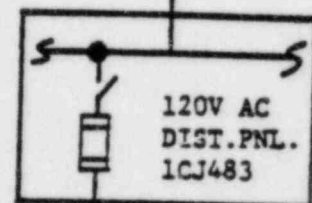
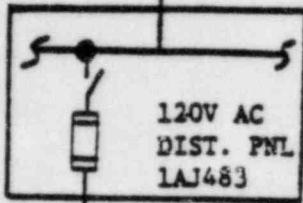
Provision is made for manually bypassing one APRM channel at a time. Calibration or maintenance can be performed without tripping the RPS. Removal of an APRM channel from service without bypassing it, by unplugging a card, by taking the APRM function switch out of "operate," or by having too few assigned LPRM signals to the APRM, will result in an APRM "inoperative" condition which causes a half scram, a rod block, and annunciation

The APRM channels receive power from ^{the same} non-Class 1E uninterruptible power sources. Power for each APRM trip unit is supplied from

that supply the LPRMs (see Section 7.6.1.4.2).
7.6-11

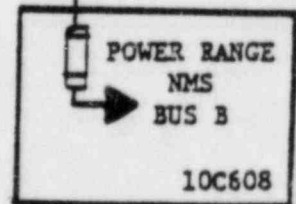
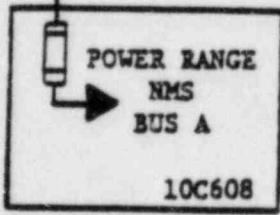
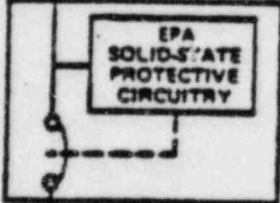
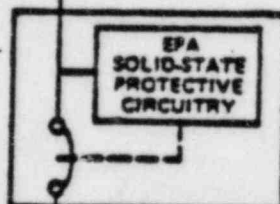
FROM AC
POWER SUPPLY
LAD483
(See Fig. 8.3-11, sht. 3)

FROM AC
POWER SUPPLY
1CD483
(See Fig. 8.3-11, sht. 3)



NON-CLASS 1E
LPS SYSTEM

CLASS 1E
NON-ESSENTIAL POWER
NON-DIVISIONAL
SAFETY RELATED SYSTEM

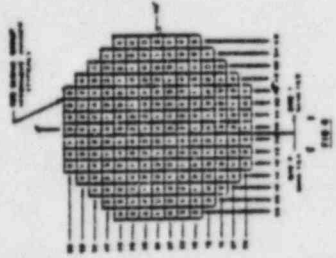
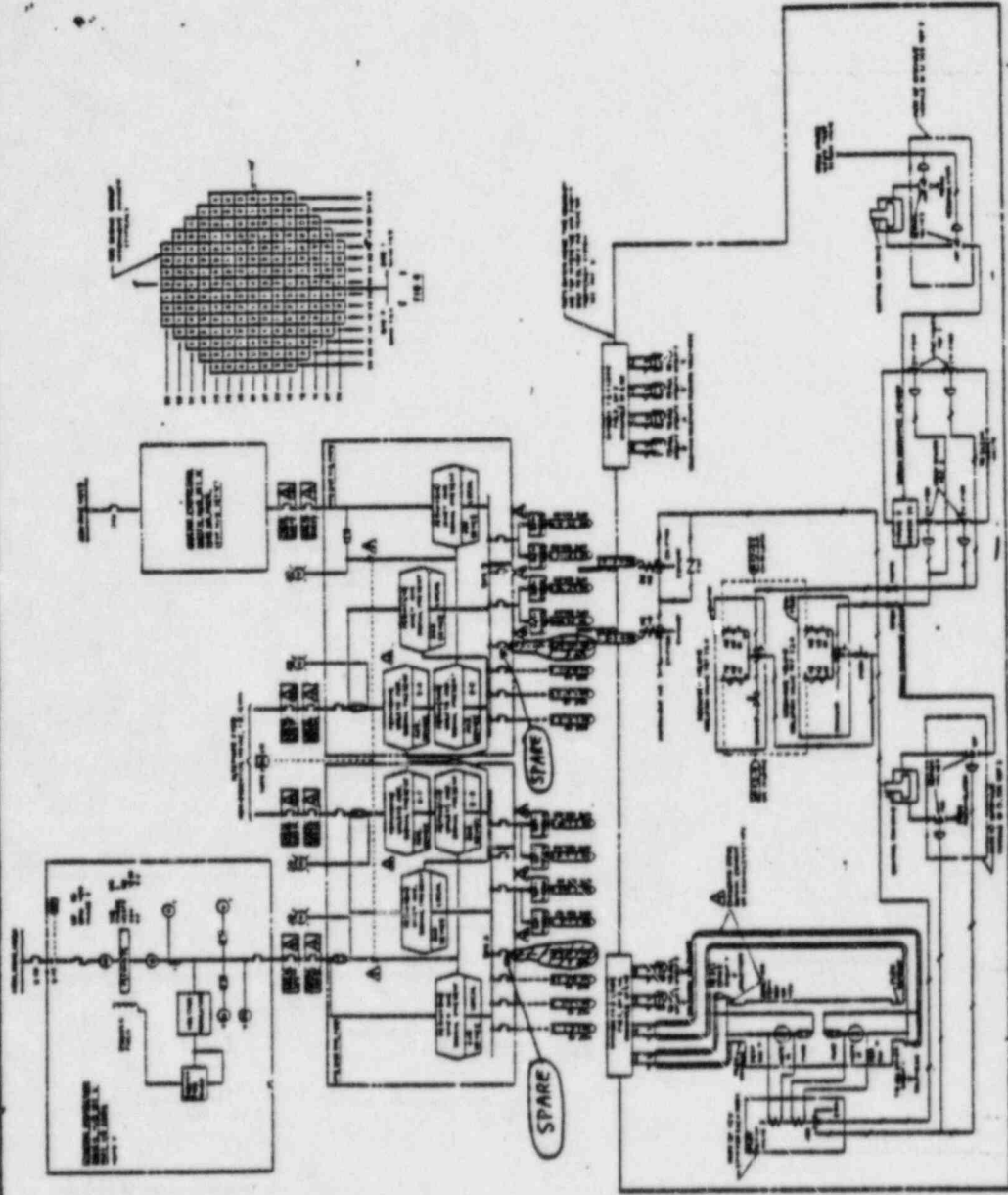


HOPE CREEK
GENERATING STATION
FINAL SAFETY ANALYSIS REPORT

ELECTRICAL PROTECTION ASSEMBLIES
(EPAs) IN THE POWER RANGE
NEUTRON MONITORING SYSTEM

FIGURE 7.6-11 Amendment

REV. 1 13/26

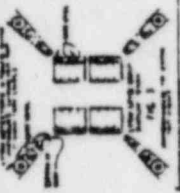
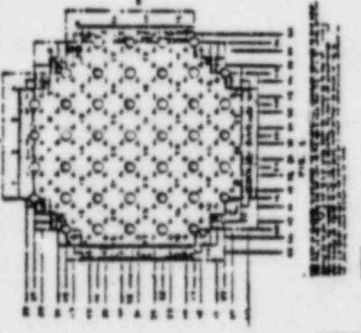
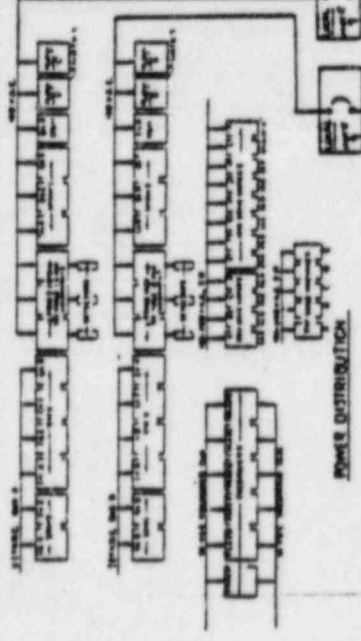
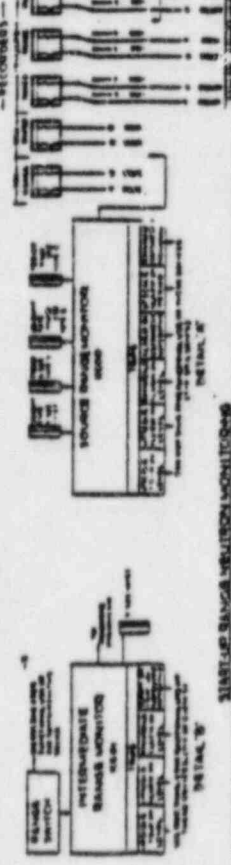
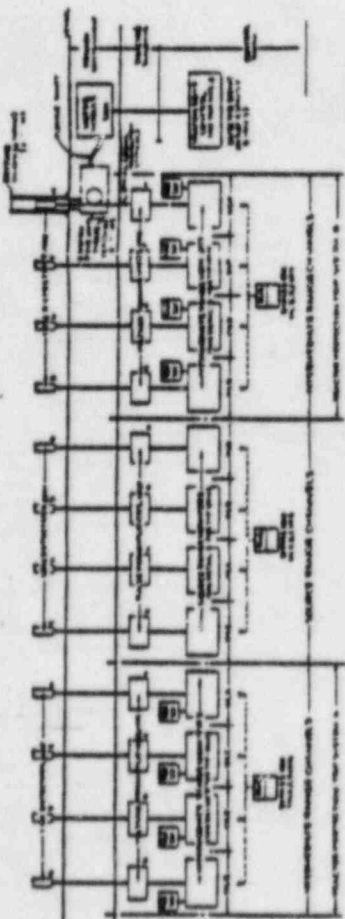
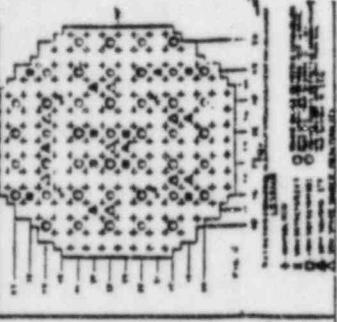


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 HOPE CREEK
 GENERATING STATION
 FINAL SAFETY ANALYSIS REPORT

REACTOR PROTECTION SYSTEM

SHEET 7
 OF 8
 Attachment 11.000

- 1. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERCURRENTS AND SHORT CIRCUITS.
- 2. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERVOLTAGE AND UNDERVOLTAGE.
- 3. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERHEATING.
- 4. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERSPEED.
- 5. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERFREQUENCY.
- 6. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM UNDERFREQUENCY.
- 7. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM UNBALANCED PHASES.
- 8. THE PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM LOSS OF SYNCHRONISM.
- 9. CLASS II PROTECTION, PROTECTION ASSEMBLY SHALL BE DESIGNED TO PROTECT THE GENERATING STATION FROM OVERCURRENTS AND SHORT CIRCUITS.



9. SINGLE LINE ELECTRICAL DRAWING

701815AC

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GENERATING STATION
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FIGURE 753
SHEET 1 OF 1

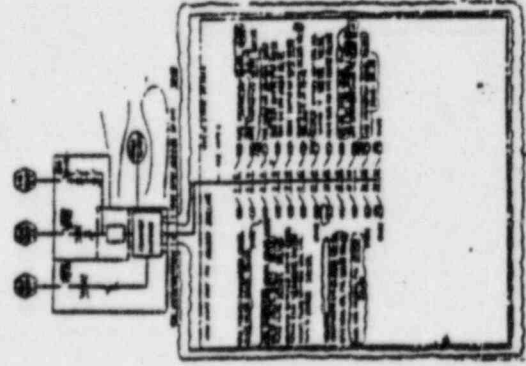
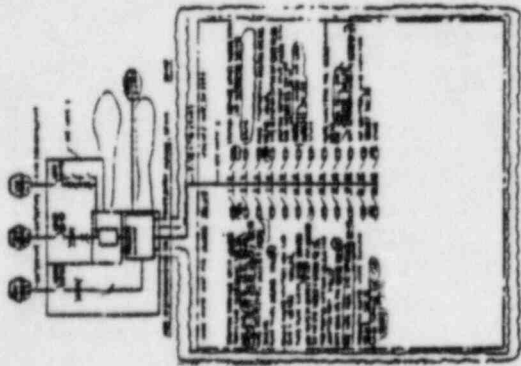
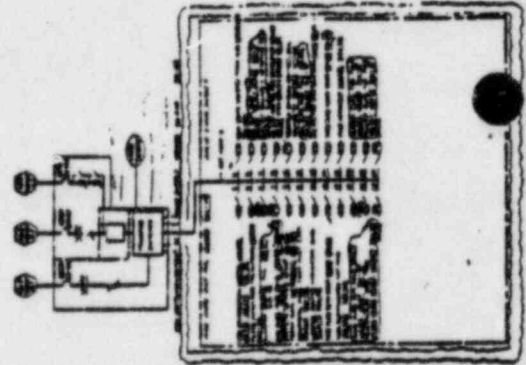
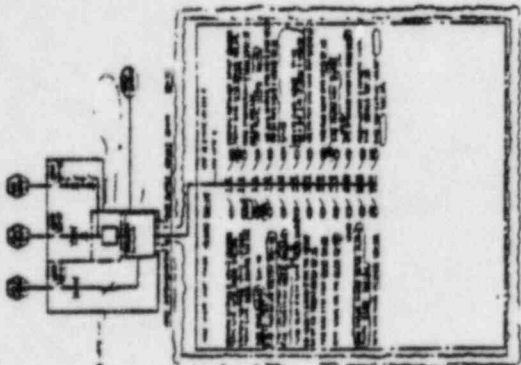
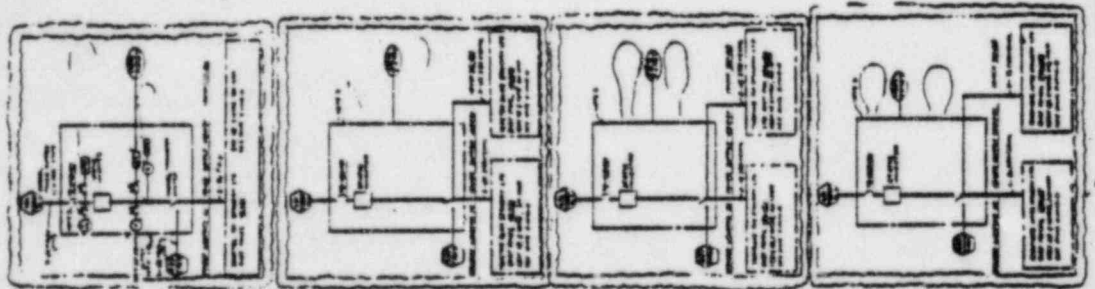
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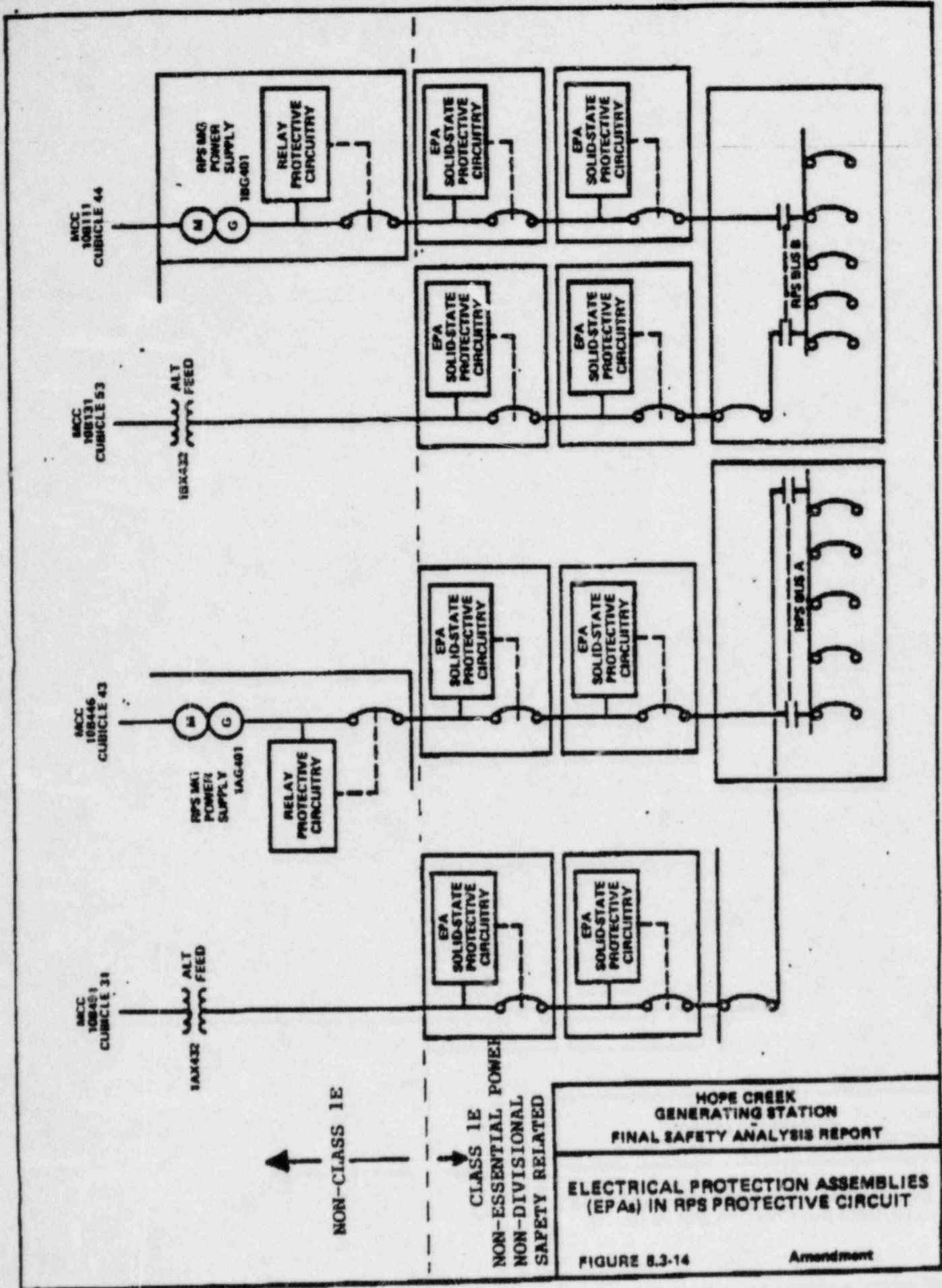
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REVISIONS:
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Rev 5
 8-0112.1
 HOWE GREEN
 OPERATING STATION
 FINAL SAFETY ANALYSIS REPORT
 SINGLE LINE METER &
 RELAY DIAGRAM 120 V AC
 INSTRUMENTATION & MISC. SYSTEMS
 FIGURE 8.3
 SHEET 3 OF 4



HOPE CREEK
GENERATING STATION
FINAL SAFETY ANALYSIS REPORT

**ELECTRICAL PROTECTION ASSEMBLIES
(EPAs) IN RPS PROTECTIVE CIRCUIT**

FIGURE 8.3-14 Amendment

To: *[Handwritten]*
From: *Dean James*
Date: *9/4/84*

REV. 1
17/26

SINGLE-FAILURE ANALYSIS FOR THE NEUTRON MONITORING
AND PROCESS RADIATION MONITORING SYSTEMS

HOPE CREEK GENERATION STATION
PUBLIC SERVICE ELECTRIC AND GAS

AUGUST 1984

DBJ:rm/A08311*-1
8/31/84

REV. 1
18/24

SINGLE-FAILURE ANALYSIS FOR THE NEUTRON MONITORING
AND PROCESS RADIATION MONITORING SYSTEMS

Some of the safety-related portions of the neutron monitoring system (NMS) and the process radiation monitoring system (PRMS) for the Hope Creek Generating Station (HCGS) are not designed and built to conform to the literal separation guidelines of Regulatory Guide 1.75. This analysis establishes the acceptability of these portions of the NMS and PRMS by demonstrating that they meet the single-failure criteria of IEEE Standard 279, which requires that the consequences of any single, design-basis failure event in a safety-related portion of the systems be tolerated without the loss of any safety function.

Portions of NMS and PRMS External to the NMS and PRMS Panels

See Figure 7.1-1 of the HCGS FSAR for the separations concept of the reactor protection system (RPS) and its relationship to the NMS.

Under the reactor vessel, cables from the individual, local power-range monitor (LPRM) detectors and from the individual intermediate-range monitor (IRM) detectors are grouped to correspond with the RPS trip channel designations. These cable groupings are run in conduit from the vessel pedestal area to the NMS and PRMS panels.

The radiation monitors on the main-steam lines are physically separated. The cabling from the individual sensors to the panels is run in separate metallic conduit.

Cabling from the NMS and PRMS panels to the RPS cabinets is also run in metallic conduit, providing electrical isolation and physical separation of the NMS and PRMS cabling associated with the RPS system.

It is concluded that the safety-related portions of the NMS and PRMS external to the NMS and PRMS panels adequately conform to the separation criteria of Regulatory Guide 1.75.

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8/31/84

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19/26

Single Failure in the NMS and PRMS Panels

Figures 1 and 2 depict schematically the physical arrangement of the equipment in NMS and PRMS panels H11-P608, H11-P635, and H11-P636. The designs of these panels are similar to those of NMS and PRMS panels used in several BWR plants accepted by the NRC.

The layouts of the panels and the assignments of specific RPS trip logic circuitry provides the designs with the required tolerance to postulated single failures. The worst-case single failure would be the loss of any combination of trip signals within one bay of any panel. However, the loss of any bay and its associated wiring would not prevent a scram. A valid scram signal would be transmitted via the other bays because of the redundancy in the panel designs and the interconnections to the RPS (see Figure 7.1-1 of the HCGS FSAR).

The eight IRM channels and the six average power range monitor (APRM) channels are electrically isolated and physically separated. Within the IRM and APRM modules, analog outputs are derived for use with control room meters, recorders, and the process computer. Electrical isolation at the interfaces would prevent any single failure from influencing the trip unit output.

Physical Separation in the NMS and PRMS Panels

Adequate separation in the NMS and PRMS panels is achieved by using the bay design depicted in Figures 1 and 2, by using relay coil-to-contact as sufficient separation/isolation, and by separation between divisions/channels/wiring. Where conformation with Regulatory Guide 1.75 separation criteria cannot be achieved, the best-effort design is used.

Circuits that provide inputs to different divisions of the RPS are physically separated by airgaps or by the walls between the bays. Within the panels, where the cable and wiring runs to the different RPS divisions do not conform to the Regulatory Guide 1.75 separation criteria, fire-resistant "Sil-Temp" tape is wrapped around the cables and wires. This eliminates the possibility of fault propagation between the RPS divisions. In accordance with paragraph 5.6 of IEEE Standard 384, this tape has been demonstrated to be acceptable.

Separated ducts are provided in the panel for the incoming circuit wires from the sensors that belong to UPS Bus 1 or Bus 2.

As shown in Figure 3, the isolation/separation precludes the propagation from outside the NMS cabinets of failures that could cause the loss of any safety function.

NMS/PRMS Interface to RPS

Although the LPRM sensors are not required to meet Class 1E requirements, the design bases of the APRMs specify that the LPRM signals used for the APRMs be so selected, powered, and routed that the APRMs do meet applicable safety criteria. The LPRM signal conditioners and associated power supplies are isolated and separated into groups.

The logic circuitry for the NMS and PRMS scram trip signals conforms to the single-failure criteria. The contact configurations and failure consequences associated with IRM A (see Figure 4) and APRM A (see Figure 5) are typical of the other trip channels and are described in what follows.

- With the reactor scram mode switch in the "Shutdown," "Refuel," or "Startup" positions, IRM A upscale or inoperating signals (unless bypassed) or APRM A upscale or inoperative signals (unless bypassed) would produce a channel trip of the output relay.
- With the reactor system mode switch in the "Run" position, IRM A upscale or inoperative signals (unless bypassed) and an APRM A downscale signal (unless bypassed) or APRM A upscale neutron trip or upscale thermal trip or inoperative signals (unless bypassed) would produce a channel trip of the output relay.
- A trip of the channel output relay for IRM A and APRM A or a trip of the channel output relay for IRM E and APRM E would produce an RPS A1 channel trip. In PRMS, the log radiation monitor A would produce an RPS A1 channel trip (see Figure 6).

For NMS, one tripped (unbypassed) channel on the RPS trip system would cause a half scram. If one APRM bay were to fail in an untripped condition, the remaining bays would be capable of sending RPS sufficient scram signals to produce a full scram, even if one of them were bypassed.

As shown in Figures 2 and 7, if one bay of panels H11-P635 or H11-P636 were to fail in an untripped condition, the remaining bays would be capable of sending sufficient RPS signals even if one of the IRM channels were bypassed. The IRM bypass switches can bypass one IRM channel at a time.

Similarly for PRMS, if one bay were to fail in an untripped condition, the remaining bays would be capable of sending sufficient RPS trip signals to produce a full scram.

Common Power Supply Justification

The NMS is supplied with 120-Vac, 60-Hz power from UPS busses 1 & 2. A design change has been authorized for the installation on each bus of redundant electrical protection assemblies (EPAs), which will monitor the incoming voltage and frequency.

Any fault in one NMS channel could not cause an unsafe failure in another channel sharing the same low voltage power supply because 10-amp fuses are installed for wire protection, and the power supplies are designed with over-voltage and over-current protection circuitry at their output.

The PRMS is supplied with 120-Vac, 60-Hz power from RPS busses A and B. EPAs are already installed on each bus to provide voltage and frequency protection.

Any fault in one PRMS channel could not cause an unsafe failure in another channel sharing the same power supply because 5-amp fuses are installed for wire protection, and the power supplies are designed with over-voltage and over-current protection circuitry at their output.

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Because of the fail-safe NMS/PRMS logic configuration, a loss of one supply would result in a half scram signal to RPS. Loss of both supplies would result in a full scram.

Common Associated Circuit Interfaces

Nonessential (associated) circuits to common information equipment are current limited and protected such that their failure cannot jeopardize an adjacent circuit.

Figure 8 provides an example of an associated circuit interface on LPRM card Z11. At the zero-to-160-mV computer output, the card is protected with a 30-MA fuse. The zero-to-10-V output to the rod block monitor has an additional isolator protection for the card.

PANEL
H11-P608

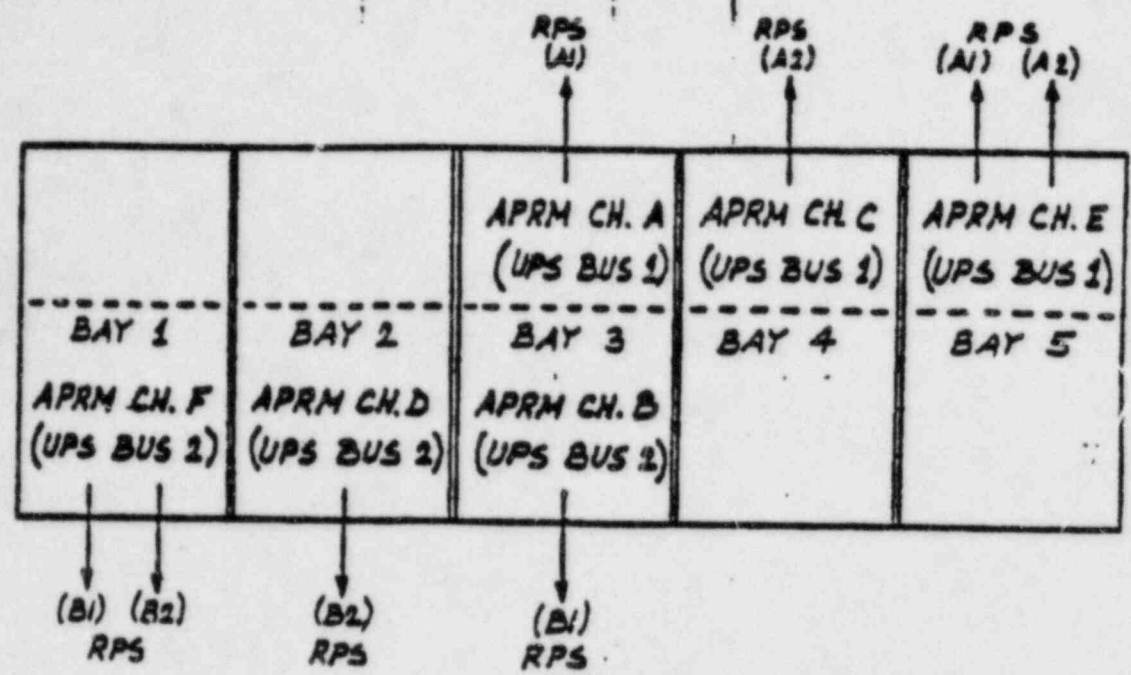
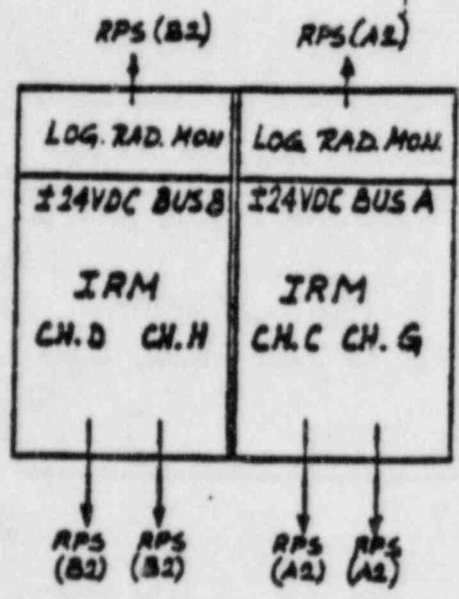


FIGURE 1 - APRM Panel Assignment

PANEL
H11-P635



PANEL
H11-P636

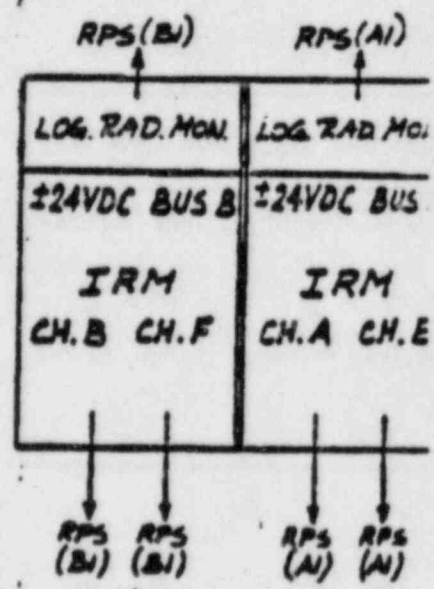


FIGURE 2 - Radiation Monitoring Panels

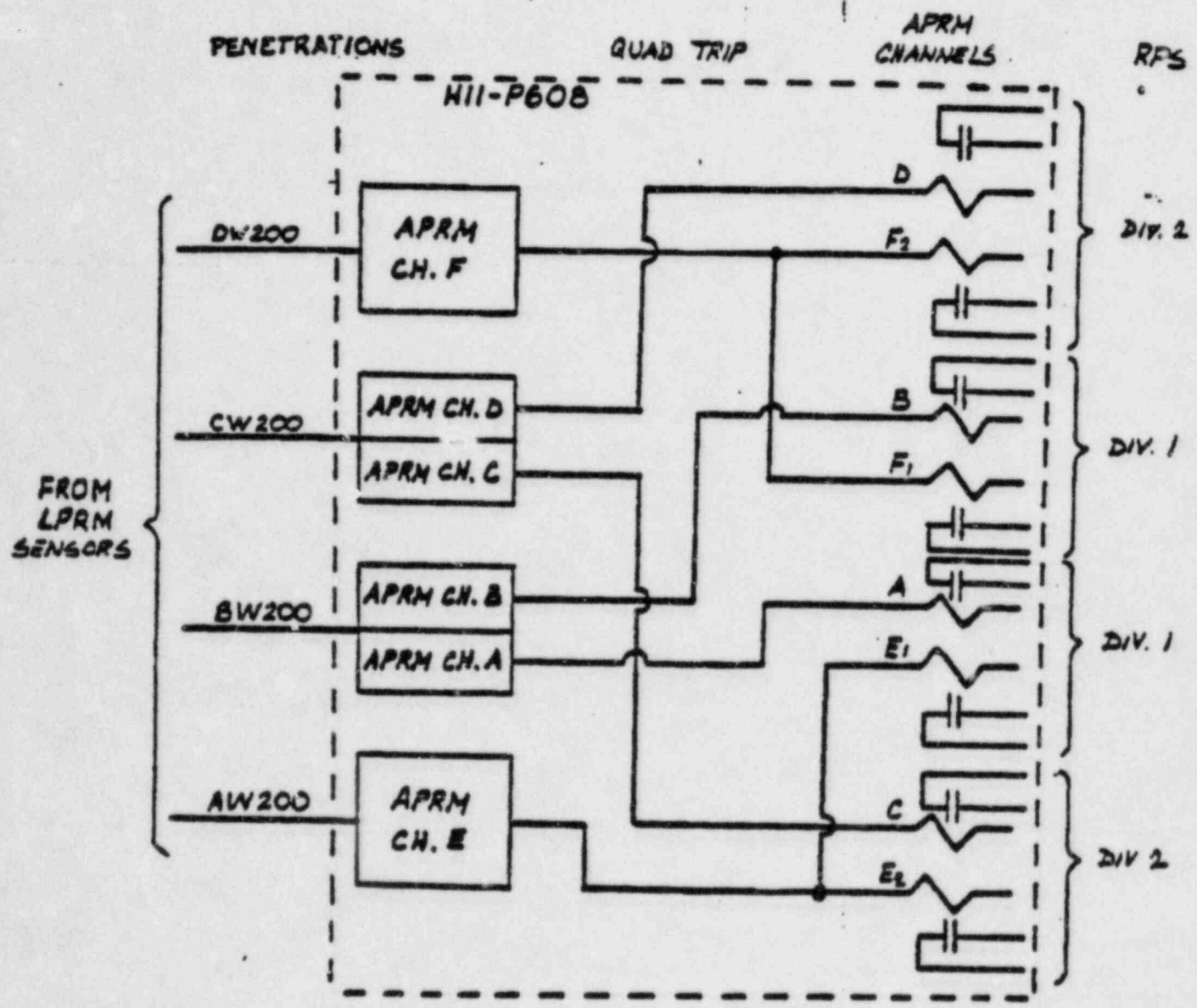


FIGURE 3 - APRM/RPS Signal Separation

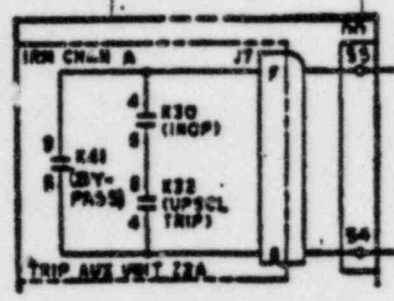


FIGURE 4 - IRM Channel A

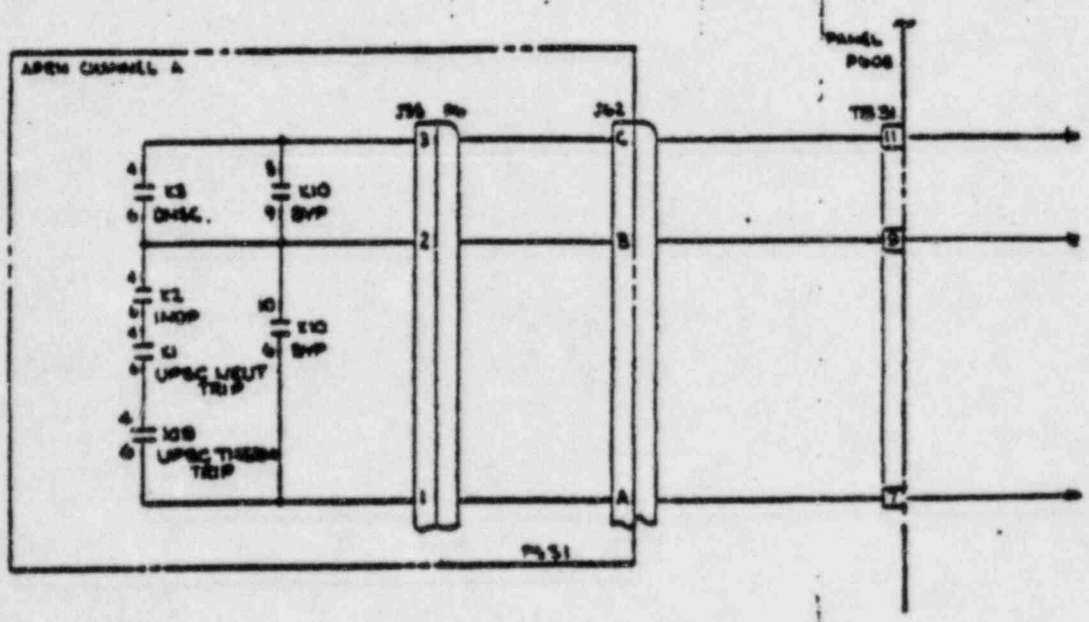


FIGURE 5 - APRM Channel A

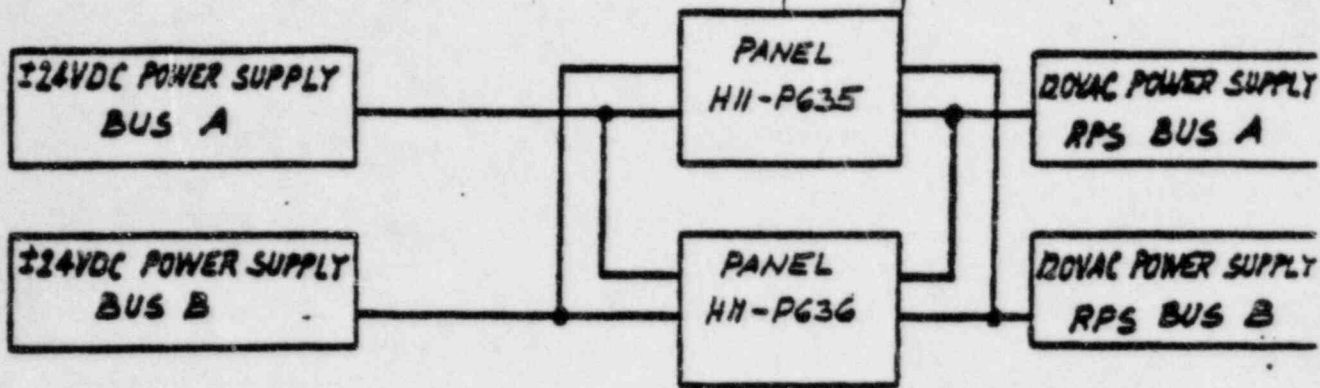


FIGURE 7 - Radiation Monitoring Panels Power Sources

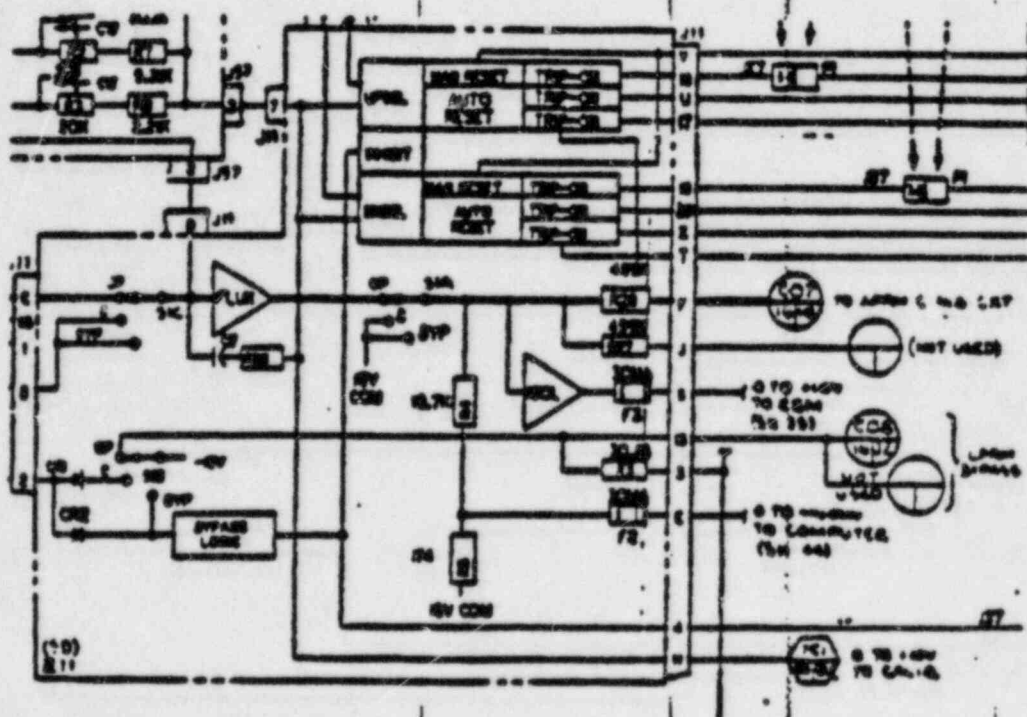


FIGURE 8 - LPRM Circuit Card

QUESTION 430.65 (SECTION 9.5.2)

The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

- a. Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe cold plant shutdown.
- b. Indicate the maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.
- c. Indicate the types of communication systems available at each of the above identified working stations.
- d. Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:
 - 1. the page party communications systems, and
 - 2. any other additional communication system provided at that working station.
- e. Describe the performance requirements and tests that the above onsite working stations communication system will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions.
- f. Identify and describe the power source(s) provided for each of the communications systems. (SRP 9.5.2; Parts II & III).

RESPONSE

Insert A

a. ~~The identification of all working stations where it may be necessary for plant personnel to communicate with the control room during and/or following transients and/or accidents is not provided because all necessary plant shutdown controls and indications are located within the control room which precludes necessity of having plant personnel located at any particular station. If, however, plant shutdown is controlled~~

Insert A

~~from the emergency shutdown panel, then it may be necessary to have plant personnel able to communicate from three working stations which have backup controls and indications. These three stations are at the diesel generator remote control panels rooms (4 total), the Class 1E switchgear rooms (4 total), and at the reactor protection system (RPS) motor generator set area. In the event of fires, the fire brigade reports to the affected area(s) and the areas are listed in Section 9.5.1.2.15.~~

b. ~~Maximum sound levels have not been defined for the above working stations. The effectiveness of the communication system(s) will be demonstrated during the preoperational and power ascension test programs of Chapter 14.~~ Insert B

c. The page party communication system is available at or nearby the above working stations. In addition, a two-way radio communication system is available as a backup system. Insert C

~~d. The maximum background noise level that could exist at the stations for communicating with the control room has not been established. The communications systems provided on HCGS are of proven design as used in previously approved plants. In addition, the communication system will be tested as described in Part (e) of this response.~~ Insert D

e. See response to Question 430.68, communication systems performance requirements and tests. In-plant communication tests are also described in Section 14.2.12.1.38. The test method states that communication is checked between the control room and the remote shutdown panel. Insert E

f. The power source to the page party communication system is from an uninterruptible power supply feeding the public address system distribution panel 10D496 which in turn supplies the public address system cabinet 10C685, as shown on Sheet 2 of Figure 8.3-11. Insert F

Insert A

Table 9.5-17 identifies all necessary working stations where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe cold plant shutdown. The identified working stations or areas in this table are selected from the Fire Hazard Analysis presented in Appendix 9A wherein all areas containing safe shutdown equipment and cables are evaluated for effect of fire on the ability to achieve and maintain cold shutdown. The areas shown on Table 9.5-17 are those which contain equipment required for shutdown, areas containing only raceways and cables are not shown.

Insert B

The locations of public address loudspeakers and handset/speaker amplifier are selected to provide effective communications and to accommodate areas with high noise levels during normal plant operation and accident condition, including fire. The design of these public address components includes provisions for volume control of the loudspeakers, adjustment in loudspeaker mounting to provide maximum coverage, and special noise-cancelling handset which are effective in high ambient noise areas without use of acoustic booths. As indicated in Section 14.2.12.1.38, the public address system will be tested with area equipment running. Any relocation and adjustment of the public address components will be provided as necessary as result a of the testing. Estimates of maximum sound levels are provided as indicated on Table 9.5-17. These estimates are based on equipment being energized or running and based on sound level attenuation which would result from accounting for room constant and distance and location of the noise source(s).

Insert C

Table 9.5-17 also shows for each of the safety-related rooms the types of communication system components available with the associated maximum sound levels within the room. All of the communication components have the capability to function in the sound environments that are listed in the Table 9.5-17. The table 9.5-17 defines the maximum sound level capability for each communication component.

Insert D

As part of Table 9.5-17, the maximum noise levels are estimated for the areas where personnel will be communicating with the control room or remote shutdown panel room. Generally, PA handsets and telephones are not located in areas with high noise levels. The maximum noise levels are estimated based on the type of operating equipment in the area with the sound defined by industry standards, such as NEMA Publication MG I and IEEE standards. If several types of equipment are in the same area, then the noise level associated with the noisiest equipment is shown on this table.

Insert E

The communication systems are preoperationally tested to demonstrate that the public address system is effective in areas with high noise levels and that other communication systems are effective between the control room or emergency shutdown panel and working stations as indicated in Table 9.5-17.

Insert F

This uninterruptible power supply (UPS) is fed from Class 1E, Channel A, distribution buses. The UHF radio system is also supplied with a non-class 1E uninterruptible power supply. The design of each UPS, as shown on Figure 8.3-11, is such that there are three input power feeders - two from 480V ac motor control centers and one from a 125V dc switchgear. In the case of the UHF radio system, the non-class 1E 480V ac motor control centers, which are connected to Class 1E 480V load centers, are tripped on a LOCA signal. The radio system will be powered from the non-class 1E batteries (4 hour rated) through the UPS under all accident cases. After a LOCA the operator can manually reconnect the non class 1E UPS to the Class 1E load center that is powered from the stand-by diesel generator. The UHF radio system will be powered at all times during any power distribution transfers. The non-class 1E UPS, batteries, and associated electrical distribution equipment that supply power to the radio system were purchased under the same technical specifications as the Class 1E equipment and are located in Seismic Category I structures.

Notes for Table 9.5-17

1. These lighting levels are at the panel or equipment surface.
2. The following are the maximum sound levels (dbs) that the communication components are capable of producing or operating in.

<u>Component</u>	<u>Sound Level</u>
PA speaker (driven by 30w amplifier)	120
PA headset	110
UHF radio portable set	80
Telephone	70

3. In these rooms the UHF radio sets' sound capability is below the maximum sound level that could be experienced in the room. In these rooms the adjacent hallway can be utilized for communication with the UHF radio set.
4. The work stations identified on the table are areas that may be required to be manned during design basis accidents or during the improbable event of a loss of all ac power.
5. These rooms have a PA handset for two way communication in the adjacent hallway, corridor or room (within approximately 50 ft of these rooms).
6. All Class 1E batteries are passive electrical components and do not require any inspection during a station blackout per the HCGS station blackout procedures. The electrical status of the Class 1E batteries is available in the control room.
7. All Class 1E dc switchgear (HPCI, RCIC, etc), inverters and battery chargers can be monitored at the control room and require no local control per the HCGS station blackout procedures.
8. These rooms and equipment are not required to be locally monitored or are not required during the station blackout condition per the HCGS procedures.
9. The 2 ft candle lighting level is a design intent which will cover a sufficient area of the corridor to provide safe ingress and egress routes. Any hazards within the corridor will be lighted to provide safe passage.
10. In addition to areas of the plant which have at least 10 ft candles of emergency lighting, trouble shooting during a station blackout may be required in the diesel fuel oil storage tank and pump rooms and the diesel generator battery rooms. ~~Emergency lighting will be stored in the corridors near each of~~

Portable lighting (5 battery packs) will be stored in the corridors near the diesel fuel oil storage tank and pump rooms and diesel generator battery rooms.

Note

11. The diesel generator and the control panels near the diesel can be monitored or operated from the control panels at elevation 130 ft. It is not necessary to perform any operations in the diesel generator rooms.

TABLE 9.5-17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHELTER AREAS

COMMUNICATIONS FEATURES
 ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA
 ESSENTIAL AC
 EMERGENCY LIGHTING SYSTEM FEATURES
 APPROPRIATE FOOTCANDLES AT EQUIPMENT FROM 8-HOUR BATTERY PACK

AREA / ELEVATION

LEGEND:
 1 = PA AMPLIFIER
 2 = PA SPEAKER
 3 = TELEPHONE
 4 = RADIO

LEGEND:
 DEA = DECIBEL A-WEIGHTED
 < = LESS THAN

WORK STATION
 (See note 4)

AVIATION BUILDING

Room 3576, EL. 137
 REMOTE SHUTDOWN PANEL

Room 5104 EL. 54
 HPCI BATTERIES

Room 5105, EL. 54
 RPS HIGH SET

Room 5106, EL. 54
 CORRIDOR

Room 5107, EL. 54
 DIESEL FUEL OIL STORAGE TANKS AND PUMPS

Room 5108, EL. 54
 DIESEL FUEL OIL STORAGE TANKS AND PUMPS

Room 3504, EL. 137
 CORRIDOR

10 (see note 1)

Yes 30

< 60

NOTE 6, 8

< 30

NOTE 6

< 80

NOTE 8

< 50

NOTE 10

< 20

NOTE 10

< 50

NOTE 8

< 50

1

1

3

1

1

3

(see NOTE 9)

(see NOTE 10)

(see NOTE 10)

(see NOTE 9)

HCGS PSAR
TABLE 9.5-17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA/EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT AREA - ESSENTIAL AC	8-HOUR BATTERY PACK
AUXILIARY BUILDING - CONTINUED	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 5109, EL. 51 DIESEL FULL OIL STORAGE TANKS AND PUMPS	2, 4 (SEE NOTE 5)	< 80	NOTE 10	3
ROOM 5110, EL. 54 DIESEL FULL OIL STORAGE TANKS AND PUMPS	2, 4 (SEE NOTE 5)	< 80	NOTE 10	3
ROOM 5111, EL. 54 CORRIDOR	1, 2 (SEE NOTE 5)	< 50	NOTE 8	3
ROOM 5112, EL. 54 COMPUTER	1 (IN ADJACENT VESTIBULE), 2, 4	< 50	NOTE 8	5
ROOM 5128, EL. 54 KIC BATTERIES	2, 4 (SEE NOTE 5)	< 50	NOTE 6, 8	3
ROOM 5129, EL. 51 HPCI BATTERY CHARGER AND DC SWITCHGEAR	4, 2 (SEE NOTE 5)	< 70	NOTE 7	10
ROOM 5101, EL. 137 STAIRWAY	2, 4	< 50	NOTE 8	3

1 (SEE NOTE 10)

1 (SEE NOTE 10)

2 (SEE NOTE 9)

2 (SEE NOTE 9)

2

3 (SEE NOTE 9)

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT IN A- ESSENTIAL AC	B-HOUR BATTERY PACK
<p>AVILIA: 1.1.1.1.1. CONTINUED</p>	<p><u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO</p>	<p><u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN</p>	<p><u>WORK STATION</u></p>	
ROOM 5130, EL. 54 ACIC BATTERY CHARGER AND DC SWITCHGEAR	2, 4 (SEE NOTE 5)	< 70	NOTE 7 3	+2
ROOM 5208, EL. 77 D/G ROOM HVAC COOLER AND RECIRCULATION FAN	2, 4 (SEE NOTE 3 AND 5)	< 100	NOTE 8 3	+2
ROOM 5209, EL. 77 D/G ROOM HVAC COOLER AND RECIRCULATION FAN	2, 1 (SEE NOTE 3 AND 5)	< 100	NOTE 8 3	+2
ROOM 5210, EL. 77 D/G ROOM HVAC COOLER AND RECIRCULATION FAN	2, 1 (SEE NOTE 3 AND 5)	< 100	NOTE 8 3	+2
ROOM 5211, EL. 77 D/G ROOM HVAC COOLER AND RECIRCULATION FAN	2, 4 (SEE NOTE 3 AND 5)	< 100	NOTE 8 3	+2
ROOM 5217 EL. 77 CORRIDOR	8 (IN AN AREA VISIBLE), 2, 3	< 50	NOTE 8 5	+2 (SEE NOTE 9)

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FACIA - ESSENTIAL AC	8-HOUR BATTERY PACK
AUXILIARY BUILDING - CONTINUOUS	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 5301, EL. 102 CORRIDOR	2, 4, 1	< 50	NOTE 8	5 12
ROOM 5302, EL. 102 CONTROL PANELS	2, 4 (SEE NOTE 5)	< 65	NOTE	3 12
ROOM 5304, EL. 102 D/G AND CONTROL PANELS	2, 4 (SEE NOTE 3) AND 5	< 110	Yes	3 (SEE NOTE 11) 10
ROOM 5305, EL. 102 D/G AND CONTROL PANELS	2, 4 (SEE NOTE 3) AND 5	< 110	Yes	3 (SEE NOTE 11) 10
ROOM 5306, EL. 102 D/G AND CONTROL PANELS	2, 4 (SEE NOTE 3) AND 5	< 110	Yes	3 (SEE NOTE 11) 10
ROOM 5307, EL. 102 D/G AND CONTROL PANELS	2, 4 (SEE NOTE 3) AND 5	< 110	Yes	3 (SEE NOTE 11) 10
ROOM 5313, EL. 102 CORRIDOR	1 (IN ASSOCIATION VESTIBULE), 2, 4	< 50	NOTE 8	4 12 (SEE NOTE 9)

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT INSTALLED ESSENTIAL AC	8-HOUR BATTERY PACK
AUXILIARY BUILDING CONTINUED	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN		
ROOM 5401, EL. 124 CORRIDOR / ACCESS AREA	2, 4 (see NOTE 5)	< 50	NOTE 6 3	2
ROOM 5402, FL. 117-6 CABLE SPREAD ROOM	1, 2, 1	< 65	NOTE 7 3	2
ROOM 5404, EL. 124 CORRIDOR	1, 2, 4	< 50	NOTE 8 3	2
ROOM 5409, EL. 124 CORRIDOR	1, 2, 1	< 50	NOTE 8 3	2
ROOM 5410, EL. 130 D/G REMOTE CONTROL PANELS AND SEQUENCER	1, 2, 4	< 65	YES ≥ 10	≥ 10 (see NOTE 1)
ROOM 5411, EL. 130 SWITCHGEAR, LOAD CENTERS, MCC and DIST. PANELS	1, 2, 1	< 70	YES ≥ 10	≥ 10 (see NOTE 1)
ROOM 5412, EL. 130 D/G REMOTE CONTROL PANELS AND SEQUENCER	1, 2, 1	< 65	YES ≥ 10	≥ 10 (see NOTE 1)
ROOM 5413, EL. 130 SWITCHGEAR, LOAD CENTERS, MCC and DIST. PANELS	1, 2, 1	< 70	YES ≥ 10	≥ 10 (see NOTE 1)

TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

EMERGENCY LIGHTING SYSTEM FEATURES:
 APPROXIMATE FOOTCANDLES AT EQUIPMENT IN ROOM -
 ESSENTIAL AC 8-HOUR BATTERY PACK

COMMUNICATION FEATURES:
 ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA

AREA / EQUIPMENT

LEGEND
 1 = PA HANDSET
 2 = PA SPEAKER
 3 = TELEPHONE
 4 = RADIO

LEGEND
 dBA = DECIBEL, A-WEIGHTED
 < = LESS THAN

AUXILIARY BUILDING - CONTINUE:

AREA / EQUIPMENT	COMMUNICATION FEATURES	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	EMERGENCY LIGHTING SYSTEM FEATURES	APPROXIMATE FOOTCANDLES AT EQUIPMENT IN ROOM - ESSENTIAL AC 8-HOUR BATTERY PACK
ROOM 5414, EL. 130 D/G REMOTE CONTROL PANELS AND SIGNALER	1, 2, 4	< 65	YES	10 (see note 1)
ROOM 5415, EL. 130 SWITCHGEAR, LEAD CENTERS, MCC AND DIST. PANELS	1, 2, 4	< 70	YES	10 (see note 1)
ROOM 5416, EL. 130 D/G REMOTE CONTROL PANELS AND SIGNALER	1, 2, 4	< 65	YES	10 (see note 1)
ROOM 5417, EL. 130 SWITCHGEAR, LEAD CENTERS, MCC AND DIST. PANELS	1, 2, 4	< 70	YES	10 (see note 1)
ROOM 5444, EL. 124 FBUS Control Panels	1, 4 (see note 5)	< 65	NOTE 6	2
ROOM 5448, EL. 124 INVERTER AND DIST. PANELS	(IN ADJACENT VISITORS), 2, 4	< 70	NOTE 7	2
ROOM 5501, EL. 137 INVERTER AND DIST. PANELS	2, 3 (IN ADJACENT ROOM), 4	< 70	NOTE 7	2

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TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC	8-HOUR BATTERY PACK
AUXILIARY BUILDING - COMMUNICATIONS	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 5502, EL. 137 CORRIDOR	2, 3 (IN ADJACENT ROOM), 4	< 50	NOTE 9 8	2 (see NOTE 9)
ROOM 5510, EL. 137 CONTROL ROOM PANELS AND CONSOLES	1, 2, 3, 4	< 60	YES 30	15 (see NOTE 1)
ROOM 5537, EL. 137 CORRIDOR	1 (IN ADJACENT VESTIBULE), 2, 4	< 50	NOTE 8 3	2 (see note 9)
ROOM 5538, EL. 137 BATTERY CHARGERS, FUSE BOX AND BATT. MONITOR	4 (see NOTE 5)	< 65	NOTE 8 3	2 (see note 10)
ROOM 5540, EL. 137 BATTERY CHARGERS, FUSE BOX AND BATT. MONITOR	4 (see NOTE 5)	< 65	NOTE 8 3	2 (see note 10)
ROOM 5541, EL. 137 BITTERIES	4 (see NOTE 5)	< 50	NOTE 8 3	2 (see NOTE 10)
ROOM 5546, EL. 137 BATTERY CHARGERS FUSE BOX AND BATT. MONITOR	2, 4 (see NOTE 5)	< 65	NOTE 8 3	2 (see note 10)

TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES	EMERGENCY LIGHTING SYSTEM FEATURES	LEGEND	LEGEND	WORK	
APPLICABLE BUILDING CONTINUOUS			1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	
ROOM 5513, E.L. 157 BATTERIES	2, 4 (see NOTE 5)	< 50			NOTE 8, 10	2 (see NOTE 10)
ROOM 5511, E.L. 157 BATTERY CHARGERS, FUSE BOX AND BATT. MONITOR	2, 4 (see NOTE 5)	< 65			NOTE 8, 10	2 (see NOTE 10)
ROOM 5545, E.L. 157 BATTERIES	4 (see NOTE 5)	< 50			NOTE 10	2 (see NOTE 10)
ROOM 5602, E.L. 155-3 CONTROL AREA WATER CHILLER, CENTRAL ROOM AIR HANDLING UNIT AND PERSON AIR FAN, AND MUSIC CONTROL PANEL	1 (LOCATED AWAY FROM EMERGENCY LIGHT SOURCE), 2, 1 (see NOTE 5) AND 5	< 110			NOTE 8	2
ROOM 5601, E.L. 163-6 CONTROL	1, 2, 4	< 50			NOTE 8	2 (see NOTE 9)
ROOM 5655, E.L. 163-6 CONTROL PANEL	1, 2 (see NOTE 5)	< 65			NOTE 8	2
ROOM 5656, E.L. 163-6 CONTROL PANEL	2, 1 (see NOTE 5)	< 50			NOTE 8	2 (see NOTE 9)

HCGS FSAR
TABLE 9.5-17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC	8-HOUR BATTERY PACK
A-SYSTEMS BUILDING (CONTINUED)	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN		
ROOM 5606, EL. 163-6 SWITCHGEAR ROOM COOLERS AND D/G BATTERY ROOM EXHAUST FANS	2, 4 (SEE NOTE 5)	< 90	NOTE 7 5	2
ROOM 5607, EL. 163-6 INVERTER, DC SWITCHGEAR, EX-ITER'S CHARGER AND FUSE BOX	4 (SEE NOTES 5)	< 70	NOTE 7 3	2
ROOM 5608, EL. 163-6 CORRIDOR	1, 2 (IN ADJACENT CORRIDOR), 4	< 50	NOTE 8 5	2 (SEE NOTE 9)
ROOM 5609, EL. 163-6 BATTERIES	1 (SEE NOTES 5)	< 50	NOTE 6 4	2
ROOM 5610, EL. 163-6 CORRIDOR	1, 1	< 50	NOTE 8 4	2 (SEE NOTE 9)
ROOM 5612, EL. 163-6 CORRIDOR	4, 1	< 50	NOTE 8 8	2 (SEE NOTE 9)
ROOM 5619, EL. 163-6 SWITCHGEAR ROOM COOLERS AND D/G BATTERY ROOM EXHAUST FANS	1, 2, 4 (SEE NOTE 5)	< 90	NOTE 7 5	2
ROOM 5620, EL. 163-6 CONTROL ROOM OF THE CHILLER, CONTROL ROOM AND HANDLING UNIT AND CONTROL ROOM FAN, AND FAN CONTROL PANEL	2, 1 (SEE NOTE 5) AND 5	< 110	NOTE 8 3	2

WORK
STATION

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES		
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT TERMINALS	ESSENTIAL AC	8-HOUR BATTERY PACK
<p>LEGEND</p> <p>1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO</p>	<p>LEGEND</p> <p>dBA = DECIBEL, A-WEIGHTED < = LESS THAN</p>	<p>WORK STATION</p>			
<p>ROOM 5702, EL. 172 COMPUTER</p>	<p>2 (IN ADJACENT ROOM), 4</p>	<p>< 70</p>	<p>NOTE 8</p>	<p>5</p>	<p>2 (SEE NOTE 9)</p>
<p>ROOM 5709, EL. 178 CONTROL AND DIESEL AREA H/AC EQUIPMENT</p>	<p>1 (LOCATED AWAY FROM NOISY EQUIPMENT), 2, 4 (SEE NOTE 3)</p>	<p>< 105</p>	<p>NOTE 7</p>	<p>3</p>	<p>2</p>
<p>REACTOR BUILDING</p> <p>ROOM 4104, EL. 51 CORE SPRAY PUMP AND UNIT COOLERS</p>	<p>1 (IN ADJACENT VESTIBULE), 2, 1 (SEE NOTE 3)</p>	<p>< 06</p>	<p>NOTE 8</p>	<p>15</p>	<p>2</p>
<p>ROOM 4106, EL. 51 VALVES</p>	<p>(SEE NOTE 3)</p>	<p>< 111</p>	<p>NOTE 8</p>	<p>5</p>	<p>1</p>
<p>ROOM 4105, EL. 54 CORE SPRAY PUMP AND UNIT COOLERS</p>	<p>1 (IN ADJACENT VESTIBULE), 2, 1 (SEE NOTE 3)</p>	<p>< 106</p>	<p>NOTE 8</p>	<p>15</p>	<p>2</p>
<p>ROOM 4107, EL. 54 RRR PUMP, SUMP PUMP, UNIT COOLERS AND INLET WATER PUMP</p>	<p>1 (IN ADJACENT ELECTRICAL ROOM), 2, 1 (SEE NOTE 3)</p>	<p>< 108</p>	<p>NOTE 8</p>	<p>3</p>	<p>2</p>

TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

COMMUNICATION FEATURES
 EMERGENCY LIGHTING SYSTEM FEATURES
 COMPONENTS AVAILABLE AT AREA
 ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA
 ESSENTIAL AC
 8-HOUR BATTERY PACK

AREA / EQUIPMENT

LEGEND
 1 = PA HANDSET
 2 = PA SPEAKER
 3 = TELEPHONE
 4 = RADIO

LEGEND
 dBA = DECIBEL, A-WEIGHTED
 < = LESS THAN

WORK STATION

LEGEND

ROOM 4108, I.L.S.A
 HPCI-MCC AND INSTRUMENT RACKS

1, 2, 4 < 65

NOTE 7

2

ROOM 4109, I.L.S.A
 RHX PUMP, HX AND UNIT COOLER

1 (IN ADJACENT ELECTRICAL ROOM), 2, 4 (SEE NOTE 3) < 108

NOTE 8

2

ROOM 4110, I.L.S.A
 HPCI PUMP, TURBINE, GRAND STEAM CONDENSER, VACUUM PUMP, CONDENSATE PUMP, JOSELYN PUMP AND UNIT COOLERS

2, 4 (SEE NOTE 1) AND 5 < 110

NOTE 7

2

ROOM 4111, I.L.S.A
 HPCI PUMP, TURBINE, GRAND STEAM CONDENSER, VACUUM PUMP, JOSELYN PUMP, VALVES, FW, UNIT COOLERS

2, 4 (SEE NOTE 2) AND 5 < 110

NOTE 7

2

ROOM 4112, I.L.S.A
 HPCI-MCC AND INSTRUMENT RACKS

1, 2, 4 < 65

NOTE 7

2

HCCS F:
TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC	8-HOUR BATTERY PACK
REACTOR BUILDING - CONTINUED	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 4113, EL. 54 RHR PUMP, HX AND UNIT COOLER	1 (IN ADJACENT ELECTRICAL ROOM), 2, 4 (SEE NOTE 3))	< 108	NOTE 8 3	2
ROOM 4114, EL. 54 RHR PUMP, JOCKEY PUMP, INSTRUMENT RACK, UNIT COOLERS	1 (IN ADJACENT ELECTRICAL ROOM), 2, 4 (SEE NOTE 3))	< 108	NOTE 8 3	2
ROOM 4116, EL. 54 CORE SPRAY PUMP AND UNIT COOLERS	1 (IN ADJACENT VESTIBULE), 2, 4 (SEE NOTE 3))	< 106	NOTE 8 15	2
ROOM 4118, EL. 54 FIRE SPRAY PUMP AND UNIT COOLERS	1 (IN ADJACENT VESTIBULE), 2, 4 (SEE NOTE 3))	< 106	NOTE 8 15	2
ROOM 4201, EL. 77 MCC	1 (IN ADJACENT ROOM), 2, 4	< 65	NOTE 8 3	2
ROOM 4202, EL. 77 INSTRUMENT RACK	1, 2, 4 (SEE NOTE 3))	< 100	NOTE 8 3	2
ROOM 4203, EL. 77 INSTRUMENT RACK	2, 4 (SEE NOTE 5))	< 65	NOTE 8 3	2

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC	8-HOUR BATTERY PACK
REACTOR BUILDING - CONTINUED	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN		
ROOM 4208, EL. 77 RHR HX AND UNIT COOLER	2, 4 (SEE NOTE 5)	< 85	NOTE 8 3	2
ROOM 4209, EL. 77 VALVES AND INSTRUMENTS	1 (IN ADJACENT VESTIBULE), 2, 4 (SEE NOTE 5)	< 100	NOTE 8 3	42 (SEE NOTE 1)
ROOM 4210, EL. 77 INSTRUMENTS	2, 4 (SEE NOTE 5)	< 65	NOTE 8 3	2
ROOM 4214, EL. 77 RHR HX	2, 4 (SEE NOTE 5)	< 85	NOTE 8 3	2
ROOM 4215, EL. 77 INSTRUMENTS	2, 4 (SEE NOTE 5)	< 65	NOTE 8 3	2
ROOM 4216, EL. 77 CORRIDOR	2, 4 (SEE NOTE 5)	< 65	NOTE 8 3	2
ROOM 4218, EL. 77 INSTRUMENT RACK	1, 2, 4	< 65	NOTE 8 3	2
ROOM 4219, EL. 77 INSTRUMENTS	2, 4 (SEE NOTE 5)	< 65	NOTE 8 3	2

WORK STATION

TABLE 9.5 - 17

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	LEGEND	LEGEND	WORK STATION	EMERGENCY LIGHTING SYSTEM FEATURES
REACTOR BUILDING CONTINUOUS	1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	WORK STATION	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC 8-HOUR BATTERY PACK

ROOM 4301, EL. 102 CORRIDOR	1, 2, 4	< 65	NOTE 8	2 (see note 9)
ROOM 4303, EL. 102 MCC	1, 2, 4	< 65	NOTE 8	2
ROOM 4307, EL. 102 SACS PUMPS AND HXs, CONTROL PANELS, VALVES AND UNIT COOLERS	2, 4 (see note 3) AND 5	< 106	NOTE 7	2
ROOM 4309, EL. 102 SACS PUMPS AND HXs, CONTROL PANELS, VALVES AND UNIT COOLERS	1 (LOCATED AWAY FROM NOISEST EQUIPMENT), 2, 4 (see note 1)	< 106	NOTE 7	2
ROOM 4315, EL. 102 CORRIDOR	2 (HEART), 4	65	NOTE 8	2 (see note 9)
ROOM 4327, EL. 102 HPCI VALVES	2, 4 (see note 3)	< 80	NOTE 7	2
ROOM 4329, EL. 102 RUP 10-115	2, 4 (see note 3)	< 80	NOTE 8	2
ROOM 4317, EL. 102 RUC VALVE	2, 4 (see note 3)	< 80	NOTE 7	2
ROOM 4321, EL. 102 RUF 10-115	2, 4 (see note 3)	< 80	NOTE 8	2

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COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT IN A- ESSENTIAL AC	8-HOUR BATTERY PACK
INTAKE STRUCTURE	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 107, EL. 79-8 VALVES	2, 4 (SEE NOTE 5)	< 80	NOTE 8	3 2
ROOM 110, EL. 79-8 VALVES	2, 4 (SEE NOTE 5)	< 80	NOTE 8	3 2
ROOM 203, EL. 93 MCCA	1 (IN ADJACENT ROOM), 2, 1	< 65	NOTE 8	10 2
ROOM 204, EL. 93 PUMPS, VALVES AND CONTROL PANELS	1 (IN ADJACENT ROOM), 2, 4 (SEE NOTE 3)	< 108	NOTE 8	5 2
ROOM 207, EL. 93 MCCA	1, 2 (IN ADJACENT ROOM), 3, 4	< 65	NOTE 8	10 2
ROOM 208, EL. 93 PUMPS, VALVES AND CONTROL PANELS	1, 2 (IN ADJACENT ROOM), 4 (SEE NOTE 3)	< 108	NOTE 8	5 2
EL. 107 TRAVELLING SCREEN CONTROL PANELS	2, 4 (SEE NOTE 5)	< 80	NOTE 8	10 1 (SEE NOTE 1)
EL. 114 TRAVELLING SCREEN CONTROL PANELS	2, 4 (SEE NOTE 5)	< 70	NOTE 8	10 2

COMMUNICATIONS AND EMERGENCY LIGHTING SYSTEMS FOR SAFE SHUTDOWN AREAS

AREA / EQUIPMENT	COMMUNICATION FEATURES		EMERGENCY LIGHTING SYSTEM FEATURES	
	COMPONENTS AVAILABLE AT AREA	ESTIMATED MAXIMUM NOISE LEVEL AT AREA, dBA	APPROXIMATE FOOTCANDLES AT EQUIPMENT FROM ESSENTIAL AC	8-HOUR BATTERY PACK
INTAKE STRUCTURE - CONTINUED	<u>LEGEND</u> 1 = PA HANDSET 2 = PA SPEAKER 3 = TELEPHONE 4 = RADIO	<u>LEGEND</u> dBA = DECIBEL, A-WEIGHTED < = LESS THAN	<u>WORK STATION</u>	
ROOM 305, 306, EL. 122 FANS	1, 2, 4 (SEE NOTE 3)	< 90	NOTE 8 10	12
ROOM 311, 312, EL. 122 FANS	1, 2, 4 (SEE NOTE 3)	< 90	NOTE 8 10	12
STAIRWELLS IN Control, Diesel, Reactor Bldgs	2 (SEE NOTE 5)	< 50	NOTE 8 5	10

QUESTION 430.75 (SECTION 9.5.3)

In Section 9.5.2.4 of the FSAR you state that inservice inspection tests, preventative maintenance, and operability checks are performed periodically to prove the availability of the communication systems. However no description is provided for the inservice inspection tests, preventative maintenance and operability checks to prove the availability of the emergency lighting systems. Describe the tests and checks that will be performed on the emergency lighting systems and their frequency. (SRP 9.5.3, Parts I & II).

RESPONSE

The emergency lighting systems will be demonstrated operable by energizing the lighting systems. Visual inspections will be performed: (1) Semiannually for those areas of the plant that are accessible; and (2) Within 72 hours of achieving cold shutdown for those areas of the plant that are not accessible during plant operation, unless emergency lighting operability has been demonstrated in those areas within the past six months.

Testing of the Class 1E feed will be performed in conjunction with the standby diesel generator load testing.

Additionally the dc emergency battery pack lighting units, as well as stored onsite portable dc lighting packs, will be tested on an 18 month interval in accordanced with manufacturers recommendations to insure that rated illumination is available. As a minimum this will include the following:

- a. Check of battery voltmeter.
- b. Functional test of the unit by an installed push button to verify lamp operation, power transfer, and battery operability.

On a periodic basis the capability of the dc lighting packs to perform the design safety function shall be verified by testing a 5% sample in accordance with the manufacturer's recommendations and as specified in the maintenance procedures. In the event of a failure additional 5% samples will be tested until there are no failures in a sample.

QUESTION 430.81 (SECTION 9.5.4)

In Section 9.5.4.2.1 of the FSAR you state that "The interior and exterior surfaces of the [fuel oil storage] tank are corrosion protected by carboline carbo zinc 11 coatings. I&E circular 77-15 discusses the incompatibility between diesel fuel oil and zinc. The reaction results in a substance resembling soap which when heated becomes insoluble and this substance could render diesel generators inoperable due to blocked fuel lines, injectors, etc. This is not acceptable. It is our position that fuel oil storage tanks be provided with internal corrosion protection. Therefore provide the results of tests which show that over the lifetime of the plant that the carboline carbo zinc 11 coating used is compatible with the type of diesel fuel oil that will be used at your plant and that the condition described in the circular will not occur or replace the internal coating with a non-zinc base type that is compatible with diesel fuel oil. (SRP 9.5.4, Part II)

RESPONSE

Hope Creek will remove the existing inorganic zinc coating from the diesel generator fuel oil tanks. The tanks will be blasted to the white metal criteria of SSPC-SP5. Two coats of Amercoat No. 90 or equivalent will be applied to the tank interior to a height of one foot from the bottom.

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QUESTION 430.101 (SECTION 9.5.5)

Provide the results of a failure mode and effects analysis to show that failure of a piping connection between subsystems (engine water jacket, lube oil cooler, governor lube oil cooler, and engine air inter-cooler) will not degrade engine performance or cause engine failure. (SRP 9.5.5, Parts II & III)

RESPONSE

The interconnecting piping (SACS water side) between the intercooler heat exchanger, jacket water heat exchanger, and lube oil heat exchanger, is moderate energy piping and is designed to Seismic Category I criteria. As discussed in Section 9.2.2, during an LOP/LOCA each of the two SACS loops provide cooling to the two diesel engines dedicated to each loop. However, if one of the loops is in a limited condition for operation as discussed in item 3 below, the two diesel engines dedicated to this loop will be realigned to the operating SACS loop by manually opening the valves in the intertie lines. These intertie valves will be locked open in this LCO mode. If a pipe break occurs in the interconnecting piping between the cooling subsystems of a diesel engine which results in leakage exceeding the makeup supply capability, the low-low switch in the expansion tank will ultimately activate an alarm in the main control room. This diesel engine will then be isolated from the SACS by manually closing the isolation valves (shown on Figure 9.2-5). Therefore failure of the cooling water piping will cause loss of cooling water supply to only one engine. Loss of cooling water will result in shutdown of this diesel engine. However, as stated in Section 9.5.4.3, since only three of the four SDGs are required for safety loads, failure of the SDG does not preclude safe shutdown of the plant following LOCA/LOP.

The design basis for the safety auxiliaries cooling system (SACS) is that no single active failure can disable an entire loop. The SACS is also designed to prevent a complete loss of function due to a passive failure during the long term containment cooling mode following a LOCA. Leakage from a passive failure is assumed equivalent to that resulting from pump seal failure. The rate of leakage is such that after receipt of a low-low SACS expansion tank alarm sufficient operator action time, approximately 30 minutes, is available to realign the diesel generator cooling to the remaining SACS loop.

The proposed draft technical specifications for the SACS system, to be submitted for review and approval by the NRC, will contain the following conditions:

1. With one SACS pump or heat exchanger inoperable, restore the inoperable pump or heat exchanger to OPERABLE status within 14 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

2. With one SACS pump or heat exchanger in each subsystem inoperable, restore at least one inoperable pump or heat exchanger to OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
3. With one SACS subsystem inoperable, restore the inoperable subsystem to OPERABLE status with at least one OPERABLE pump and flow path within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Realign the affected diesel generators to the OPERABLE SACS subsystem.
4. With both SACS subsystems inoperable, restore at least one subsystem to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

The definition of a SACS subsystem is:

- a. Two OPERABLE SACS pumps, and
- b. An OPERABLE flow path consisting of a closed loop through the SACS heat exchangers, SACS pumps and associated safety related equipment.

Realignment of diesel generators from their normal SACS supply is only required when one SACS subsystem is completely inoperable. One SACS pump and one heat exchanger in each subsystem have sufficient capacity to provide cooling to connected diesel generators and safely shut the plant down.

The justification for the time periods will be provided at a later date.

ATTACHMENT 5

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and performance data. All safety-related portions of the CACS are environmentally qualified to normal and accident environments according to Section 3.11 requirements.

The CACS is shown schematically on Figure 6.2-29. The system is located within the reactor building except for the nitrogen vaporizer, which is located in the auxiliary building; the HOAS hydrogen bottles, which are located on the reactor building roof; and the control cabinets, which are located in the auxiliary building.

6.2.5.2.1 Nitrogen Inerting

During normal power operation of the reactor, the oxygen content of the primary containment atmosphere is maintained at a concentration no greater than 4% by volume by the containment inerting and purge system (CIPS). This limit is established to preclude the attainment of a combustible gas mixture inside the containment if combustible gases are released into the containment atmosphere following a postulated accident. Oxygen monitoring during normal operation is done by analyzing grab samples taken by the plant leak detection system located in the reactor building and discussed in Section 11.5.2.

This low oxygen atmosphere is achieved by displacing air in the primary containment with nitrogen gas. Prior to reactor operation, the nitrogen is supplied from a liquid nitrogen facility, which consists of two liquid nitrogen storage tanks and one steam-heated water bath vaporizer.

Gaseous nitrogen from the discharge of the vaporizer is supplied to the drywell and/or the suppression chamber as selected by the operator. The flow rate of nitrogen is controlled to a value that is also selected by the operator. Displaced gases released from the primary containment during nitrogen inerting are processed through the HEPA filters of the RBVS exhaust system and monitored for radioactivity before release to the environment. The RBVS is discussed in Section 9.4.2.

During the inerting operation, nitrogen is supplied to the containment through the two RBVS supply purge penetrations, and gases are released from the containment through the two RBVS exhaust purge penetrations. Once the 4% by volume oxygen concentration in the primary containment has been achieved,

Smart A

Insert A to Section 6.2.5.2.1

Because the inboard and outboard 26-inch containment vent and purge butterfly valves are sealed closed and under administrative control during normal plant operating conditions (Operational Conditions 1, 2, and 3), inerting is restricted to makeup operation under these conditions. During the makeup operation, nitrogen is supplied to the containment through the one inch nitrogen makeup line, and gases are released from the containment to the RBVS exhaust system by opening the inboard 26-inch purge and vent valve and the 2-inch bypass valve around the sealed closed 26-inch outboard purge and vent valve (Reference Figure 6.2-29).