Florida Power
CORPORATION

October 29, 1982
#3F-1082-32
File: 3-F-2

Mr. Darrell G. Eisenhut
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Generic Letter 81-12 on Fire Protection

Dear Mr. Eisenhut:

On June 30, 1982, Florida Power Corporation submitted our final 10 CFR 50 Appendix R Fire Study and an item by item response to Enclosure 2 ("Clarification of Generic Letter)" of the May 4, 1982 letter from Mr. Sydney Miner, Project Manager, Operating Reactors Branch #4, US Nuclear Regulatory Commission. At that time, we were only able to provide partial responses to some of the requests of the May 4, 1982 letter, due to the impact of incorporating Appendix R requirements into the expanded evaluation and design criteria to the original Branch Technical Position 9.5-1 (BTP 9.5-1) for Crystal River Unit 3. The design effort for Appendix R has now progressed to the point where we can supply the detailed information required by the May 4, 1982 letter. This submittal responds to the NRC May 4, 1982 letter; therefore it completely supercedes the FPC June 30,1982 submittal.

With regard to the overall implementation schedule proposed by FPC for Sections III.O, III.J and III.G of Appendix R, we offer the following discussion.

Section III.O

Existing Reactor Coolant Pump Oil Collection System "as-built" data was gathered during the Refuel III Outage (Fall, 1981); therefore, the design and procurement is progressing such that the modifications to the Reactor Coolant Pump Oil Collection System can be installed during the Refuel IV outage (Spring, 1983). This schedule is consistent with our commitment letter dated June 30, 1981.

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1/1
Aper. Dist.
SEND DRwgs to:
BC
[redacted]:
Limited Dist.
SEND Encl. to:
Reg Files
PDR
LPDR
NSIC
NTIS
BC
wambach
FIORAVANT

Section III.J

As stated in our March 19, 1981 letter, we presently meet the intent of Section III.J of Appendix R. However, we plan to install during Refuel IV, additional 8-hour battery-backed emergency lighting between the control room and the new dedicated shutdown room to provide for orderly and safe ingress and egress.

Section III.G

Detailed design of the Dedicated Shutdown Panel and associated systems have progressed to a point where we are now able to submit the remaining portions of our responses to the May 4, 1982 letter. Each item requiring a response is restated along with the response.

We would like to withdraw the implementation date extension requested in our June 30, 1982 letter since NRC approval of our Appendix R submittal is not contemplated 180 days prior to our refueling outage, Refuel IV, scheduled to start in March 1983.

We have enclosed a schedule for implementation of the modifications proposed in our June 30, 1982 letter (3F-0682-37) and further described in this submittal. This schedule indicates final completion of the modifications during Refuel V, which is in compliance with the requirements of 10 CFR 50.48 (c)(4). This outage is currently scheduled to commence in the Fall of 1984.

If changes in plant operation or system conditions should require any revision in the scheduled outage date, we will notify you of any impact on the completion of these modifications.

The extensive amount of design work and equipment delivery times make it impractical, if not impossible, to complete this work before Refuel V. Our basis for this schedule is:

1. Equipment delivery times make it very unlikely that the work can be completed before Refuel V since environmentally qualified transmitters have a 26 week delivery time frame.

2. If it is assumed that equipment delivery times can be compressed for an earlier completion date, modification work and design engineering would have to progress on an overly optimistic and burdensome schedule. This would result in an increased likelihood of errors, an increase in costs, and bypassing, modifying, or accelerating normal procedures.

3. Due to the large capital expenditure ($5-$10 million), the management of our company dictates that adequate cost-benefit and alternative studies be performed for the problems identified in our final Appendix R Fire Study such that the most expeditious and cost effective solution is implemented.

Section III.J

As stated in our March 19, 1981 letter, we presently meet the intent of Section III.J of Appendix R. However, we plan to install during Refuel IV, additional 8-hour battery-backed emergency lighting between the control room and the new dedicated shutdown room to provide for orderly and safe ingress and egress.

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On October 19, 1982, the NRC requested additional information in a joint telephone conversation with Gilbert Associates Inc. and Florida Power Corporation (October 19, 1982 Requested Information). Florida Power Corporation herein directly addresses twenty-three of the twenty-five information request items. The remaining two items (#2 and #11) will require additional time to develop our response. As agreed in the telephone conference, Item #2 will require additional clarification from the NRC staff in order for Florida Power Corporation to adequately respond. Following receipt of this clarification, Florida Power Corporation will respond to the remaining items as soon as possible. If you have any questions regarding the information we are providing for the other twenty-three items, please contact us as soon as possible in order that we can quickly reach closure on these issues.

Florida Power Corporation has expended considerable effort in the preparation of the detailed Appendix R information and additional information requested. The modification implementation schedule is long range and based on the best estimate as to the start of Refuel V. Florida Power Corporation plans to complete Appendix R commitments and modifications during Refuel V as required by 10 CFR 50.48 (c)(4).

Should there be any questions, please contact this office.

Very truly yours,

Patsy Y. Baynard

Dr. Patsy Y. Baynard
Assistant to Vice President
Nuclear Operations

Attachment

WRK/myf

cc: Mr. J.P. O'Reilly
Regional Administrator, Region II
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
101 Marietta Steet, N.W., Suite 3100
Atlanta, GA 30303

Enclosures

Responses to Attachment 1 to Enclosure 2 of the NRC Letter Dated 5/4/82

Responses to the "Fire Area Approach" Section of Attachment 2 to Enclosure 2 of the NRC Letter Dated 5/4/82

Responses to the "High/Low Pressure Interface" Section of Attachment 2 to Enclosure 2 of the NRC Letter Dated 5/4/82

Attachment 1

Attachment 2

Attachment 3

Attachment 4

Attachment 5

Table 1

Table 2

Foxboro Technical Information: Voltage-to-Current Converter

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Request for Additional Information by October 19, 1982 Teleconference

List of Block Diagrams

List of Elementary Drawings

Block Diagrams

Elementary Drawings

ITEM 1 OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1 - Identify those areas of the plant that will not meet the requirements of Section III.G.2 of Appendix R and, thus alternative shutdown will be provided or an exemption from the requirements of Section III.G.2 of Appendix R will be provided. Additionally provide a statement that all other areas of the plant are or will be in compliance with Section III.G.2 of Appendix R.

FPC Response 1 -

1) Section VI entitled "Dedicated Shutdown" of the "Safe Shutdown Analysis For Fires Occurring In Any Area Containing Required Safe Shutdown Equipment," hereafter referred to as SSA report (Attachment 3) identifies the unprotectable areas.

2) Section VIII entitled "Conclusions" of the SSA report (Attachment 3) verifies the intent to comply with Section III.G.2.

ITEM 1.a OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1a - For each of those fire areas of the plant requiring an alternative shutdown system(s) provide a complete set of responses to the following requests for each fire area:

a. List the system(s) or portions thereof used to provide the shutdown capability with the loss of offsite power.

FPC Response 1a - Section III entitled "Shutdown Sequence and Systems Functions (Normal Control Location)" of the SSA report (Attachment 3) provides the list of systems.

ITEM 1.b OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For those systems identified in "1a" for which alternative or dedicated shutdown capability must be provided, list the equipment and components of the normal shutdown system in the fire area and identify the functions of the circuits of the normal shutdown system in the fire area (power to what equipment, control of what components and instrumentation). Describe the system(s) or portions thereof used to provide the alternative shutdown capability for the fire area and provide a table that lists the equipment and components of the alternative shutdown system for the fire area.

For each alternative system identify the function of the new circuits being provided. Identify the location (fire zone) of the alternative shutdown equipment and/or circuits that bypass the fire area and verify that the alternative shutdown equipment and/or circuits are separated from the fire area in accordance with Section III.G.2

RESPONSE TO ITEM 1.b OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

Item 1.b requests information regarding the normal and dedicated shutdown systems. The information regarding the normal shutdown system equipment, circuits and circuit functions is contained in Attachment. A description of the dedicated shutdown system equipment is contained in Attachment 4. A tabulation of the new circuits and circuit functions of the dedicated shutdown system is provided in the attached Table 1. This table lists the circuits that pertain to equipment required to operate in the event of a fire occuring in either the main control room or cable spreading room.

Item 1.b also requests that information be provided regarding to the location of the circuits by fire areas and to verify that the dedicated shutdown circuits are separated from the fire areas for which the dedicated shutdown method is being provided. Table 1 of Attachment #1 is divided into several columns to provide this information.

The column labeled "Circuit No." provides the identification of the circuit.

The column labeled "Circuit Function" provides the information regarding what component(s) the circuit supplies power, control or instrumentation for.

The columns labeled "Normal Shutdown Method" and "Dedicated Shutdown Method" indicate whether the circuit is used for normal shutdown, dedicated shutdown or both.

The column labeled "Fire Areas Where Ckt. Is Located" indicates a letter designation which correlates with a letter shown on the block diagram of Figure 2 which schematically shows the routing of the new circuits. Figure 3 shows the layout of the dedicated shutdown equipment.

This table in correlation with Figures 2 and 3 provide the required information for the new circuits of the dedicated shutdown system.

An explanation of how to use Table 1, Figures 2 thru 6, the Block Diagrams and Elementary Drawings are provided in Attachment 5.

RESPONSE TO ITEM 1.c OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.c - Provide drawings of the alternative shutdown system(s) which highlight any connections to the normal shutdown systems (P&IDs for piping and components, elementary wiring diagrams of electrical cabling). Show the electrical location of all breakers for power cables, and isolation devices for control and instrumentation circuits for the alternative shutdown systems for that fire area.

FPC Response 1.c - Item 1c has two parts as follows:

1) The P&IDs, Elementary Drawings, and Block Diagrams are attached. The Breakers providing power are located in VBDP-8 & 10 as shown on Figure 2 and specific power and central feeds to electrical equipment (Motors, Valves) are from Motor Control Centers and Switchgear. These specific feeds are shown on the elementaries. The isolation devices for the control and instrumentation devices are located in the Dedicated Shutdown Auxiliary Equipment Cabinets "A" and "B", the Dedicated Shutdown Relay Cabinet "A" and "B", and the Resistor Boxes. The location of these cabinets is shown on Figure 2.

2) The isolation devices provided in the DSP for interfacing with existing equipment are Foxboro Spec. 200 equipment. Environmentally and seismically qualified Model No. N2A0-V2I (V/V option) are utilized. Foxboro product literature showing descriptive information is attached for your information.

RESPONSE TO ITEM 1.d OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.d - Verify that changes to safety systems will not degrade safety systems (e.g., new isolation switches and control switches should meet design criteria and standards in the FSAR for electrical equipment in the system criteria and standards in the FSAR for electrical equipment in the system that the switch is to be installed; cabinets that the switches are to be mounted in should also meet the same criteria (FSAR) as other safety related cabinets and panels; to avoid inadvertent isolation from the control room, the isolation switches should be keylocked or alarmed in the control room if in the "local" or "isolated" position; periodic checks should be made to verify that the switch is in the proper position for normal operation; and a single transfer switch or other new device should not be a source of a failure which causes loss of redundant safety systems).

FPC Response 1.d - The design criteria and standards for the DSP and components are as follows:

IEEE 323-1974	Reg. Guide 1.89-1974
IEEE 344-1975	Reg. Guide 1.100-1977
IEEE 383-1974	Reg. Guide 1.74-1978
IEEE 384-1977	Reg. Guide 1.29-1978
ANSI N45.2.2-1978	10CFR50, Appendix R

This criteria and standards exceed that of the original equipment installed in the plant safety systems and documented in the FSAR. Therefore, the associated circuits have not degraded the safety related systems below existing FSAR criteria. However, due to the fact that some safety related systems and circuits are located in the control room, that equipment and circuits must be disconnected and new Dedicated Shutdown control circuits connected. This design feature is not interpreted to mean a degradation in safety functions but rather a design enhancement that allows separate control in the event of a catastrophic fire in the safety system.

There are four isolation switches transferring control from the Main Control Room to the Dedicated Shutdown Panel. The following identifies the switches, their physical location, and the Elementary Drawings:

Description of Switch	Location of Switch	Elementary Drawing Showing Switch	Switch Contacts
A	Shutdown Aux. Aux. Equip. Cabinet A	RS-01	RS-02,03,04,11
B	Shutdown Aux. Equip. Cabinet B	RS-05	RS-06,07,08,12
A/B	Dedicated Shutdown Panel	RS-10	RS-10
*BOP	Dedicated Shutdown Panel	RS-09	RS-9

For each transfer switch, a spare contact from a relay activated by the transfer switch (shown on the above Elementary drawings) will be wired to the annunciator in the Main Control Room. Single failure of a transfer switch will not cause a loss of the redundant safety system.

ITEM 1.e OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.e - Verify that licensee procedures have been or will be developed which describe the tasks to be performed to effect the shutdown method. Provide a summary of these procedures outlining operator actions.

FPC Response 1.e - The following is a list of actions (manual operation of valves, and equipment repair or replacement) that must be undertaken to accomplish plant shutdown in the event of a fire. These actions have been determined in consideration that a fire could occur anywhere in the plant. Since it is postulated that a fire will be confined to only one fire area, not all of these indicated actions will be required for a particular fire. A fire in just one fire area will damage or disable remote control of only a portion of these components.

Components Requiring Manual Operation:

Open EFV-1 (See Note 1)
Close EFV-4 (See Note 1)
Open EFV-2 (See Note 2)
Close EFV-3 (See Note 2)
Open MSV-25 and 26
Close MSV-411, 412, 413, and 414 (See Note 3)
Open SWV-353 and 354 (See Note 3)
Open DHV-3, 4, and 41
Open DHV-5, 39 and 110 (See Note 4)
Close DHV-34 (See Note 4)
Open DHV-6, 40, and 111 (See Note 5)
Close DHV-35 (See Note 5)
Close DHV-17 (See Note 6)
Open DCV-177 (See Note 6)
Close DVV-18 (See Note 7)
Open DCV-178 (See Note 7)
Close CVF-5 and 6

Components Requiring Circuit Repair:

DHP-1A or 1B
DCP-1A or 1B
RWP-3A or 3B
AHF-15A or 15B
CD-6-LT and CD-67-LT

Components Requiring Replacement:

DCP-1A or 1B (Motor only)
CD-6-LT
CD-67-LT

NOTES:

1. This action is needed only if switchover from the condensate storage tank to the hotwell is required, and if EFP-2 is operating.

2. This action is needed only if switchover from the condensate storage tank to the hotwell is required, and if EFP-1 is operating.

3. Manual operation of these valves is only one of two options being recommended to meet Appendix R criteria. The other option is to protect the required circuits. The latter option to protect the circuits has been selected.

4. This action is required if DHP-1A is used.

5. This action is required if DHP-1B is used.

6. This action is required if DCP-1A is used.

7. This action is required if DCP-1B is used.

Attachment #2 lists the systems, instrumentation and controls required to go to cold shutdown from outside the Control Room. EM-101 "Fire Protection Plan" and EP-113 "Plant Shutdown from Outside Control Center" will be revised prior to operation of the new DSP.

ITEM 1.f OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.f - Verify that the manpower required to perform the shutdown functions using the procedures of Item e as well as to provide fire brigade members to fight the fire is available as required by the fire brigade technical specifications.

FPC Response 1.f - We would like to modify our response from the June 30, 1982 letter. There will be adequate manpower to bring the plant to cold shutdown using the normal shift personnel complement and to provide the necessary Fire Brigade consisting of 5 plant personnel (3 members of the Fire Brigade will be knowledgeable of plant systems). Presently the Fire Brigade consists of 3 Operators, 1 Chem/Rad Technician, and 1 Building Service person on each shift. However, Florida Power Corporation maintains the option to choose the Fire Brigade members.

ITEM 1.g OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.g - Provide a commitment to perform adequate acceptance tests of the alternative shutdown capability. These tests should verify tha : equipment operates from the local control station when the transfer or isolations which is placed in the "local" position and that the equipment cannot be operated from the control room; and that equipment operates from the control room but cannot be operated at the local control station when the transfer isolation switch is in the "remote" position.

FPC Response 1.g - Florida Power Corporation will perform acceptance tests of the DSP that will verify that: equipment operates from the local control station when the transfer or isolation switch is placed in the "local" position and that the equipment cannot be operated from the control room; and that equipment operates from the control room but cannot be operated at the local control station when the transfer isolation switch is in the "remote" position. These test procedures will be developed before the DSP becomes operational.

ITEM 1.h OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1.h - Provide Technical Specifications of the surveillance requirements and limiting conditions for operation for that equipment not already covered by existing Technical Specifications. For example, if new isolation and control switches are added to a shutdown system, the existing Technical Specifications surveillance requirements should be supplemented to verify system/equipment functions from the alternate shutdown station at testing intervals consistent with the guidelines of Regulatory Guide 1.22 and IEEE 338. Credit may be taken for other existing tests using group overlap test concepts.

FPC Response 1.h - Florida Power Corporation will submit Technical Specification changes for the surveillance requirements and limiting conditions for operation for that equipment not already covered by the existing Technical Specifications, after the completed design of the DSP and in sufficient time to allow NRC review and issuance prior to placing the DSP in service.

ITEM I.i OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item I.i - For new equipment comprising the alternative shutdown capability, verify that the systems available are adequate to perform the necessary shutdown function. The functions required should be based on previous analyses, if possible (e.g., in the FSAR), such as a loss of normal ac power or shutdown on Group 1 isolation (BW). The equipment required for the alternative capability should be the same or equivalent to that relied on in the above analysis.

FPC Response I.i - Attachment 2 lists systems, instrumentation and controls required to go to cold shutdown from outside the control room.

ITEM 1.j OF ATTACHMENT 1 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 1j - Verify that repair procedures for cold shutdown systems are developed and material for repairs is maintained onsite. Provide a summary of these procedures and a list of the material needed for repairs.

FPC Response 1j - FPC response 1e to Enclosure 1 of the June 30, 1982 letter provided a list of manual operator actions to shutdown the reactor. This response also listed the components requiring circuit repair and/or requiring replacement. The procedures required for each item are listed below.

1. Components Requiring Circuit Repair

Tag No.	Procedure/Comments
DHP-1A or 1B	MP-131 "Disassembly and Reassembly of BSP-1A and 1B and DHP-1A and 1B".
DCP-1A or 1B	MP-144 "Disassembly and Reassembly of Decay Heat Closed Cycle Cooling Pumps DCP-1A and 1B".
RWP-3A or 3B	MP-150 "Disassembly and Reassembly of Nuclear Services Seawater and Decay Heat Seawater System Pumps RWP-1, 3A, 3B, 2A and 2B".
AHF-15A or 15B	Utilize trained Heating, Ventilation and Air Conditioning (HVAC) journeyman for routine work. MP-404 "Electric Motor Bearing Replacement". PM-139 "HVAC Equipment Inspection and Service".
CD-6-LT	PM-132 "Plant Non-Safety Related Instrument Calibration". Utilize trained I&C Technicians for routine work.
CD-67-LT	SP-169 "Plant Safety-Related Instrument Calibration". Utilize trained I&C Technicians for routine work.

2. Components Requiring Replacement

Tag No.	Procedure/Comments
DCP-1A or 1B (motor only)	CP-133 "Procedure for Handling and Controlling Work Requests". This procedure covers determinating and reterminating of motor leads. The actual removal and reinstallation is within the normal skills of a journeyman.
CD-6-LT	PM-132 "Plant Non-Safety Related Instrument Calibration". Utilize trained I&C Technicians for routine work.
CD-67-LT	SP-169 "Plant Safety-Related Instrument Calibration". Utilized trained I&C Technicians for routine work.

It should be noted that there are many evolutions which are considered to be within the skills of a journeyman. These skills are routine in nature and of recurring characteristic. Therefore, there may not be a procedure which states how to remove/replace/repair some specific pieces of equipment/component.

ITEM 1.a OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For each fire area where an alternative or dedicated shutdown method, in accordance with Section III.G.3 of Appendix R is provided, the following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the alternative or dedicated shutdown method:

Provide a table that lists all the power cables in the fire area that connect to the same power supply of the alternative or dedicated shutdown method and the function of each power cable listed (i.e., power for RHR pump).

RESPONSE TO ITEM 1.a OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 of the NRC LETTER DATED 5/4/82

Item 1.a requests a list of the power cables in the fire area that connect to the same power supply as the alternative or dedicated shutdown method. The words "same power supply" are interpreted as meaning a power source not electrically protected from the circuit of concern by coordinated breakers, fuses, or similar devices as defined in Item 2.a of the "Associated Circuits of Concern" section of the 5/4/82 NRC letter. The power to the Dedicated Shutdown Panel is from the 120 V ac vital distribution panels located in the EFIC Equip.Rooms. One 30 amp branch fuse on each of the two vital distribution panels feeds the Dedicated Shutdown Panel. No other circuits are fed by these two fuses. (Figure 1 is a one-line sketch of the power distribution scheme which is typical for each of the two distribution apenls feeding the dedicated shutdown system).

Upstream of the vital distribution panels the 25 kVA inverter power source is shared with loads that are located in the main control room. However, upon detection of a fault condition in either the main control room or cable spreading room,static switch SW#1 transfers to the current limiting 30 kVA voltage regulator thereby isolating the 25 kVA inverter from the fault and allowing the 25 kVA inverter to continue feeding the Dedicated Shutdown Panel via Static Switch SW#2.

Consequently, no circuits are being listed in response to Item 1.a because any power cables that connect to the same power source as the Dedicated Shutdown Panel are provided with either coordinated fuses and breakers, or are isolated from the power source via transfer switches.

ITEM 1.b OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For each fire area where an alternative or dedicated shutdown method, in accordance with Section III.G.3 of Appendix R is provided, the following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the alternative or dedicated shutdown method:

Provide a table that lists all the cables in the fire area that were considered for possible spurious operation which would adversely affect shutdown and the function of each cable listed.

RESPONSE TO ITEM 1.b OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

The following tabulation lists the cables in the cable spreading room and main control room that were considered for spurious operation that could adversly affect safe plant shutdown. The cables are listed by system. The function of each cable is indicated.

ELECTRICAL POWER DISTRIBUTION SYSTEM

Ckt. No.	Function
MTM46	Control of 4160V Switchgear Bkr. 3205
MTM47	Control of 4160V Switchgear Bkr. 3205
MTM51	Control of 4160V Switchgear Bkr. 3206
MTM53	Control of 4160V Switchgear Bkr. 3206
MTM114	Control of 4160V Switchgear Bkr. 3220
MTM118	Control of 4160V Switchgear Bkr. 3221
MTM65	Control of 4160V Switchgear Bkr. 3209
MTM70	Control of 4160V Switchgear Bkr. 3210
MTL16	Control of 480V Switchgear Bkr. 3310
MTL21	Control of 480V Switchgear Bkr. 3311
MTM152	4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (3209)
MTM154	4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (3205)
MTM153	4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control
MTM161	4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control
MTM156	4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (3210)
MTM158	4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (3206)
MTM157	4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control
MTM162	4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control
EGM2	Sync. Potential & Control for Diesel Gen. 3A
EGM12	Sync. Potential & Control for Diesel Gen. 3B

NUCLEAR SERVICES AND DECAY HEAT SEAWATER SYSTEM

Cat. No.	Function
RWM12	Control of Emerg. Nuc. Serv. Sea Water Pump 3A (RWP-2A)
RWM14	Intlk. for Emerg. Nuc. Serv. Sea Water Pump 3A (RWP-2A)
RWM17	Control of Emerg. Nuc. Serv. Sea Water Pump 3B (RWP-2B)
RWM19	Intlk.for Emerg. Nuc. Serv. Sea Water Pump 3B (RWP-2B)
RWM36	Intlk.for Emerg. Nuc. Serv. Sea Water Pump 3B (RWP-2B)

RESPONSE TO ITEM 1.b (Cont'd)

NUCLEAR SERVICES AND DECAY HEAT SEAWATER SYSTEM (Cont'd)

Ckt. No.	Function
RWM23	Control of Decay Heat Serv. Sea Water Pump 3A (RWP-3A)
RWM25	Intlk. for Decay Heat Serv. Sea Water Pump 3A (RWP-3A)
RWM28	Control of Decay Heat Serv. Sea Water Pump 3B (RWP-3B)
RWM30	Intlk. for Decay Heat Serv. Sea Water Pump 3B (RWP-3B)

DECAY HEAT CLOSED CYCLE COOLING SYSTEM

Ckt. No.	Function
DCL2	Control of Decay Heat Closed Cycle Pump 3A (DCP-1A)
DCL4	Intlk. for Decay Heat Closed Cycle Pump 3A (DCP-1A)
DCL11	Intlk. for Decay Heat Closed Cycle Pump 3A (DCP-1A)
DCL6	Control of Decay Heat Closed Cycle Pump 3B (DCP-1B)
DCL8	Intlk. for Decay Heat Closed Cycle Pump 3B (DCP-1B)
DCL12	Intlk. for Decay Heat Closed Cycle Pump 3B (DCP-1B)
DCS13	Control Signal for E/P Converter DH-17-E/P
DCS14	Control Signal for E/P Converter DH-18-E/P

MAIN STEAM SYSTEM

Ckt. No.	Function
MSE6	Control of Main Steam Iso. Valve to Emerg. Feedwater Pump Turbine (MSV-56)
MSE16	Control of Main Steam Iso. Valve to Emerg. Feedwater Pump Turbine (MSV-55)

AIR HANDLING SYSTEM

Ckt. No.	Function
AHC115	Control of Reactor Bldg. Fan 3A (AHF-1A)
AHC116	Intlk. for Reactor Bldg. Fan 3A (AHF-1A)
AHC125	Control of Reactor Bldg. Fan 3B (AHF-1B)
AHC126	Intlk. for Reactor Bldg. Fan 3B (AHF-1B)
AHC140	Control of Reactor Bldg. Fan 3C (AHF-1C)
AHC107	Intlk. for Reactor Bldg. Fan 3C (AHF-1C)
AHC135	Intlk. for Reactor Bldg. Fan 3C (AHF-1C)
AHC137	Intlk. for Reactor Bldg. Fan 3C (AHF-1C)
AHC527	Control of Diesel Gen. Room Fan 3A (AHF-22A)
AHF70	Intlk. for Diesel Gen. Room Fan 3A (AHF-22A)
AHC528	Intlk. for Diesel Gen. Room Fan 3A (AHF-22A)
AHC537	Control of Diesel Gen. Room Fan 3B (AHF-22B)
AHC538	Intlk. for Diesel Gen. Room Fan 3B (AHF-22B)
AHC547	Control of Diesel Gen. Room Fan 3C (AHF-22C)
AHC548	Intlk. for Diesel Gen. Room Fan 3C (AHF-22C)
AHC549	Intlk. for Diesel Gen. Room Fan 3C (AHF-22C)
AHF80	Intlk. for Diesel Gen. Room Fan 3C (AHF-22C)
AHC557	Control of Diesel Gen. Room Fan 3D (AHF-22D)

RESPONSE TO ITEM 1.b (Cont'd)

AIR HANDLING SYSTEM (Cont'd)

Ckt. No.	Function
AHC558	Intlk. for Diesel Gen. Room Fan 3D (AHF-22D)
AHC559	Intlk. for Diesel Gen. Room Fan 3D (AHF-22D)

EMERGENCY FEEDWATER SYSTEM

Ckt. No.	Function
EFE27	Turbine Driven EF Pump Discharge Iso. Valve to Steam Gen. (EFV-11)
EFE47	Turbine Driven EF Pump Discharge Iso. Valve to Steam Gen. (EFV-32)

REACTOR COOLANT SYSTEM

Ckt. No.	Function
RCF19	Control of Pressurizer Electromatic Relief Valve (RCV-10)
RCE62	Control of Pressurizer Electromatic Relief Valve (RCV-10)
RCE63	Control of Pressurizer Electromatic Relief Valve (RCV-10)
RCR217	Control of Pressurizer Electromatic Relief Valve (RCV-10)
RCC255	Control of Pressurizer Relief Block Valve (RCV-11)
RCC256	Control of Pressurizer Relief Block Valve (RCV-11)
RCR2	Power and Level Signal for Pressurizer Level Xmetter #1
RCR4	Power and Level Signal for Pressurizer Level Xmitter #2
RCR9	Power and Level Signal for Pressurizer Level Xmitter #3
RCR5	Pressurizer Level Signal to Control Board Indicator #1
RCR6	Pressurizer Level Signal to Control Board Indicator #2
RCR16	Pressurizer Level Signal to Control Board Indicator #3

MAKEUP AND PURIFICIATION SYSTEM

Ckt. No.	Function
MUM3	Control of Makeup and Purif. Pump 3A (MUP-1A)
MUM5	Intlk. for Makeup and Purif. Pump 3A (MUP-1A)
MUM15	Control of Makeup and Purif. Pump 3B (MUP-1B
MUM21	Control of Makeup and Purif. Pump 3B (MUP-1B)
MUM17	Intlk. for Makeup and Purif. Pump 3B (MUP-1B)
MUM23	Intlk. for Makeup and Purif. Pump 3B (MUP-1B
MUC3	Control of MU&P Pump 3A Main Lube Oil Pump (MUP-2A)
MUC24	Control of MU&P Pump 3A Main Gear Oil Pump (MUP-4A)
MUC26	Intlk. for MU&P Pump 3A Main Gear Oil Pump (MUP-4A)
MUC8	Control of MU&P Pump 3B Main Lube Oil Pump (MUP-2B)
MUC34	Control of MU&P Pump 3B Main Gear Oil Pump (MUP-4B)
MUC37	Intlk. for MU&P Pump 3B Main Gear Oil Pump (MUP-4B)
MUC103 thru 107	Control of MU Iso. Valve to Reactor Inlet Lines Loop A (MUV-27)

MAKEUP AND PURIFICATION SYSTEM (Cont'd)

Ckt. No.	Function
MUC123 thru 125	Control of Valve from BWST to MU Pump (MUV-73)
MUC113	Control of Valve from BWST to MU Pump (MUV-58)
MUC114	Intlk. for Valve from BWST to MU Pump (MUV-58)
MUC115	Intlk. for Valve from BWST to MU Pump (MUV-58)
MUC267	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-25)
MUF309	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-25)
MUF311	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-25)
MUC268	Intlk. for HPI Valve to Reactor Inlet Lines Loop B (MUV-25)
MUF303	Intlk. for HPI Valve to Reactor Inlet Lines Loop B (MUV-25)
MUC273	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-26)
MUF310	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-26)
MUF312	Control of HPI Valve to Reactor Inlet Lines Loop B (MUV-26)
MUC274	Intlk. for HPI VAlve to Reactor Inlet Lines Loop B (MUV-26)
MUF304	Intlk. for HPI Valve to Reactor Inlet Lines Loop B (MUV-26)

AUXILIARY STEAM SYSTEM

Ckt. No.	Function
ASE7	Control of Turbine Driven EFW Pump Turbine Stop Valve (ASV-5)
ASE10	Control of Turbine Driven EFW Pump Turbine Stop Valve (ASV-5)
ASE11	Control of Turbine Driven EFW Pump Turbine Stop Valve (ASV-5)

CHEMICAL ADDITION SYSTEM

Ckt. No.	Function
CAC74	Control of RC Letdown Sampling Iso. Valve (CAV-126)
CAC75	Control of RC Letdown Sampling Iso. Valve (CAV-126)
CAC101	Control of RC Letdown Sampling Iso. Valve (CAV-126)

REACTOR COOLANT SYSTEM INSTRUMENTATION

Ckt. No.	Function
RCR88	RC Press. Sig. from Xmitter RC-3A-PT3 to NNI Cabinet
RCR87	RC Press. Sig. from Xmitter RC-3A-PT3 to NNI Cabinet
RCR92	RC Press. Sig. from Xmitter RC-3A-PT4 to NNI Cabinet
RCR96	RC Press. Sig. from Xmitter RC-3B-PT3 to NNI Cabinet
RCR97	RC Press. Sig. from Xmitter RC-3B-PT3 to NNI Cabinet
RCR19 thru 22	RC Press. Sig. from NNI Cab. to Control Board Indicators
RCH4	Stm. Gen. 3A Outlet Temp. Signal from RTD RC-4A-TE2 to NI&P Cab.
RCH16	Stm. Gen. 3B Outlet Temp. Signal from RTD RC-4B-TE2 to NI&P Cab.
RCH28	Stm. Gen. 3A Outlet Temp. Signal from RTD RC-4A-TE3 to NI&P Cab.
RCH40	Stm. Gen. 3B Outlet Temp. Signal from RTD RC-4B-TE3 to NI&P Cab.

NUCLEAR SERVICE CLOSED CYCLE COOLING SYSTEM

Ckt. No.	Function
SWM10	Control of Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A
SWM33	Control of Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A
SWM34	Control of Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A
SWM12	Intlk. for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A
SWM16	Control of Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B
SWM18	Intlk. for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B
SWM19	Intlk. for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B
SWE17	Control of Reactor Bldg. Fan 3A Inlet Valve (SWV-35)
SWE15	Intlk. for Reactor Bldg. Fan 3A Inlet Valve (SWV-35)
SWE22	Control of Reactor Bldg Fan 3B Inlet Valve (SWV-37)
SWE21	Intlk. for Reactor Bldg. Fan 3A Inlet Valve (SWV-37)
SWE350	Control of Reactor Bldg. Fan 3C Inlet Valve (SWV-39)
SWE31	Intlk. for Reactor Bldg. Fan 3C Inlet Valve (SWV-39)
SWE42	Control of Reactor Bldg. Fan 3A Disch. Valve (SWV-41)
SWE41	Intlk. for Reactor Bldg. Fan 3A Disch. Valve (SWV-41)
SWE53	Control of Reactor Bldg. Fan 3B Disch. Valve (SWV-43)
SWE52	Intlk. for Reactor Bldg. Fan 3B Disch. Valve (SWV-43)
SWE360	Control of Reactor Bldg. Fan 3C Disch. Valve (SWV-45)
SWE61	Intlk. for Reactor Bldg. Fan 3C Disch. Valve (SWV-45)
SWE280	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-353)
SWE282	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-353)
SWE290	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-353)
SWE283 thru 285	Intlk. for Reactor Bldg. Fan Assembly Transfer Valve (SWV-353)
SWE-280	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-354)
SWE-337	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-354)
SWE-345	Control of Reactor Bldg. Fan Assembly Transfer Valve (SWV-354)
SWE338 thru 340	Intlk. for Reactor Bldg. Fan Assembly Transfer Valve (SWV-354)

ITEM 1.c OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For each fire area where an alternative or dedicated shutdown method, in accordance with Section III.G.3 of Appendix R is provided, the following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the alternative or dedicated shutdown method:

Provide a table that lists all the cables in the fire area that share a common enclosure with circuits of the alternative or dedicated shutdown systems and the function of each cable listed.

Response to Item 1.c of the "Fire Area Approach" section of Attachment 2 to Enclosure 2 of the NRC letter dated 5/4/82

Item 1.c requests a listing of the cables in the fire area that share a common enclosure with circuits of the alternative or dedicated shutdown systems. Figure 2 is a block diagram of the dedicated shutdown system. The circuits for the dedicated shutdown system are the cables connected between the Dedicated Shutdown Panel, Dedicated Shutdown Relay Cabinets, Dedicated Shutdown Auxiliary Equipment Cabinets, Resistor Boxes and the 120VAC Vital Distribution Panels.

As shown in the block diagram, circuits from the main control room terminate at the relay cabinets, the auxiliary equipment cabinets, and the Dedicated Shutdown Panel. Consequently, these components serve as common enclosures to the dedicated shutdown circuits and to the circuits located in the fire areas for which the dedicated shutdown method is provided.

The following tabulation lists the circuits from the main control room that terminate at the common enclosures. Circuits shown with an asterisk terminate at the Dedicated Shutdown Panel. Circuits without an asterisk terminate at either the Dedicated Shutdown Relay Cabinets or the Dedicated Shutdown Auxiliary Equipment Cabinets.

Ckt. No.	Function
AHC926	Control for Reactor Building Fan 3A (AHF-1A)
AHC928	Control for Reactor Building Fan 3B (AHF-1B)
AHE75	Control for Containment Purge Valves 3A & 3D
AHE77	Control for Control Complex Air Supply Valve AH-517-SV
AHE79	Control for Control Complex Air Supply Valve AH-518-SV
*ARE184	Control for Condenser Vacuum Breaker Valve ARV-48
*ARE189	Control for Condenser Vacuum Breaker Valve ARV-49
ASE23	Control for Emergency Feedwater Pump Turbine Stop Valve ASV-5
BSR27	Signal from Building Spray Pressure Transmitter B5-16-PT
BSR30	Signal from Building Spray Pressure Transmitter BS-17-PT
CIE62	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-34
CIE65	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-34
CIE66	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-35
CIE69	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-35
CIE70	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-40
CIE73	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-40
CIE74	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-41
CIE77	Control for Reactor Cavity Cooling Coil Iso. Valve CIV-41
DCL16	Control for Decay Heat Closed Cycle Cooling Water Pump 3A (DCP-1A)
DCL14	Control for Decay Heat Closed Cycle Cooling Water Pump 3B (DCP-1B)
DHR37, 40, 43, 46	Decay Heat Temperature Instrumentation Signals
DHR59, 62	Decay Heat Flow Instrumentation Signals
*DHS24	Decay Heat Level Instrumentation Signals
DHM15	Control for Decay Heat Pump 3A (DHP-1A)
DHM18	Control for Decay Heat Pump 3B (DHP-1B)
DHC133	Control for Decay Heat Removal Outlet Valve DHV-3
DHC137	Control for Decay Heat Removal Outlet Valve DHV-4

Ckt. No.	Function
DHC142	Control for Low Pressure Injection Containment Iso. Valve DHV-5
DHC145	Control for Low Pressure Injection Containment Iso. Valve DHV-6
DHC149	Control for Decay Heat Cooler Discharge Valve DHV-110
DHC152	Control for Decay Heat Cooler Discharge Valve DHV-111
DHC156	Control for Decay Heat Suction Valve DHV-34 from BWST
DHC158	Control for Decay Heat Suction Valve DHV-35 from BWST
DHC162	Control for Decay Heat Removal Outlet Valve DHV-41
DHC166	Control for Decay Heat Suction Valve DHV-42 from Reactor Building Sump
DHC169	Control for Decay Heat Suction Valve DHV-43 from Reactor Building Sump
* DHC171	Control for Decay Heat to Pressurizer Spray Outside Isolation Valve DHV-91
EFE63	Control for Motor Driven Emerg. Feedwater Pump 3A (EFP-1)
*EFC25	Control for Motor Driven EFW Pump to Cond. Stor. Tk. Iso. Valve EFV-3
*EFC27	Control for Turbine Driven EFW Pump to Cond. Stor. Tk. Iso. Valve EFV-4
*EFC30	Control for Motor Driven EFW Pump Discharge Valve EFV-7
*EFC33	Control for Turbine Driven EFW Pump Discharge Valve EFV-8
*EFE65	Control for Turbine Driven EFW Pump to Hotwell Iso. Valve EFV-1
*EFE69	Control for Motor Driven EFW Pump to Hotwell Iso. Valve EFV-2
EFE74	Control for Turbine Driven EFW Pump Discharge Isolation to Steam Generator Valve EFV-11
EFE77	Control for Motor Driven EFW Pump Discharge Isolation to Steam Generator Valve EFV-14
EFE80	Control for Turbine Driven EFW Pump Discharge Isolation to Steam Generator Valve EFV-32
EFE83	Control for Motor Driven EFW Pump Discharge Isolation to Steam Generator Valve EFV-33
ESK77, 78	Decay Heat Removal Valve Trouble Alarm Circuits
MSE72	Control for Steam Gen. to EFW Pump Turbine Iso. Valve MSV-56
MSE75	Control for Steam Gen. to EFW Pump Trubine Iso. Valve MSV-55
MUM43	Control for Makeup and Purification Pump 3A (MUP-1A)
MUM46, 49	Control for Makeup and Purification Pump 3B (MUP-1B)
MUM52	Control for Makeup and Purification Pump 3C (MUP-1C)
MUC310	Control for Letdown Cooler 3A Inlet Iso. Valve MUV-38
MUC313	Control for Letdown Cooler 3B Inlet Iso. Valve MUV-39
MUC317	Control for Letdown Cooler 3A Inlet Iso. Valve MUV-40
MUC320	Control for Letdown Cooler 3B Inlet Iso. Valve MUV-41
MUC323	Control for MU&P Sys. Demin. Bleed Valve MUV-112
*MUC326	Control for MU&P Iso. Valve MUV-27 to Reactor Inlet Line Loop A
MUC328	Control for H.P. Pump Suction from BWST Valve MUV-58

Ckt. No.	Function
MUC332	Control for BWST to Makeup Pump Valve MUV-73
MUC336	Control for H.P. Injection Control Valve MUV-23 to Reactor Inlet Lines Loop A.
MUC340	Control for H.P. Injection Control Valve MUV-24 to Reactor Inlet Lines Loop A
MUC344	Control for H.P. Injection Control Valve MUV-25 to Reactor Inlet Lines Loop B
MUC348	Control for H.P. Injection Control Valve MUV-26 to Reactor Inlet Lines Loop B
*MUC350	Control for RC Pump Seal Iso. Valve MUV-18
MUC352	Control for Makeup Pump Recirc. Valve MUV-257
MUC356	Control for Makeup Pump Recirc. Valve MUV-53
MUC359	Control for RC Pump Seal Bleedoff Valve MUV-258
MUC363	Control for RC Pump Seal Bleedoff Valve MUV-259
MUC368	Control for RC Pump Seal Bleedoff Valve MUV-260
MUC372	Control for RC Pump Seal Bleedoff Valve MUF-261
MUE153	Control for Letdown Cooler Iso. Valve MUV-49
MUE157	Control for RC Pump Seal Bleedoff Shutoff Valve MUV-253
MUE160, 164	Control for Primary Iso. Valve MUV-64
MUC374	Control for Makeup Pump Suction Crossover Valve MUV-62
MUC376	Control for Makeup Pump Discharge Crossover VAlve MUV-3
MUC380	Control for Makeup Pump Suction Crossover Valve MUV-69
MUC384	Control for Makeup Pump Discharge Crossover Valve MUV-9
*MUR79	Letdown Pressure Transmitter Signal
MUR82, 86	Makeup Tank Level Transmitter Signal
*MUR88	RC Makeup Flow Transmitter Signal
MUR91, 94, 97, 100	Emerg. RC Flow Transmitter Signal
RCM118, 119	Control for Reactor Coolant Pump 3A1 (RCP-1A)
RCM122, 123	Control for Reactor Coolant Pump 3A2 (RCP-1B)
RCM126, 127	Control for Reactor Coolant Pump 3B1 (RCP-1C)
RCM130, 131	Control for Reactor Coolant Pump 3B2 (RCP-1D)
*RCC302	Control for Pressurizer Relief Block Valve RCV-11
*RCC305	Control for Pressurizer Spray Line Block Valve RCV-13
*RCC309	Control for Pressurizer Spray Line Flow Valve RCV-14
*RCC311	Control for Reactor Coolant Low Press. Spray Valve RCV-53
RCC313	Control for Pressurizer Heaters Group #7
*RCC316	Control for Pressurizer Heaters Group #8
*RCC318	Control for Pressurizer Heaters Group #9
RCC320	Control for Pressurizer Heaters Group #10
*RCC323	Control for Pressurizer Heaters Group #11
*RCC325	Control for Pressurizer Heaters Group #12
*RCC327	Control for Pressurizer Heaters Group #13
*RCE86	Control for Pressurizer Electromatic Relief Valve RCV-10
RCR241, 245	Pressurizer Water Temperature (RTD) Signal
RCR233, 237	Pressurizer Level Transmitter Signal
RCR249, 253	RC Outlet & Unit Temperature (RTD) Signal
RCR257, 261	RC Temperature (RTD) Wide Range Signal
RWM41	Control of Emerg. Nuclear Serv. Seawater Pump 3A (RWP-2A)
RWM43	Control of Emerg. Nuclear Serv. Seawater Pump 3B (RWP-2B)
RWM46	Control of Decay Heat Serv. Seawater Pump 3A (RWP-3A)
RWM48	Control of Decay Heat Serv. Seawater Pump 3B (RWP-3B)

Ckt. No.	Function
SWM42	Control of Normal Nuclear Serv.Closed Cycle Cooling Pump 3 (SWP-1C)
SWM45	Control of Emerg. Nuclear Serv. Closed Cycle Cooling Pump 3A (SWP-1A)
SWM48	Control of Emerg. Nuclear Serv. Closed Cycle Cooling Pump 3B (SWP-1B)
SWC32	Control of Nuclear Serv. Booster Pump 3A (SWP-2A)
SWC34	Control of Nuclear Serv. Booster Pump 3B (SWP-2B)
SWE379, 382	Control of Auxiliary Service Iso. Valve SWV-12
SWE385	Control of RB Fan 3A Inlet Valve SWV-35
SWE388	Control of RB Fan 3B Inlet Valve SWV-37
SWE391	Control of RB Fan 3C Inlet Valve SWV-39
SWE394	Control of RB Fan 3A Discharge Valve SWV-41
SWE395	Control of RB Fan 3B Discharge Valve SWV-43
SWE400	Control of RB Fan 3C Discharge Valve SWV-45
SWE403, 405	Control of Letdown Cooler 3A Supply Valve SWV-47
SWE412, 414	Control of Letdown Cooler 3B Supply Valve SWV-48
SWE419, 421	Control of Letdown Cooler 3A Return Valve SWV-50
SWE426, 428	Control of Letdown Cooler 3B Return Valve SWV-49
SWE435, 437	Control of RC Pump 3A2 Cooler Supply Valve SWV-79
SWE443, 445	Control of RC Pump 3A1 Cooler Supply Valve SWV-80
SWE451, 453	Control of RC Pump 3B2 Cooler Supply Valve SWV-81
SWE459, 461	Control of RC Pump 3B1 Cooler Supply Valve SWV-82
SWE467, 469	Control of RC Pump 3A2 Cooler Return Valve SWV-83
SWE474, 476	Control of RC Pump 3A1 Cooler Return Valve SWV-84
SWE481, 483	Control of RC Pump 3B2 Cooler Return Valve SWV-85
SWE488, 490	Control of RC Pump 3B1 Cooler Return Valve SWV-86
SWE495, 497	Control of CRDM Supply Valve SWV-109
SWE504, 506	Control of CRDM Return Valve SWV-110
SWE513, 528	Control of RB Fan Assembly Transfer Valve SWV-353
SWE524, 527	Control of RB Fan Assembly Transfer Valve SWV-354
SWE531	Control of RB Fan Assembly Transfer Valve SWV-355
SWE534	Control of RB Fan Assembly Transfer Valve SWV-151
SWE537, 540	Control of RB Fan Assembly Transfer Valve SWV-152
MTM179	Control of 4 kV ES Swgr. Bkr. 3209
MTM181	Control of 4 kV ES Swgr. Bkr. 3210
MTM186	Control of 4 kV ES Swgr. Bkr. 3205
MTM187	Control of 4 kV ES Swgr. Bkr. 3205
MTM190	Control of 4 kV ES Swgr. Bkr. 3206
MTM191	Control of 4 kV ES Swgr. Bkr. 3206
MTM183	Control of 4 kV ES Swgr. Bkr. 3221
MTM185	Control of 4 kV ES swgr. Bkr. 3220
MTL112	Control of 480V ES swgr. Bkr. 3310
MTL114	Control of 480V ES Swgr. Bkr. 3311
AHC930	Control of Diesel Gen. Rm. Air Handling Fan 3C (AHF-22C)
AHC932	Control of Diesel Gen. Rm. Air Handling Fan 3A (AHF-22A)
MUC391	Control of Makeup & Purification Pump 3A Main Lube Oil Pump (MUP-2A)
MUC393	Control of Makeup & Purification Pump 3B Main Lube Oil Pump (MUP-2B)

Ckt. No.	Function
MUC394	Control of Makeup & Purification Pump 3A Main Gear Oil Pump (MUP-4A)
MUC396	Control of Makeup & Purification Pump 3B Main Gear Oil Pump (MUP-4B)
CAC112	Control of RC Letdown Sampling Iso. Valve CAV-126
CAC113	Control of RC Letdown Sampling Iso. Valve CAV-126
EGM56	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14
MTM194	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14
EGM53	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2
MTM142	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2

ITEM 1.d OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For each fire area where an alternative or dedicated shutdown method, in accordance with Section III.G.3 of Appendix R is provided, the following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the alternative or dedicated shutdown method:

Show that fire-induced failures (hot shorts, open circuits or shorts to ground) of each of the cables listed in a, b, and c will not prevent operation or cause maloperation of the alternative or dedicated shutdown method.

RESPONSE TO ITEM 1.d OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

Item 1.d requests information showing that fire induced failures of the cables listed in Items 1.a, 1.b and 1.c will not prevent operation or cause maloperation of the alternative or dedicated shutdown method.

CABLES LISTED IN ITEM 1.b (CIRCUITS CONSIDERED FOR SPURIOUS OPERATION)

Ckt. RWM36

This circuit is used for wiring two auxiliary relays which are used for alarm and to automatically start the Emergency Nuclear Service Seawater Pump 3B on low pressure. Failure of this circuit will not affect manual control of the pump. In addition, the control circuit for the redundant pump is not affected by failure of this circuit, and will be available in the event of a fire in either the main control room or cable spreading room.

Ckts. DCL11 and DCL12

These circuits are used in wiring auxiliary relays which are used only for alarm purposes for Decay Heat Closed Cycle Cooling Pumps 3A and 3B. Failure of these circuits will not affect the operability of either of the two pumps.

Ckts. DCS13 and DCS14

These circuits provide signals to E/P converters which control the outlet and bypass valves for the Decay Heat Removal Heat Exchangers. Failure of these circuits will cause these valves to go to the safe position and consequently, will not jeopardize shutdown operation. Also, there will be sufficient time for manual operation of these valves if the plant is being shutdown in the event of a fire.

Ckts. AHC107, 135, 137 and 140

These circuits are used for the control of Reactor Building Fan 3C. Only one of the three Reactor Building Fans is required to operate when shutting down in the event of a fire. Fans 3A and 3B are being relied upon for this purpose. Consequently, failure of the circuits for Fan 3C will not affect plant shutdown in the event of a fire.

Ckts. AHC528, 548 and 549

These circuits are used in wiring auxiliary relays which interlock with Diesel Generator Room Fans 3A and 3C. Failure of these circuits will affect the operation of the fans. However, a review of the relay room during the Appendix R fire study indicated that these particular auxiliary relays must be relocated in another fire area in order to resolve separation problems with redundant relays for fans 3B and 3D. Relocation of these relays will require the installation of new circuits, and the new circuits will be routed to bypass the main control room and cable spreading room thereby avoiding the fire areas for which the dedicated shutdown is being provided.

Ckts. AHF70 and AHF80

These circuits are used in wiring auxiliary relays which are used only for alarm and indication for Diesel Generator Room Fans 3A and 3C. Failure of these circuits will not affect the control and operation of the fans.

Ckts. AHC537, 538, 557, 558 and 559

These circuits are used for control of Diesel Generator Room Fans 3B and 3D. Since each Diesel Generator Room contains two 100% capacity fans (3A and 3B for DG Room A and 3C and 3D for DG Room B), fans 3A and 3C are being relied upon when the dedicated shutdown method is being used. Consequently, the failure of the circuits for fans 3B and 3D will not affect plant shutdown operation.

Ckt. RCE63

This circuit is used in wiring the control circuit of the Pressurizer Power Actuated Relief Valve. For the purpose of shutting down in the event of a fire, this valve is considered redundant to the Emergency Feedwater System. The Emergency Feedwater System is operable from the dedicated shutdown panel, and consequently the failure of the control for the power actuated relief valve will not jeopardize plant shutdown when the dedicated shutdown method is being used.

Ckt. MUC26

This circuit is used in wiring an auxiliary relay which interlocks in the control circuit for the Main Gear Oil Pump for Makeup and Purification Pump 3A. Failure of this circuit will affect operation of the oil pump. However, a review of the relay room indicated that this auxiliary relay must be relocated to another fire area in order to separate it from another relay used in the Backup Gear Oil Pump for MU&P Pump 3A. Otherwise, a fire in the relay room could disable both gear oil pumps for MU&P Pump 3A. The relocation of the auxiliary relay for the main gear oil pump will result in a new circuit being installed for the relay. The new circuit will be routed to bypass the main control room and cable spreading room thereby avoiding the fire areas for which the dedicated shutdown is being provided.

Ckt. MUC37

This circuit is used in wiring an auxiliary relay which interlocks in the control circuit for the Main Gear Oil Pump for Makeup and Purification Pump 3B. The analysis of this circuit is similar to the analysis for Ckt. MUC26 above.

Ckts. MUE59 and MUE70

Circuits MUE59 and MUE70 are used in the control of the Backup Gear Oil Pumps for Makeup and Purification Pumps 3A and 3B respectively. The Main Gear Oil Pumps are being relied upon when the dedicated shutdown method is being used. Consequently, failure of these circuits will not effect plant shutdown operation.

Ckt. MUC115, 106 and 125

These circuits are used in wiring relays which interlock with the control circuits for motor operated valves used in the makeup pump charging paths. Circuits MUC106 and MUC125 pertain to valves in the "A" charging path and circuit MUC 115 pertains to a valve in the "B" charging path. Failure of these circuits could affect the operability of the valves. However, a review of the relay room indicated that the relay associated with the valve in "B" charging path must be relocated to another fire area in order to separate it from the relays associated with valves in the "A" charging path. Relocation of this relay will result in a new circuit being installed for the relay. The new circuit will be routed to bypass the main control room and cable spreading room, thereby avoiding the fire areas for which dedicated shutdown is being provided. Consequently, the "B" charging path will be available when dedicated shutdown is being used, and failure of circuits MUC106 and MUC125 for the "A" charging path will not affect shutdown operation.

Ckt. ASE10

This circuit is used in wiring an auxiliary relay which is used only for alarm for the Turbine Driven EFW Pump Steam Inlet Isolation Valve. Although this circuit and relay do not directly interlock with the control of the valve, failure of this circuit could cause loss of power to the valve control circuit. This will be resolved by installing a new circuit to bypass the cable spreading room and main control room. The new circuit will then be outside of the fire areas for which the dedicated shutdown method is being provided.

Ckt. ASE11

This circuit is used in wiring two auxiliary relays each of which interfaces with the motor driven EFW pump and the inlet steam isolation valve for the Turbine driven EFW pump. The relays are located in the relay room, and consequently, a fire in the relay room could disable both EFW pumps. In order to resolve this, a set of parallel relays will be installed in a separate fire area and will be properly fused to preclude the possibility of a fire in one fire area disabling both EFW pumps. The relays in the relay room will interlock with the motor driven EFW pump, and the new parallel relays will interlock with the inlet steam isolation valve of the turbine driven EFW pump. Circuit ASE11 presently interfaces with this valve from the relays in the relay room. Therefore, this circuit will be voided and a new circuit will be installed to the parallel relays. The new circuit will be routed to bypass the cable spreading room and main control room, thereby avoiding the fire areas for which the dedicated shutdown mehtod is being provided.

Ckt. CAC101

This circuit is used for wiring an auxiliary relay which interlocks with the control circuit of Reactor Coolant Letdown Sampling Isolation Valve CAV-126. This valve will be used to obtain an RC sample to determine boration when the dedicated shutdown system is being used. In the event of a fire occuring in fire areas other than the main control room or cable spreading room, either this valve or Post Accident Sampling Isolation Valves CAV-429 and 430 will be used to obtain an RC sample. All three valves, however, have auxiliary relays located in the relay room. In order to preclude a relay room fire from disabling all three valves, the auxiliary

relay for CAV-126 will be relocated in a separate fire area. The relocation of this auxiliary relay will result in a new circuit being installed for the relay. Consequently, circuit CAC101 will be voided and the new circuit will be routed to bypass the cable spreading room and main control room, thereby avoiding the fire areas for which the dedicated shutdown method is being provided.

Ckts. SWM33 and SWM19

Circuits SWM33 and SWM19 are used in wiring auxiliary relays for Emergency Nuclear Service Closed Cycle Cooling Pumps 3A and 3B respectively. The failure of these circuits may affect the capability of tripping the particular pump which is operating. However, circuit failure will not affect continuous operation of the pumps, nor will it affect the capability to start the particular pump if it is not already operating. Consequently, circuit failure will not affect safe shutdown operation when using the dedicated shutdown method.

Ckts. SWE31 and SWE61

These circuits are used in wiring auxiliary relays which interlock with the nuclear service water inlet and discharge valves for Reactor Building Fan 3C. RB Fan 3C is not relied upon when shutting down in the event of a fire. Therefore, the failure of these circuits will not affect the dedicated shutdown method.

Ckts. SWE15, 41, 21 and 52

Circuits SWE15 and 41 are used for wiring auxiliary relays which interlock with the nuclear service water inlet and discharge valves for Reactor Building Fan 3A, and circuits SWE21 and 52 are used in wiring auxiliary relays which interlock with the nuclear service water inlet and discharge valves for Reactor Building Fan 3B. The relays are presently located in the relay room. In order to assure that a fire will not disable both fans, the relays that interlock with the valves for the "A" fan will be relocated to a separate fire area. As a result of relocating these relays, new circuits will be installed for the relays. Circuits SWE15 and 41 will then be voided, and the new circuits will be routed to bypass the cable spreading room and main control room. Reactor Building Fan 3A will then be relied upon when the dedicated shutdown method is used, and the failure of circuits SWE21 and 52 will not affect safe shutdown operation.

Ckts. SWE280, 285 and 340

These circuits are used in wiring four auxiliary relays which interlock with Reactor Building Fan Assembly Transfer Valves SWV-353 & 354. Each valve is a double solenoid valve. Since the four relays are presently located in the relay room, the two relays which interlock with the "A" solenoid of each valve will be relocated in a separate fire area to preclude a relay room fire from disabling both redundant solenoids of each valve. The relocation of these relays will require that new circuits be installed for the relays. These new circuits will be routed to bypass the cable spreading room and main control room, thereby avoiding the fire areas for which dedicated shutdown is being provided. The "A" solenoids of these valves will then be relied upon when the dedicated shutdown method is used, and the failure of the circuits for the "B" solenoids will not affect plant shutdown operation.

All other circuits listed for Item 1.b will be isolated from the fire areas via the isolation relays located in either the Dedicated Shutdown Relay Cabinets, or the Dedicated Shutdown Panel. This will be accomplished by either (1) pulling the existing circuit back from the main control room and rerouting it to the isolation relays and then installing a new circuit from the isolation relays to the main control room, or (2) "sparing" the existing circuit and installing new circuits from the main control room to the isolation relays, and from the isolation relays to the required safe shutdown components.

Cables listed in Item 1.c (Circuits sharing a common enclosure with dedicated shutdown circuits)

Ckts. RCR233 and RCR237

Circuit RCR233 feeds a Pressurizer Level signal from Auxiliary Equipment Cabinet "A" to the main control room, and circuit RCR237 feeds the redundant signal from Auxiliary Equipment Cabinet "B" to the main control room. Indication is provided at the main control room and at the Dedicated Shutdown Panel. A fire in any one fire area will not disable both redundant signals. The signals are transformer coupled to each indicator. Thus, a circuit failure in the main control room or cable spreading room will not affect the indicators on the Dedicated Shutdown Panel.

Ckts. RCR249 and RCR253

The installation of these circuits and their respective indicators is identical to that described above for circuits RCR233 and RCR237. Failure of these circuits will not affect the dedicated shutdown method.

Ckts. RCR257 and RCR261

The installation of these circuits and their respective indicators is identical to that described above for circuits RCR233 and RCR237. Failure of these circuits will not affect the dedicated shutdown method.

Ckts. BSR27, 30
DHR37, 40, 43, 46, 59, 62
DHS24
MUR79, 82, 86, 88, 91, 94, 97, 100
RCR 241, 245

These circuits pertain to instrumentation which is not required for shutdown in the event of a fire. Consequently, failure of these circuits will not affect the dedicated shutdown method.

The remaining circuits listed for Item 1.c terminate at the isolation relays located in either the Dedicated Shutdown Relay Cabs. or the Dedicated Shutdown Panel.

Circuits terminating at the Isolation Relay Cabinets:

For equipment required to function immediately or soon after the occurrence of a fire, the circuits for the redundant components terminate at the respective Dedicated Shutdown Relay Cabinets located in the 4KV switchgear rooms. A fire in one of the switchgear rooms will not affect plant shutdown operation because the redundant equipment required for safe shutdown can be controlled via the dedicated shutdown circuits terminating at the Dedicated Shutdown Relay Cabinet located in the other switchgear room.

Circuits terminating at the Dedicated Shutdown Panel:

Circuits terminating at isolation relays located in the Dedicated Shutdown Panel pertain to equipment which either does not have to operate in the event of a fire; or whose operation is not required immediately following a fire, and sufficient time is available for manual operation or circuit repair.

ITEM 1.e OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

For each fire area where an alternative or dedicated shutdown method, in accordance with Section III.G.3 of Appendix R is provided, the following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the alternative or dedicated shutdown method:

For each cable listed in a, b, and c where new electrical isolation has been provided or modification to existing electrical isolation has been made, provide detailed electrical schematic drawings that show how each cable is isolated from the fire area.

RESPONSE TO ITEM 1.e OF THE "FIRE AREA APPROACH" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

Item 1.e requests that for each cable listed in Item 1.a, 1.b and 1.c where new electrical isolation has been provided or modification to existing electrical isolation has been made provide detailed electrical schematic drawings that show how each cable is isolated from the fire area. The enclosed elementary wiring diagrams and block diagrams provide this information. The block diagrams identify the circuits that pertain to the various components. The block diagrams also indicate wire mark numbers for each of the conductors used in each circuit. To determine where individual conductors are used in the control circuit on the corresponding elementary diagrams, the wire marks on the block diagrams must be correlated with the wire mark number shown on the elementary. The wire marks are shown as a solid circle on the elementary diagram circuits.

ITEM 2.a OF THE "HIGH-LOW PRESSURE INTERFACE" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 2.a - Identify each high-low pressure interface that uses redundant electrically controlled devices (such as two series motor operated valves) to isolate or preclude rupture of any primary coolant boundary.

FPC Response 2.a -

1. Decay Heat Drop Line
2. Reactor Coolant Letdown to Makeup and Purification System
3. PORV and Block Valve

ITEM 2.b OF THE "HIGH-LOW PRESSURE INTERFACE" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 2.b - For each set of redundant valves identified in a., verify the redundant cabling (power and control) have adequate physical separation as required by Section III.G.2 of Appendix R.

FPC Response 2.b - For the Reactor Coolant Letdown to the Makeup and Purification System adequate physical separation as required by Section III.G.2 of Appendix R is provided.

ITEM 2.c OF THE "HIGH-LOW PRESSURE INTERFACE" SECTION OF ATTACHMENT 2 TO ENCLOSURE 2 OF THE NRC LETTER DATED 5/4/82

NRC Item 2.c - For each case where adequate separation is not provided, show that fire induced failures (hot short, open circuits or short to ground) of the cables will not cause maloperation and result in a LOCA.

FPC Response 2.c - For the Decay Heat Drop Line and for the PORV and Block Valve adequate physical separation as required by Section III.G.2 of Appendix R is not provided. However, to insure a fire induced failure will not cause maloperation of valves resulting in a LOCA, DHV-3 will be locked closed by locking out the breaker in the Motor Control Center thus preventing loss of coolant through the drop line.

Adequate separation as required by Section III.G.2 is not provided for the redundant PORV and Block Valve. In certain cases, it has been determined that spurious operation of the valves could be detrimental to plant operation. Therefore the necessary modifications to comply with Section III.G.2 will be implemented.

ATTACHMENT 1

Table 1 lists the equipment by device tag number that will be controlled manually from the Dedicated Shutdown Panel (DSP), and will be isolated from the control room by the transfer relays. Table 2 lists the equipment by device tag number that will be controlled manually from motor control centers, switchgear, or local control stations; and will be isolated from the control room by the transfer relays. Table 3 lists the indicators by process variable that will be provided on the Dedicated Shutdown Panel.

Items shown with an asterisk (*) are components which are required to remain operable for safe plant shutdown in the event of a fire in either the main control room or cable spreading room.

TABLE 1

ARV-48	*ASV-5	MSV-26	MUV-51	RCV-13	SWV-79
ARV-49	*EFV-1	*MSV-55	MUV-53	RCV-14	SWV-80
DCV-17	EFV-2	*MSV-56	*MUV-58	RCV-53	SWV-81
DCV-18	EFV-3	MUV-3	MUV-62	*SWP-1A	SWV-82
DHV-3	EFV-4	MUV-9	MUV-64	*SWP-1B	SWV-83
DHV-4	EFV-7	MUV-23	MUV-69	SWV-35	SWV-84
DHV-5	EFV-8	MUV-24	*MUV-73	SWV-37	SWV-85
DHV-6	*EFV-11	*MUV-25	MUV-112	SWV-39	SWV-86
DHV-34	EFV-14	*MUV-26	MUV-253	SWV-41	SWV-109
DHV-35	*EFV-32	*MUV-27	MUV-257	SWV-43	SWV-110
DHV-41	EFV-33	MUV-31	MUV-258	SWV-45	SWV-151
DHV-42	*EFV-55	MUV-38	MUV-259	SWV-47	SWV-152
DHV-43	*EFV-56	MUV-39	MUV-260	SWV-48	SWV-353
DHV-91	EFV-57	MUV-40	MUV-261	SWV-49	SWV-354
DHV-110	EFV-58	MUV-41	RCV-10	SWV-50	SWV-355
DHV-111	MSV-25	MUV-49	RCV-11		

PRZR, HTR. GP-7, GP-8, GP-9, GP-10, GP-11, GP-12, GP-13

TABLE 2

*AHF-1A	*DCP-1A	*MUP-2A	RCP-1C	*4.16 KV ES Swgr. Bkr. 3205
*AHF-1B	*DCP-1B	*MUP-2B	RCP-1D	*4.16 KV ES Swgr. Bkr. 3206
AHF-1C	*DHP-1A	MUP-2C	*RWP-2A	*4.16 KV ES Swgr. Bkr. 3209
*AHF-22A	*DHP-1B	*MUP-4A	*RWP-2B	*4.16 KV ES Swgr. Bkr. 3210
AHF-22B	EFP-1	*MUP-4B	*RWP-3A	*4.16 KV ES Swgr. Bkr. 3220
*AHF-22C	*MUP-1A	MUP-4C	*RWP-3B	*4.16 KV ES Swgr. Bkr. 3221
AHV-22D	*MUP-1B	RCP-1A	SWP-2A	*480V ES Swgr. Bkr. 3310
*CAV-126	MUP-1C	RCP-1B		*480V ES Swgr. Bkr. 3311
				*Diesel Gen. CT's & PT's (See Note 1)

TABLE 3

* Cdste., storage tank level indicator scale 0 to 35 feet.
* EFW flow loop A indicator scale - 0 to 820 gpm (See Note 2)
* OTSG "A" start-up level indicator scale - 0 to 250 inches (see Note 2)
* OTSG "A" operate level indicator scale 0 to 100 percent (See Note 2)
* OTSG "A" pressure indicator scale - 0 to 1200 psig. (See Note 2)
D.H inlet/outlet temp. loop A indicator scale - 0 to 300°F.
Borated wtr. flow LPI loop A indicator scale - 0 to 5000 gpm.
* Pressurizer level indicator scale - 0 to 320 inches.
Pressurizer temp. indicator scale - 0 to 700°F.
* Th, wide range loop A indicator scale - 120 to 920°F.
Δt, loop A indicator scale - 0 to 70°F.
Tc, wide range loop A indicator scale - 50 to 650°F.
HPI flow loop A indicator scale - 0 to 500 gpm.
HPI flow loop B indicator scale - 0 to 500 gpm.
Make up flow indicator scale - 0 to 200 gpm.
* RC pressure - wide range indicator scale - 0 to 2500 psig.
RC pressure - low range indicator scale - 0 to 600 psig.
* Th, wide range loop B indicator scale - 120° to 920°F.
Δt, loop B indicator scale - 0 to 70°F.
Tc, wide range loop B indicator scale - 50 to 650°F.
HPI flow loop A indicator scale - 0 to 500 gpm.
HPI flow loop B indicator scale - 0 to 500 gpm.
Make up tank level indicator - 0 to 120 inches.
Diesel MW load indicator scale - 0 to 6 MW.
BWST level indicator scale - 0 to 50 feet.
RB pressure indicator scale - 0 to 70 psia.
RB sump level indicator scale - 0 to 10 feet.
Letdown flow indicator scale - 0 to 160 gpm.
* OTSG "B" start-up level indicator scale - 0 to 250 inches (See note 2)
* OTSG "B" operate level indicator scale - 0 to 100 percent (See Note 2)
* OTSG "B" pressure level indicator scale - 0 to 1200 psig (See Note 2)
* EFW flow loop B indicator scale 0 to 820 gpm. (See Note 2)
D.H. inlet/outlet temp. loop B indicator scale - 0 to 300°F.
Borated wtr. flow LPI loop B indicator scale - 0 to 5000 gpm.

NOTE 1. Manual control of the diesel generators is not required because automatic operation of the diesel generators is being relied upon for dedicated shutdown capability.

NOTE 2. This instrumentation will be installed as part of the Emergency Feedwater Initiation & Control (EFIC) system presently under design.

ATTACHMENT 2

SYSTEMS, INSTRUMENTATION AND CONTROLS REQUIRED TO GO TO COLD SHUTDOWN FROM OUTSIDE CONTROL ROOM

CRYSTAL RIVER UNIT NO. 3

FLORIDA POWER CORPORATION

PURPOSE

To define the devices and systems required to achieve hot and cold shutdown from outside the control room, and to ascertain control capability outside the control room of those devices and systems in case of control or cable spreading room fire and loss of offsite power.

BASES

1. The attached listing of systems, controls and instrumentation includes those devices which may be required or desirable in going to hot and cold shutdown from outside the control room via suitable procedures. The list covers those devices as listed in FSAR 7.4.6 (Amendment 49) and in the Fire Protection Program Review paragraph 5.3.8. Also included are modifications identified to be done for alternate shutdown capability. Descriptions of systems used are in FSAR sections as referenced. Not included are manual only valves. Unless otherwise noted, all devices listed have control capability from the control room by the operator or by a control system in that room. Noted in parenthesis behind each device description is a notation for that device as being used for H - hot or C - cold shutdown.

2. Time to go to cold shutdown is of long duration (72 hours allowed). Thus, there is plenty of time to reach handwheels and even remove wires or jumper circuits via procedure as necessary. This method is stated where applicable and, as such, no control or cable spreading room isolation is provided.

3. Local control of safeguards and reactor bus feeder breakers is not a necessity although it is available. In case of loss of offsite power, the diesel generators will be automatically started and lined-up to critical equipment.

4. The operator should trip the reactor before leaving the control room. There are four (4) trip trains with only two (2) trains required. Thus, it is not probable that a fire would prevent this trip. (Can, however, manually trip breakers outside of control room).

	SYSTEMS REQUIRED		System Description, FSAR Section	Required for Hot - H Cold - C Shutdown
1.	Main Steam	FD-302-011	10.2	H,C
2.	Auxiliary Steam	FD-301-051	10.2	H,C
3.	Feedwater	FD-301-081	10.2	H,C
4.	Emergency FW	FD-302-082	10.2	H,C
5.	Nuclear Services CCC	FD-302-601	9.5	H,C

SYSTEMS REQUIRED

(Continued)

			System Description, FSAR Section	Required Hot - H Cold - C Shutdown
6.	Nuclear Services Sea Water	FD-302-611	9.5	H,C
7.	DH Sea Water	FD-302-611	9.5	C
8.	DH CCC	FD-302-631	9.5	C
9.	DH Removal	FD-302-641	9.4	C
10.	Reactor Coolant	FD-302-651	4.2	H,C
11.	Makeup and Purification	FD-302-661	9.1	H,C
12.	Primary Chemical Addition	FD-302-671	9.2	H,C
13.	C.A. - Liquid Sampling	FD-302-672	9.2	H,C
14.	Core Flood	FD-302-702	6.1	C
15.	Air Handling	FD-302-751, 760	5.5 & 5.6.5	H,C
16.	Miscellaneous			
	a. HPI, LPI Bypass		6.1	C
	b. Communications		7.4.4	H,C

LEGEND

H - Required to get to and/or maintain hot shutdown (subcritical and Tave > 525F).

C - Required to get from hot shutdown to and/or maintain cold shutdown (subcritical and Tave $\leq$ 200F).

DSP - Dedicated Shutdown Panel to be installed on Cont. Bldg. El. 108' in DSP Rm. and Switchgear Rm. A and B.

✗ - Remote isolation switches will be provided to ensure alternate operational capability outside of control room.

* - Automatic devices for which no operator action is anticipated. Listed to show capabilities.

F - Required for safe plant shutdown in the event of a fire.

O - (Optional) may be utilized in the event of a fire, but not required for safe plant shutdown.

*1. MSV-55, 56: Steam to T.D. Emergency FW Pump (H,C,F)

Valve operator and control are on DC power. MSV-55 and ASV-5 normally open automatically if lose main feedwater (a possibility). This auto. operation cannot be assured due to control room interface. Thus, DSP control and isolation capability will be provided for MSV-55, MSV-56, and ASV-5.

Local Control:

☆a. Open/close control, location select capability will be provided at the DSP.

b. Open/close control and position indication at local control station MS-5 (MSV-56) and MS-6 (MSV-55).

c. Handwheel on operator.

2. MSV-25, 26: Atmospheric Dump Valves (H,C,F)

ICS will normally control either turbine bypass valves (MSV-9F, 10F, 11F, 14F) or MSV-25, 26 to maintain main steam pressure at set point (valves used depends on condenser conditions). Will need to control MSV-25, 26 from the DSP if ICS fails. Provisions for a backup air supply have been made.

Local Control:

☆a. Manual control and DSP/control room location selection will be provided on the DSP for both valves for isolation from control room.

b. Handwheels.

3. Main Steam Line Isolation: (C,F)

The EFIC system must be bypassed before reaching 600 psig main steam pressure to prevent OTSG feedwater isolation, if not yet on decay heat. Bypass switches provided on EFIC system cabinet. Failure to bypass will initiate Emergency Feedwater and isolate steam generators.

Local Control:

Bypass will have to be accomplished on EFIC cabinets.

4. SP-017-LI, SP-018-LI, SP-021-LI, SP-022-LI, SP-025-LI, SP-026-LI, SP-031-LI, SP-032-LI: OTSG - Level (H,C,F)

Isolated outputs from EFIC on Dedicated Shutdown Panel from new EFIC transmitters and power supplies.

5. MS-106-PI, MS-107-PI, MS-110-PI, MS-111-PI: OTSG Outlet Pressure (H,C,F)

Isolated outputs from EFIC on Dedicated Shutdown Panel from new EFIC transmitters and power supplies.

6. Main Turbine Trip (H , F)

Local Control:

Mechanical manual trip at the turbine (normally trips upon reactor trip).

AUXILIARY STEAM FD-302-051

*1. ASV-5: Steam to T.D. Emergency FW Pump (H,C,F)

Operation similar to MSV-55. Thus, isolation and control will be provided at the DSP.

Local Control:

☆a. Open/close control location select capability will be provided at the DSP. Isolation capability at relay cab.

b. Jogging and open/closed control plus position indication at local control station AS-1.

c. Handwheel on operator.

FEEDWATER FD-302-081

1. FWV-39F, 40F: Startup FW Regulating Valves (H,C,O)

ICS normally controls these valves. Loss of ICS power and loss of air would cause valves to go to full open. EFIC system emergency feedwater valves EFV-55, EFV-56, EFV-57, and EFV-58 may be used as alternates. Control room isolation not provided. EFIC system can isolate main feedwater.

Local Control:

a. Handwheels.

2. FWV-161, 162: Emergency FW to OTSG (H,C) (F - EFV-11, 32, 55, 56)
(O - EFV-14, 33, 57, 58)

Replaced by EFIC system isolation valves EFV-11, EFV-14, EFV-32, EFV-33 and control valves EFV-55, EFV-56, EFV-57, and EFV-58.

3. FWP-1A, 1B: FW Booster Pumps (H,C,O)

Continue to run after reactor trips. May shutdown if main FW pumps are no longer in use. Thus, no local start control required. Will trip on loss of offsite power, upon which emergency feedwater would have to be used.

Local Control:

On/off control at switchgear and at local control stations near pumps. Can stop pumps manually at switchgear without control power or isolation.

4. FWP-2A, 2B: Main FW Pumps (H,O)

Continue to run after reactor trip. Shutdown when main steam no longer sufficient or if emergency FW is to be used. Thus, no local start controls required. Main FW not available on loss of offsite power. Must depend on emergency FW at that point.

Local Control:

Trip P.B. at local Delaval control panel.

5. OTSG 3A, 3B: Startup FW Flow (H,C,F) Replaced by Emergency Feedwater Flow.

Provided by EFIC Tag No. EF-023-FI, EF-024-FI, EF-025-FI, and EF-026-FI.

EMERGENCY FEEDWATER FD-302-082

1. EFP-1: Motor Driven Emergency FW Pump (O)

Automatically initiated by EFIC. For use if emergency turbine driven FW pump is not desirable. Would normally auto. start in manner similar to emergency turbine driven pump. Because of need to maintain feedwater, the pump will be provided with control at the switchgear. Control room controls isolated at the relay cab.

Local Control:

☆On/off control and running status at switchgear.

2. EFV-1, 2: Emergency FW Pumps Suction from Hotwell (H,C,F)

Normally closed. Opened only if necessary to draw from hotwell. There is sufficient time to go to handwheel control on these valves if local electric control (a. below) is lost due to control or cable spreading room fire. Isolation is provided at the relay cab.

Local Control:

a. Jogging and open/close control plus position indication at local control station EF-1.

b. Control switch on DSP.

c. Handwheel.

NOTE: The normal flow path is from the condensate storage tank through the pumps into the OTSG feedwater lines. The valves in this flow path are normally open.

3. EF-6-PI: Turbine Driven Emergency FW Pump Discharge Pressure (H,C ,O)
EF-2-PI: Motor Driven Emergency FW Pump Discharge Pressure (H,C ,O)

Replaced by EFIC flow transmitters.

4. EFV-3, 4: Suction from Condensate Storage Tank (H,C',F)

Automatically initiated by EFIC. These valves are normally open. May need to close if take suction from hotwell. There is sufficient time to go to handwheels on these valves if local electric control (a. below) is lost due to control or cable spreading room fire. Isolation is provided at the relay cab.

Local Control:

a. Open/close control and position indication at respective motor control center.

b. Control switch on the DSP.

c. Handwheel.

5. ARV-48F, 49F: Condenser Vacuum Breaker Valves (H,C,O)

Must be opened if emergency FW suction is to be taken from hotwell. There is sufficient time to go to handwheel control on these valves if local electric control (a. below) is lost due to control or cable spreading room fire. Isolation is provided at the relay cab.

Local Control:

a. Jogging and open/close control plus position indication at local control station AR-11.

b. Control switch on the DSP.

c. Handwheel on operator.

6. EFV-11, 14, 32, 33: Emergency Feedwater Cross Connects (F - EFV-11, 32)
(O - EFV-14, 33)

Automatically initiated by EFIC. These valves are normally open and will fail as is. Isolation is provided at the relay cab. Local control is provided at the DSP.

7. EFV-55, 56, 57, 58: Emergency Feedwater Control Valves (F - EFV-55, 56)
(O - EFV-57, 58)

Automatically initiated and controlled by EFIC. These valves are normally open and will fail open. Isolation is provided by EFIC and controlled at the DSP.

NUCLEAR SERVICES CLOSED CYCLE COOLING FD-302-601

1. SWV-151, 152, 355: Industrial Cooler Water to RB Fan Assemblies (H,C, O)
   SWV-353, 354: Nuclear Services CCC to RB Fan Assemblies (H,C,F)

   If offsite power is lost after turbine trip, cooling water flow must be switched from the industrial cooler to nuclear services CCC via these valves. Since cooling must be established in less than an hour and there are no handwheels on these valves, control capability will be added in the DSP. Isolation is provided in the relay cab.

   Local Control:

   ☆a. Open/close control, select capability will be provided on the DSP.

   b. Open/closed control and position indication at local control stations SW-10 (SWV-152, 353), SW-11 (SWV-354).

2. SW-3-PI: Nuclear Services CCC Pumps Discharge Pressure (H,C,O)

   Near pumps for pump operation verification if desired.

3. SW-123, 124, 125, 126-TI: Nuclear Services Heat Exchangers Discharge Temperature (H,C,O)

   Near heat exchangers.

4. SWP-1A, 1B: Emergency Nuclear Services CCC Pumps (H,C,F)

   Are on E.S. buses, and one would have to be started should there be a blackout causing the normal pump SWP-1C to stop. Action would be required quickly; therefore, isolation will be provided at the relay cab. for control room isolation.

   Local Control:

   ☆On/off control and status indication at switchgear.

   On/off control and status indication provided at the DSP.

NUCLEAR SERVICES AND DECAY HEAT SEA WATER FD-302-611

1. RWP-2A, 2B: Nuclear Services Sea Water Pumps (H,C,F)

   RWP-1 is normally operating and requires no local control (is available, however). RWP-2B will auto. start if E.S. Diesel Gen. 3B breaker is open and discharge header pressure drops below 25 psig. RWP-2A or RWP-2B would have to be manually started in case of a blackout which would stop RWP-1. Thus, action would be required quickly; therefore, isolation will be provided at the relay cab. for control room isolation.

Local Control:

On/off control and status indication for RWP-1, 2A, 2B at respective switchgear. On/off control for RWP-1 at local control station RW-1.

2. RWP-3A, 3B: Decay Heat Service Sea Water Pumps (C, F)

Operator must start these pumps when decay heat systems are to be used. There is sufficient time to alter the control power circuit at the switchgear to provide local control. Isolation is provided at the relay cab.

Local Control:

On/off control and status indication at switchgear.

DECAY HEAT CLOSED CYCLE COOLING FD-302-631

1. DCP-1A, 1B: Decay Heat CCC Pumps (C,F)

These pumps must be manually started before starting DHP-1A, 1B, Decay Heat Pumps. There is sufficient time to alter the control power circuit at the switchgear to provide local control. Isolation is provided at the relay cab.

Local Control:

On/off and status indication at switchgear.

2. DCV-17, 18, 177, 178: Decay Heat Heat Exchangers, DHHE-1A, 1B Cooling Flow (C,F)

Must be positioned for proper flow through DHHE-1A, 1B for desired decay heat water temperature into the reactor coolant system. There is sufficient time to lift or jumper wires at instrument air compressor switchgear to re-establish air if lost due to control or cable spreading room fire or loss of offsite power.

Local Control:

Temperature controllers DH-17, 18-TC and handwheels on valves, both of which are in the decay heat pit and probably inaccessible during decay heat system operation. Use DHHE-1A, 1B outlet temperature indicators DH-39, 40-TI and manual loaders DH-41, 42-MS for control. These are now located in the 4160 V.E.S. Swgr. Room 3B. To avoid loss of control of redundant trains from the control room in case of switchgear room fire, DH-41-MS and DH-39-TI will be moved to 4160 V.E.S. Swgr. Room 3A. The cable from the output of these loaders will be rerouted to avoid the control and cable spreading room. Control location selection for control room isolation will remain in the respective switchgear rooms. Local controls for DCV-17, DCV-18 is provided on the DSP.

3. DC-23, 25-TI: Decay Heat Heat Exchangers Cooling Flow Inlet Temps. (C,O)

Local to heat exchangers.

DECAY HEAT REMOVAL FD-302-641

1. DHP-1A, 1B: Decay Heat Pumps (C,F)

Must be manually started to place DH system into operation. There is sufficient time to alter the control power circuit at the switchgear to provide local control. Isolation is provided at the relay cab.

Local Control:

On/off control and status indication at switchgear.

2. DHV-3, 4, 41: Dropline from Reactor Coolant System (C,F)

Motor operated valves which must be opened by the operator for decay heat operation. There is sufficient time to alter the control power circuit at the MCC to provide local control. Isolation is provided at the relay cab.

Local Control:

a. Open/closed control and position indication locally at respective motor control centers.

b. Control switch on the DSP.

c. Handwheels on operator (radiation levels may prevent using this on DHV-41; DHV-3, 4 are in Reactor Building).

3. DHV-110, 111: Decay Heat Heat Exchangers Discharge (C,F

Position control required. There is sufficient time to alter the control power circuit at the MCC to provide local control. Isolation is provided at the relay cab.

Local Control:

a. Jogging control and position indication at respective motor control center.

b. Control switch on the DSP.

c. Handwheels (radiation levels may prevent using these).

4. DHV-5, 6: Decay Heat Containment Isolation (C,F)

Must be opened by operator. There is sufficient time to alter the control power circuit at the MCC to provide local control. Isolation is provided at the relay cab.

Local Control:

a. Open/close control and position indication at respective motor control centers.

b. Control switch on the DSP.

c. Handwheels (radiation levels may prevent using these).

5. DHV-91: Decay Heat to Pressurizer Spray (C,O)

Must be opened by operator. There is sufficient time to alter the control power circuit at the MCC to provide local control. Isolation is provided at the relay cab.

Local Control:

a. Open/closed control and position indication at motor control center.

b. Control switch on the DSP.

c. Handwheel.

6. V-1 Vent and Shutoff Valves in Control Air Lines to DCV-17, 18, 177, 178 (C,F)

Vent valve must be closed and shutoff valve in outlet of pneumatic signal high select relay must be opened.

Local Control:

Both are manual valves located outside of the decay heat pit.

REACTOR COOLANT FD-302-651

1. RCP-1A, 1B, 1C, 1D: Reactor Coolant Pumps (H,O)

Operator will have to stop some or all in going to cold shutdown.

Local Control:

On/off control and status indication at respective switchgear. Since only need to stop pumps, this can be done mechanically at the swgr. without control power. Isolation is provided at the relay cab.

2. RC-158-PI-1, RC-159-PI-1 Reactor Coolant Pressure (H,C,F)

On DSP from new independent transmitters and power supplies.

3. RC-4A-TI1-2,RC-4B-TI4-2:Reactor Coolant Temperature (H,C,F)

Existing RTD's routed to the DSP and isolated outputs provided to the NNI.

4. RC-1-LI1-2, RC-1-LI3-2: Pressurizer Level (H,C,F)

Existing transmitters routed to the DSP and isolated outputs provided to the NNI.

5. RCV-53: Pressurizer Spray from Decay Heat (C,O)

Must be opened by operator. There is sufficient time to alter the control power circuit at the MCC to provide local control. Isolation is provided at the DSP.

Local Control:

a. Open/closed control and position indication at motor control center.

b. Control switch on the DSP.

c. Handwheel (valve in Reactor Building).

6. RCV-13(F), 14(F): Reactor Coolant to Pressurizer Spray (H,O)

Operator control required to reduce pressure. Code safety valves will open to reduce pressure. It may be desirable but not necessary to have control of RCV-13, 14; thus, there is time to alter control power circuitry at the MCC to provide local control. Isolation is provided at the DSP.

Local Control:

a. Open/close control and position indication at respective motor control center.

b. Control switch on the DSP.

c. Handwheel (valves in Reactor Building).

7. Pressurizer Heaters Control (H,C,O)

Control is desirable for cooldown rate. Cannot depend on Group 1-6 (SCR controlled) availability, even locally, due to control room interface. In fact, such control is not really required. Cooldown can be controlled manually and locally with Groups 7-13 by wire jumpers in control circuits to the contactors of these heaters and by controlling heat transfer in the OTSG's.

Local Control:

a. Can manually open all MCC's for each heater Groups 1-13 without control power.

b. No local "on" or modulating control of Groups 1-6.

c. Can control Groups 7-13 on the DSP.

8. RCV-10(F), 11(F): Pressurizer Relief Valve (C,O)

Open if necessary to relieve pressure in order to get below the RC pressure set point which permits the RC to DH drop line to be opened. There is sufficient time to alter the control power circuit at the relay cabinet to provide local control. Isolation is provided at the DSP.

Local Control:

Control is provided on the DSP.

9. Reactor Trip (H,F)

Manually trip when leaving control room.

Local Control:

Can open control rod drive breakers outside the control room manually without control power.

MAKEUP AND PURIFICATION FD-302-661

1. MUP-1A, 1B, 1C: Makeup and Purification Pumps (H,C) (F - MUP-1A, 1B) (O - MUP-1C)

Must be operated for makeup due to RC shrinkage when cooling. Need continuous or immediate control. Isolation will be provided at the DSP for control room isolation.

Local Control:

★On/off control and status indication at switchgear.

2. MUV-49(F): Letdown Isolation Valve (H,C,O)

Should close after reactor trip. May have to reopen to allow boric acid addition. Prompt action could be required; thus isolation switch and a control switch will be installed at the DSP for that control and for control room isolation.

Local Control:

a. Open/close control and position indication at local control station MU-7.

★b. Open/close control room isolation control at DSP.

3. MUV-253(F): RC Pumps Bleedoff Isolation (C,O)

Close if all RC pumps are tripped. Isolation provided at the DSP.

Local Control:

Open/close control and position indication at local control station MU-16 and DSP.

4. MUV-18(F): RC Pump Seal Injection Isolation (C,O)

   Close if all RC pumps are tripped. Isolation provided at the DSP.

   Local Control:

   a. Open/close and jogging control and position indication at motor control center.

   b. Handwheel (radiation levels may prevent using these).

5. MUV-58(F), 73(F): Makeup Pump Suction from BWST (H,C,F)

   For makeup in addition to boric acid after proper concentrations are reached. Since prompt action may be required, control room isolation will be provided at the DSP.

   Local Control:

   a. Local control for MUV-58 and MUV-73 provided at the DSP.

   b. Open/closed and jogging control and position indication at respective motor control centers.

   c. Handwheels (radiation levels may prevent use of these).

6. MU-105-LI: Makeup Tank Level (H,C,O)

   Existing transmitters routed to the DSP and isolated outputs provided to the NNI.

7. MUV-112(F): Makeup and Purification Demineralizer Bleed to Waste Disposal (H,C,O)

   Bleed the makeup system if necessary to make room for boron addition. Isolation will be provided at the DSP.

   Local Control:

   a. Bleed/normal control, isolation and control location selection will be at DSP.

   b. Bleed/normal control and position indication at motor control center. (May also have to jumper contact 3-4 of relay BDX1 in cabinet RR2.)

8. MUV-64: Makeup Pump Suction Isolation from Makeup Tank (H,C,O)

   Must close if takes suction from BWST. Isolation will be provided in the DSP.

   Local Control:

   Open/close control, switch provided on the DSP.

9. MUV-31(F): Pressurizer Level Control Valve (H,C,O)

Normally controlled by NNI. Operator will have to manually control if NNI is incapable. Since there is no local control of MUV-31(F), local control and control room isolation is required. Loss of air may require control via a manual bypass valve.

Local Control:

☆a. Manual control will be provided on the DSP.

b. Local manual bypass valve.

CHEMICAL ADDITION FD-302-671

1. CAP-1A, 1B: Boric Acid Pumps (C,O)

Must be operated to transfer boric acid to makeup tank. If not available, can take suction from BWST. Thus, there is sufficient time to alter the control power circuit to provide local control and no isolation is provided.

Local Control:

On/off control and status indication at boric acid control station CA-7.

2. CA-11-LI, CA-13-LI: Boric Acid Storage Tanks Level (C ,O)

On Chemical Addition Panel, Elev. 143'.

3. CA-24-FI: Boric Acid Pumps Discharge Header Flow (C,O)

Near CAP-1A, 1B.

4. CAV-60: Boric Acid to Makeup System (C,O)

Must be opened. No isolation provided for same reasons under CAP-1A, 1B.

Local Control:

a. Open/close control and position indication at control station CA-5.

b. Handwheel.

LIQUID SAMPLING FD-302-672

A. RC Boron Concentration - Point CE-119

1. CAV-126: Letdown Sample Isolation (H,C,F)

Open to sample. No need for prompt control since boron concentration can be calculated. Samples verify the calculation. Sufficient time to alter control power circuit to provide local control. Isolation provided at the relay cab.

Local Control:

Open/close control and position indication at motor control center and nuclear sample room.

2. CAV-2(F): Reactor Building Sample Isolation (H,C,O)

Open to sample. No isolation for reasons under CAV-126.

Local Control:

Open/close control and position indication at local control station CA-1 and in nuclear sample room.

B. Steam Generators Shell Side Sampling - Points CE-126, 128

1. CAV-4(F), 5(F): Sample Isolation (H,C,O)

Open to sample. No isolation for reasons under CAV-126.

Local Control:

Open/close control and position indication at motor control centers and in nuclear sample room.

2. CAV-6(F), 7(F): Reactor Building Sample Isolation (H,C,O

Open to sample. No isolation provided for reasons under CAV-126.

Local Control:

Open/close control and position indication in nuclear sample room and at local control stations CA-2 (CAV-6(F)) and CA-3 (CAV-7(F)).

CORE FLOOD FD-302-702

1. CFV-5(F), 6(F): Core Flood to RC System (C, F)

Close when RC pressure decreases below 700 psig during shutdown. There is sufficient time to alter control power circuits at the MCC to provide local control; thus, no isolation is provided.

Local Control:

Open/close control and position indication at respective motor control centers.

AIR HANDLING FD-302-751, 760

1. AHF-1A, 1B, 1C: Reactor Building Recirculation Units (F - AHF-1A, 1B) O - AHF-1C)

Two of the three are normally operating. Reactor building temperature is normally automatically controlled by these units via the industrial cooler. Thus, no operator action should be required. However, in the event a blackout has required switchover from the industrial cooler to nuclear services CCC, reactor building temperature may have to be controlled by AHF-1A, 1B and 1C speed and number of units operating. Control will be provided at the MCC's for each unit. Isolation provided at the relay cab.

Local Control:

★ Slow and fast run/off control and status indication at respective E.S. motor control center.

2. LR-7-TR: Reactor Building Ambient Temperature (O)

Located on Leak Rate Panel.

MISCELLANEOUS

1. Bypass HPI between 1700 and 1500 psig reactor coolant pressure. (C,O)

Bypass LPI between 900 and 500 psig reactor coolant pressure. (C,O)

Local Control:

a. Bypass switches and bypass permissive and status indication in 4160 V.E.S. Swgr. Rooms 3A and 3B.

b. If bypass switches are inoperable, return to control room to bypass if possible.

c. If bypass switches are inoperable, manually disable auto. control of HPI, LPI and reactor building spray pumps and valves at switchgear, MCC's or handwheels.

2. Paging and Telephone Systems (O)

Local Control:

Throughout the plant.

ATTACHMENT 3

SAFE SHUTDOWN ANALYSIS FOR FIRES OCCURRING

IN ANY AREA CONTAINING REQUIRED SAFE SHUTDOWN EQUIPMENT

I. PURPOSE

To determine if required safe shutdown equipment and circuits meet the criteria of Section III.G of Appendix R to 10CFR50 as required by NRC generic letter 81-12 dated 2/20/81. In this analysis, the plant was assessed to determine what modifications must be implemented in order to ensure that required safe shutdown equipment and circuits are in compliance with Section III.G.2 of Appendix R. Where modifications have been found to be impractical, this report identifies the requirements for dedicated shutdown capability in accordance with Section III.G.3 of Appendix R.

II. ASSUMPTIONS

The following assumptions have been used in this analysis:

1. A fire area is considered to be any area of the plant which is bounded by three-hour rated walls, floors, doors and penetrations. A fire area is not being further sub-divided into zones as in the Fire Protection Program Review, Docket No. 50-302 dated June 1977. In many cases one entire floor elevation of a building is considered one fire area.

2. A fire in any fire area is considered to disable all equipment located in the particular fire area.

3. A fire will occur in no more than one fire area of the plant.

4. Loss of offsite power occurs simultaneously with, or subsequently to the fire. However, offsite power is assumed to be available after 72 hours.

5. No credit is taken for the fire detection and suppression systems.

6. Unrelated failures of required shutdown equipment and a DBE other than loss of offsite power are not postulated.

7. The use of non-safety related equipment to achieve safe shutdown is permitted.

III. SHUTDOWN SEQUENCE AND SYSTEM FUNCTIONS (NORMAL CONTROL LOCATION)

The following sequence is based on safe shutdown using normal controls available in the control room with a fire in any isolated area of the plant except the control room, cable spreading room and control complex HVAC area. For fires in the control room, cable spreading room and control

complex HVAC area, this shutdown sequence is not completely applicable since normal control, including many automatic functions, may be disabled. As discussed elsewhere in this report, the dedicated shutdown panel will be used should a fire occur in any of these areas.

Reactor Shutdown (SCRAM) must be initiated immediately. Since this is a fail-safe operation, this function will not be adversely affected by a fire. A turbine trip signal will follow a SCRAM. The reactor coolant pumps will be lost (assuming loss of offsite power) or will be tripped manually.

Feedwater flow must be maintained. The emergency feedwater pumps and their associated flow paths from the condensate storage tank or the main condenser hotwell to the steam generators provide redundant sources of feedwater. When the EFW system is initiated, steam will be dumped through the code safety valves until the steam dump valves are manually opened.

Reactor Coolant Makeup will be available immediately. Flow will be initiated on pressurizer low level. Redundant flow paths from the Borated Water Storage Tanks to the charging pumps and normal charging lines provide the redundant sources.

Boron Addition will be immediately available from the borated water storage tank. Identical flow paths will be used for makeup and boron additions.

Reactor Coolant System Instrumentation is needed to provide reactor coolant temperature and pressure information.

Reactor Coolant Letdown is not essential to safe shutdown and will be isolated on reactor SCRAM by the operator.

Reactor Building Cooling is needed to limit the temperature within the building to ensure continued operation of safe shutdown equipment. With one Reactor Building fan running, normal Reactor Building heat load and a worst case fire in the Reactor Building, the containment temperature will peak at 210°F. The three existing fans provide redundancy for this function.

Nuclear Service Closed Cycle Cooling will be available immediately, and is needed to support the operation of the Emergency Feedwater pumps, charging pumps and the Reactor Building fans. Redundancy is provided with existing pumps and heat exchangers.

Nuclear Services and Decay Heat Seawater Cooling will be immediately available and is needed to support the operation of the Nuclear Services Heat Exchangers. This system also will be available immediately to support the Decay Heat Closed Cycle Heat Exchangers which are required for cold shutdown. Redundant pumps and flow paths are pro vided.

Decay Heat Removal is not needed until the reactor coolant system has been partially cooled by dumping steam and has been depressurized. A delay of up to 72 hours is permitted before starting cooldown with decay heat removal equipment.

Decay Heat Closed Cycle Cooling is needed to supply cooling flow to the Decay Heat Removal Heat Exchangers and the decay Heat Pumps.

HVAC will be available immediately, and is required for the Diesel Generator Rooms, decay heat area and control complex switchgear, battery chargers, inverter and dedicated shutdown rooms. The decay heat area cooling units will be required after 72 hours.

Diesel Generators start automatically on a loss of offsite power condition, and supply emergency equipment as needed. Normal manual shutdown controls cannot shutdown the diesels as long as an engineered safeguards condition is present. Each diesel has a self-contained cooling system which consists of an air cooled radiator and an engine driven fan.

125 VDC Power is continually required for instruments, solenoid valves, relays and diesel generator control panels.

IV. METHODOLOGY

The actual equipment required for plant shutdown was determined from the system functions described above. A tabulation was made listing this equipment and the power and control circuits required for each equipment item. Circuits which have been determined to be associated circuits, as defined by the clarifications to NRC generic letter 81-12 dated 2/20/81, were also included in the tabulations. The power and control circuits were traced out on drawings depicting the equipment locations and the routing of the circuit cable trays and conduits. The drawings were then reviewed in detail on a system basis to determine if the requirements of Section III.G.2 of Appendix R are met for each fire area in which the system components and/or circuits are located. Interfacing systems such as the Emergency Feedwater and Main Steam Systems or the HVAC and Service Water Systems were reviewed congruently to ensure that all components required for the operation of each redundant train of equipment were considered in the review.

For any fire area in which it was revealed that a postulated fire could disable more than one of the redundant groups of shutdown equipment. modifications are being planned that will upgrade the respective area to ensure compliance with Section III.G.2 of Appendix R. The types of modifications being proposed are as follows:

1. Installation of three-hour rated barriers to separate equipment and circuits.

2. Partially rewire control circuits to avoid the possibility of equipment malfunctioning due to spurious shorts.

3. Relocation of components and circuits.

4. Lock out the power circuits for valves not required to change position and consider manual operation of valves not requiring immediate operation.

5. Use of radiant energy shields (inside containment).

6. Enclosing cable tray and conduit with one-hour rated barriers, and installing fire detection and suppression in the fire area.

V. PROPOSED MODIFICATIONS

Each system has been reviewed in accordance with methodology described in Section IV, above. In general, each system contains some circuits that require additional protection to meet Section III.G.2 of Appendix R. This protection will be provided by either rerouting redundant circuits through separate fire areas, or enclosing circuit raceways with one-hour rated barriers and installing fire detection and suppression. Other proposed modifications are as follows:

1. Install a three-hour rated wall between the motor driven Emergency Feedwater Pump and the turbine driven Emergency Feedwater pump to obtain the required separation.

2. Upgrade two of the three cubicles housing the Makeup and Purification Pumps to three-hour rated enclosures.

3. Install a three-hour rated wall to separate redundant pumps for the Nuclear Service Closed Cycle Cooling System and the Nuclear Service Seawater system.

4. The relay room presently does not meet required separation criteria. To provide the required separation, the relays associated with one of the redundant trains of equipment will either be removed and relocated in a separate fire area, or a parallel relay will be installed in a separate fire area with fuses properly located to provide isolation between the two parallel relays.

5. Manual operation of valves and equipment repair are being utilized for cold shutdown equipment. Material lists and procedures will be developed for repair parts.

6. Ensure fail-safe operation of components (Ref. Section VII).

7. Reassign motor control center loads to obtain separation of power sources for redundant equipment.

8. Install radiant energy shields inside containment to ensure that a

fire at any one location will not directly radiate heat to redundant components.

VI. DEDICATED SHUTDOWN

The main control room, cable spreading room and control complex HVAC equipment room are three fire areas which were found to contain redundant equipment which could not be adequately protected. In accordance with Section III.G. 3 of Appendix R, dedicated shutdown capability is being provided for these fire areas.

Main Control Room and Cable Spreading Room - dedicated shutdown capability is being provided by the dedicated shutdown panel (presently under design). Provisions are being made at the dedicated shutdown panel to isolate any required safe shutdown components and circuits from the main control room and cable spreading room via switches operating transfer relays which will be located in the redundant switchgear rooms. New circuits for the dedicated shutdown panel will be installed in accordance with Section III.G.2 of Appendix R. In the event of control room evacuation, safe shutdown equipment normally controlled from the main control room will be controlled from either the dedicated shutdown panel, local control stations, switchgear, or motor control centers.

Control Complex HVAC Equipment Room - separate HVAC units will be installed to provide cooling air through the Control Complex areas housing the switchgear, battery chargers, inverters and dedicated shutdown panel. This dedicated system will be designed with sufficient capacity to ensure that the required shutdown equipment will operate within its temperature design limitations. Since the main control room is also served by the normal HVAC system, the control room must be evacuated, and the dedicated shutdown panel will be utilized for shutdown if normal control complex HVAC is lost. Equipment and circuits for the dedicated HVAC units will be separated from the normal HVAC equipment and circuits in accordance with the criteria of Section III.G.2 of Appendix R.

The dedicated shutdown sequence is similar to that listed in Section III with the following exceptions:

Decay Heat Removal - Only the turbine driven emergency feedwater pump is available.

Reactor Coolant Makeup - Only the "A" flow path is available; MU pumps are controlled from the switchgear; AC lube oil pumps are controlled from the MCC's.

Reactor Coolant Sampling - Boration is determined by sample analysis taken via sampling system valves CAV-126 and CAV-133. CAV-126 will be controlled from the MCC; CAV-133 is a manual valve.

Reactor Building Cooling - RB fans will be manually controlled from the switchgear

Nuclear Services and Decay Heat Seawater Cooling - Emergency nuclear services seawater pumps and decay heat seawater pumps will be controlled from their respective switchgear units.

Residual Heat Removal - Decay heat pumps will be controlled from the switchgear.

Decay Heat Close Cycle Cooling - Decay heat closed cycle cooling pumps will be controlled from the switchgear.

Local HVAC - Diesel generator rooms fans will be manually controlled from the MCC's.

Diesel Generators - No manual DG control; automatic operation will be relied upon.

As required by paragraph 8.a of Enclosure 1 to the NRC Generic letter 81-12 of 2/20/81 and subsequent clarifications, Attachment 1 is a listing of the components and circuits that make up the normal shutdown capability from the main control room, cable spreading room, and control complex HVAC equipment room. Other information required by Section 8 of Enclosure 1 will be submitted as the design of the dedicated shutdown panel and dedicated HVAC progresses.

VII. SPURIOUS OPERATION

Postulated fires may cause conductor to conductor shorts and conductor to ground shorts in unprotected cables. These types of short circuits have been postulated to result in spurious operation of safe shutdown components. In certain special cases, it has been determined that such spurious operations could be detrimental to plant shutdown operation. For components whose spurious operation could be detrimental, the following modifications are being proposed to preclude the postulated spurious operation:

1. Lock out the power for MOV's that either do not have to change position, or whose function allows for sufficient time for manual operation. This lockout consists of opening and tagging of the manual power supply breaker in the motor control center starter unit for the respective valve.

2. Solenoid valves which fail-safe on loss of power will be partially rewired to prevent spurious energization from electrical shorts.

3. Pneumatic valve operators that vent air to fail-safe will be provided with fusible links in the pneumatic line near the valve, and associated circuits which are not in proximity to the valve will either be protected, or rewired as in Item 2 above.

VIII. CONCLUSIONS

Based on the assumptions stated in Section II, and with the implementation of the modifications proposed herein; the required safe shutdown equipment for Crystal River Unit 3 will be in compliance with Sections III.G.2 and III.G.3 of Appendix R.

ATTACHMENT 4

The following is the information required by Section 8.a of NRC generic letter 81-12 of 2/10/81 and subsequent clarifications.

There are two cases in which areas of the plant require dedicated shutdown capability. Case 1 involves the main control room and cable spreading room. Case 2 involves the Control Complex HVAC equipment room. Systems, components and circuits are listed as required for each of the two cases.

CASE 1 - Main Control Room and Cable Spreading Room

With the exception of the 120 VAC Vital Bus Distribution Panels, the components listed below are not located in either the main control room or cable spreading room. However, the controls and/or indication for these components are located in those areas, and consequently, the components and respective circuits have been listed. The referenced notes are shown on page 12. Unless noted otherwise, control room isolation and remote control of the equipment are being provided at the dedicated shutdown panel.

Circuits shown with an asterisk do not terminate at any devices in either the main control room or cable spreading room. They are included in the list because they pass through one of these two areas and terminate at other areas of the plant.

Electrical Power Distribution System

4160 Volt E.S. Switchgear Bus 3A Unit 14 (Bkr. 3205)
4160 Volt E.S. Switchgear Bus 3B Unit 1 (Bkr. 3206)
4160 Volt E.S. Switchgear Bus 3A Unit 12 (Bkr. 3209)
4160 Volt E.S. Switchgear Bus 3B Unit 3 (Bkr. 3210)
E.S. 3B Aux. Transformer 4160 Volt Swgr. (Bkr. 3220)
E.S. 3A Aux. Transformer 4160 Volt Swgr. (Bkr. 3221)
480 Volt E.S. Switchgear Bus 3B Unit 1A (Bkr. 3310)
480 Volt E.S. Switchgear Bus 3A Unit 1A (Bkr. 3311)

Circuit I.D.

MTM46 - Control of Bkr. 3205 (See Note 1)
MTM47 - Control of Bkr. 3205 (See Note 1)
MTM51 - Control of Bkr. 3206 (See Note 1)
MTM53 - Control of Bkr. 3206 (See Note 1)
MTM114 - Control of Bkr. 3220 (See Note 1)
MTM118 - Control of Bkr. 3221 (See Note 1)
MTL16 - Control of Bkr. 3310 (See Note 1)
MTL21 - Control of Bkr. 3311 (See Note 1)
MTM65 - Control of Bkr. 3209 (See Note 1)
MTM70 - Control of Bkr. 3210 (See Note 1)

Electrical Power Distribution System (cont'd)

Circuit I.D. (cont'd)

MTM152 - 4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (3209) (See Note 1)
MTM154 - 4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (3205) (See Note 1)
MTM153 - 4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (See Note 1)
MTM161 - 4160 Volt E.S. Bus 3A Crosstie Block & D.G. Parallel Block Intlk. Control (See Note 1)
MTM156 - 4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (3210) (See Note 1)
MTM158 - 4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (3206) (See Note 1)
MTM157 - 4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (See Note 1)
MTM162 - 4160 Volt E.S. Bus 3B Crosstie Block & D.G. Parallel Block Intlk. Control (See Note 1)

E.S. Diesel Generators 3A & 3B (EGDG-1A & EGDG-1B)
E.S. Diesel Generators Control Panels EGCP-1A & EGCP-1B

Circuit I.D.

EGM2 - Synchronizing Potential & Control for EGDG-1A (See Note 2)
EGM12 - Synchronizing Potential & Control for EGDG-1B (See Note 2)

250/125 Volt D.C. Dist. Panels DPDP-5A, 5B, 8A & 8B

Circuit I.D.

* DPE66 - 125 VDC Supply to RR3A from DPDP-5A (See Note 5)
* DPE41 - 125 VDC Supply to RR1A from DPDP-5A (See Note 5)
* DPE42 - 125 VDC Supply to RR1A from DPDP-5A (See Note 5)
* DPE46 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE47 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE48 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE49 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE50 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE51 - 125 VDC Supply to RR1B from DPDP-5B (See Note 5)
* DPE67 - 125 VDC Supply to RR3B from DPDP-5B (See Note 5)

120 VAC Vital Bus Dist. Panels 3A, 3B, 3C & 3D.
(VBDP-3, VBDP-4, VBDP-5, VBDP-6)

Circuit I.D.

VBF19 - 120 VAC Power to ICSAR (VBDP-4) (See Note 3)
VBF18 - 120 VAC Power to ICSAR (VBDP-3) (See Note 3)
VBF17 - 120 VAC Power to ESF(A) (VBDP-3) (See Note 3)
VBF21 - 120 VAC Power to PSA (VBDP-3) (See Note 3)

Nuclear Services and Decay Heat Seawater System

Emergency Nuclear Services Seawater Pump 3A (RWP-2A)
Emergency Nuclear Services Seawater Pump 3B (RWP-2B)
Decay Heat Service Seawater Pump 3A (RWP-3A)
Decay Heat Service Seawater Pump 3B (RWP-3B)

Circuit I.D.

RWM12	-	Control of RWP-2A	(See Note 1)
RWM14	-	Control Intlk. to RWP-2A	(See Note 1)
RWM17	-	Control of RWP-2B	(See Note 1)
RWM19	-	Control Intlk. to RWP-2B	(See Note 1)
*RWM36	-	Control Intlk. to RWP-2B	(See Note 1)
RWM23	-	Control of RWP-3A	(See Note 1)
RWM25	-	Control Intlk. to RWP-3A	(See Note 1)
RWM28	-	Control of RWP-3B	(See Note 1)
RWM30	-	Control Intlk. to RWP-3B	(See Note 1)

Decay Heat Closed Cycle Cooling System

Decay Heat Closed Cycle Cool Water Pump 3A (DCP-1A)
Decay Heat Closed Cycle Cool Water Pump 3B (DCP-1B)
E/P Converters DH-17-E/P & DH-18-E/P

Circuit I.D.

*DCL11	-	Control Interlock for DCP-1A	(See Note 1)
DCL4	-	Control Interlock for DCP-1A	(See Note 1)
DCL2	-	Control of DCP-1A	(See Note 1)
*DCL12	-	Control Interlock to DCP-1B	(See Note 1)
DCL8	-	Control Interlock to DCP-1B	(See Note 1)
DCL6	-	Control of DCP-1B	(See Note 1)
DCS13	-	Control Signal to DH-17-E/P	(See Note 12)
DCS14	-	Control Signal to DH-18-E/P	(See Note 12)

Main Steam System

Aux. F.W. Pump Turbine Steam Supply Isol. VLV (MSV-55)
Aux. F.W. Pump Turbine Steam Supply Isol. VLV (MSV-56)

Circuit I.D.

MSE6	-	Control of MSV-56
MSE16	-	Control of MSV-55

Air Handling System

Reactor Building Fan Assembly 3A (AHF-1A) (See Note 4)
Reactor Building Fan Assembly 3B (AHF-1B) (See Note 4)
Reactor Building Fan Assembly 3C (AHF-1C) (See Note 4)

Air Handling System (cont'd)

Diesel Gen. Room "A" Air Handling Fan 3A (AHF-22A)
Diesel Gen. Room "A" Air Handling Fan 3B (AHF-22B)
Diesel Gen. Room "B" Air Handling Fan 3C (AHF-22C)
Diesel Gen. Room "B" Air Handling Fan 3D (AHF-22D)

Circuit I.D.

AHC116	-	Control Interlock to AHF-1A	(See Note 4)
AHC115	-	Control of AHF-1A	(See Note 4)
AHC126	-	Control Interlock to AHF-1B	(See Note 4)
AHC125	-	Control of AHF-1B	(See Note 4)
AHC135	-	Control Interlock to AHF-1C	(See Note 4)
AHC107	-	Control Interlock to AHF-1C	(See Note 4)
AHC137	-	Control Interlock to AHF-1C	(See Note 4)
AHC140	-	Control of AHF-1C	(See Note 4)
*AHC128	-	Control Interlock to AHF-22A	(See Note 4)
AHC527	-	Control of AHF-22A	(See Note 4)
*AHF70	-	Control Interlock to AHF-22A	(See Note 4)
AHC537	-	Control of AHF-22B	(See Note 11)
AHC538	-	Control Interlock to AHF-22B	(See Note 11)
*AHC549	-	Control Interlock to AHF-22C	(See Note 4)
*AHC548	-	Control Interlock to AHF-22C	(See Note 4)
AHC547	-	Control of AHF-22C	(See Note 4)
*AHF80	-	Control Interlock to AHF-22C	(See Note 4)
*AHC559	-	Control Interlock to AHF-22D	(See Note 11)
*AHC558	-	Control Interlock to AHF-22D	(See Note 11)
AHC557	-	Control of AHF-22D	(See Note 11)

Emergency Feedwater System

Motor Driven Emergency Feedwater Pump 3A (EFP-1)
Motor Driven Emergency Feedwater Pump 3A & Aux. Feedwater Dischg. Isol. Vlv. (EFV-14)
Motor Driven Emergency Feedwater Pump 3A & Aux. Feedwater Disch. Isol. Vlv. (EFV-33)

Circuit I.D.

*EFM7	-	Control of EFP-1	(See Note 9)
EFM9	-	Control of EFP-1	(See Note 9)
EFM6	-	Control of EFP-1	(See Note 9)
*EFM11	-	Control Interlock to EFP-1	(See Note 9)
EFF8	-	Control Relay Power for EFP-1	(See Note 9)
*EFM13	-	DG3A Current Level for Control of EFP-1	(See Note 9)
*EFM14	-	DG3A Potential Level for Control of EFP-1	(See Note 9)
EFM10	-	Control of EFP-1	(See Note 9)
EFF29	-	Control of EFP-1	(See Note 9)
EFM12	-	Control Interlock to EFP-1	(See Note 9)
EFF30	-	Control Interlock to EFP-1	(See Note 9)
EFF31	-	Control Power to Auto Start Circuit EFP-1	(See Note 9)
EFF32	-	Auto Start Control of EFP-1	(See Note 9)

Emergency Feedwater System (cont'd)

Circuit I.D. (cont'd)

EFF33	-	Auto Start Control of EFP-1	(See Note 9)
*EFF34	-	Auto Start Control of EFP-1	(See Note 9)
*EFF35	-	Auto Start Control Interlock for EFP-1	(See Note 9)
EFE37	-	Control of EFV-14	(See Note 9)
EFE57	-	Control of EFV-33	(See Note 9)

Turbine Driven EFW Pump 3B (EFP-2)
Turbine Driven EFW Pump 3B & Aux. FW Discharge Isol. Vlv. (EFV-11)
Turbine Driven EFW Pump 3B & Aux. FW Discharge Isol. Vlv. (EFV-32)

Circuit I.D.

EFE27	-	Control of EFV-11	(See Note 6)
EFE47	-	Control of EFV-32	(See Note 6)

Reactor Coolant System

Pressurizer Electromatic Relief Vlv. (RCV-10)
Pressurizer Relief Block Vlv. (RCV-11)
Pressurizer Level Transmitter #1 (RC-1-LT1)
Pressurizer Level Transmitter #2 (RC-1-LT2)
Pressurizer Level Transmitter #3 (RC-1-LT3)

Circuit I.D.

RCC255	-	Control of RCV-11
RCC256	-	Control of RCV-11
RCF19	-	Control of RCV-10
RCR217	-	Control of RCV-10
RCE62	-	Control of RCV-10
*RCE63	-	Control of RCV-10
RCR2	-	Power & Level Signal for RC-1-LT1
RCR5	-	Level Signal to CB Indicator #1
RCR4	-	Power & Level Signal for RC-1-LT2
RCR6	-	Level Signal to CB Indicator #2
RCR9	-	Power & Level Signal for RC-1-LT3
RCR16	-	Level Signal to CB Indicator #3

Makeup & Purification System

Makeup & Purification Pump 3A (MUP-1A)
Borated Water Storage Tank to MU Pump Vlv. (MUV-73)
MU Isolation Valve to Reactor Inlet Lines Loop A (MUV-27)
MU & P Pump 3A Main Lube Oil Pump (MUP-2A)
MU & P Pump 3A Main Gear Oil Pump (MUP-4A)
MU & P Pump 3A Backup Lube Oil Pump (MUP-3A)
MU & P Pump 3A Backup Gear Oil Pump (MUP-5A)

Circuit I.D.

MUM3	-	Control of MUP-1A	(See Note 1)
MUM5	-	Control Interlock to MUP-1A	(See Note 1)
MUC3	-	Control of MUP-2A	(See Note 4)
MUC24	-	Control of MUP-4A	(See Note 4)
*MUC26	-	Control Interlock to MUP-4A	(See Note 4)
MUE7	-	Control of MUP-3A	(See Note 7)
*MUE59	-	Control Interlock to MUP-5A	(See Note 7)
MUE57	-	Control of MUP-5A	(See Note 7)
MUC103	-	Control of MUV-27	
MUC104	-	Control of MUV-27	
MUC105	-	Control of MUV-27	
*MUC106	-	Control of MUV-27	
MUC107	-	Control of MUV-27	
MUC123	-	Control of MUV-73	
MUC124	-	Control of MUV-73	
*MUC125	-	Control of MUV-73	

MU & P Pump 3B (MUP-1B)
MU & P Pump 3B Main Lube Oil Pump (MUP-2B)
MU & P Pump 3B Backup Lube Oil Pump (MUP-3B)
MU & P Pump 3B Main Gear Oil Pump (MUP-4B)
MU & P Pump 3B Backup Gear Oil Pump (MUP-5B)

Circuit I.D.

MUM15	-	Control of MUP-1B	(See Note 1)
MUM17	-	Control Interlock for MUP-1B	(See Note 1)
MUM21	-	Control of MUP-1B	(See Note 1)
MUM23	-	Control Interlock to MUP-1B	(See Note 1)
MUC8	-	Control of MUP-2B	(See Note 4)
MUE16	-	Control of MUP-3B	(See Note 7)
MUC34	-	Control of MUP-4B	(See Note 4)
*MUC37	-	Control Interlock to MUP-4B	(See Note 4)
*MUE70	-	Control Interlock to MUP-5B	(See Note 7)
MUE69	-	Control of MUP-5B	(See Note 7)

Makeup & Purification System (cont'd)

MU & P Pump 3C (MUP-1C)
MU & P Pump 3C Main Lube Oil Pump (MUP-2C)
MU & P Pump 3C Backup Lube Oil Pump (MUP-3C)
MU & P Pump 3C Main Gear Oil Pump (MUP-4C)
MU & P Pump 3C Backup Gear Oil Pump (MUP-5C)
Borated Water Storage Tank Isolation Valve to MU & P Pump 3C (MUV-58)
HPI Cont. Valve to Reactor Inlet Lines Loop B (MUV-25)
HPI Cont. Valve to Reactor Inlet Lines Loop B (MUV-26)

Circuit I.D.

MUM31	-	Control of MUP-1C	(See Note 10)
MUM35	-	Control Interlock to MUP-1C	(See Note 10)
MUC13	-	Control of MUP-2C	(See Note 10)
MUE24	-	Control of MUP-3C	(See Note 10)
MUC44	-	Control of MUP-4C	(See Note 10)
*MUC46	-	Control Interlock to MUP-4C	(See Note 10)
MUE78	-	Control of MUP-5C	(See Note 10)
*MUE79	-	Control Interlock to MUP-5C	(See Note 10)
MUC113	-	Control of MUV-58	
MUC114	-	Control Interlock to MUV-58	
*MUC115	-	Control Interlock to MUV-58	
MUC267	-	Control of MUV-25	
MUC268	-	Control Interlock to MUV-25	
MUF303	-	Control Interlock to MUV-25	
MUC273	-	Control of MUV-26	
MUC274	-	Control Interlock to MUV-26	
MUF304	-	Control Interlock to MUV-26	
MUF309	-	Control of MUV-25	
MUF310	-	Control of MUV-26	
MUF311	-	Control of MUV-25	
MUF312	-	Control of MUV-26	

Auxiliary Steam System

Turbine Driven Emergency Feedwater Pump Turbine Stop Valve (ASV-5)

Circuit I.D.

*ASE10	-	Control of ASV-5
ASE7	-	Control of ASV-5
*ASE11	-	Control of ASV-5

Chemical Addition System (See Note 8)

Reactor Coolant Letdown Sampling Isol. Valve (CAV-126)

Circuit I.D.

*CAC101	-	Control of CAV-126	(See Note 4)
CAC74	-	Control of CAV-126	(See Note 4)
CAC75	-	Control of CAV-126	(See Note 4)

Reactor Coolant System Instrumentation

Reactor Coolant Pressure Transmitte.
RC-3A-PT3, RC-3A-PT4 & RC-3B-PT3
Reactor Coolant Temperature Transmitters
RC-4A-TE2, RC-4A-TE3, TC-4B-TE2, RC-4B-TE3

Circuit I.D.

RCR87 - RC3A-PT3 Pressure Signal to Indicator
RCR81 - RC3A-PT3 Pressure Signal to Indicator
RCR92 - RC3A-PT4 Pressure Signal to Indicator
RCR96 - RC3B-PT3 Pressure Signal to Indicator
RCR97 - RC3B-PT3 Pressure Signal to Indicator
RCR19 - RC Pressure Instrumentation to Control Board
RCR20 - RC Pressure Instrumentation to Control Board
RCR21 - RC Pressure Instrumentation to Control Board
RCR22 - RC Pressure Instrumentation to Control Board
RCH4 - Stm. Gen. 3A RC Outlet Temp. Signal to NI&P (From RC-4A-TE2)
RCH16 - Stm. Gen. 3B RC Outlet Temp. Signal to NI&P (From RC-4B-TE2)
RCH28 - Stm. Gen. 3A RC Outlet Temp. Signal to NI&P (From RC-4A-TE3)
RCH40 - Stm. Gen. 3B Reactor Coolant Outlet Temp. Signal to NI&P (From RC-4B-TE3)

Nuclear Service Closed Cycle Cooling System

Emergency Nuclear Service C.C. Cooling Pump 3A (SWP-1A)
Emergency Nuclear Service C.C. Cooling Pump 3B (SWP-1B)
Air Handling Unit "A" Inlet Valve (SWV-35)
Air Handling Unit "B" Inlet Valve (SWV-37)
Air Handling Unit "C" Inlet Valve (SWV-39)
Air Handling Unit "A" Discharge Valve (SWV-41)
Air Handling Unit "B" Discharge Valve (SWV-43)
Air Handling Unit "C" Inlet Volve (SWV-45)
R.B. Fan Assembly Trans. Valve (SWV-353)
R.B. Fan Assembly Trans. Volve (SWV-354)

Circuit I.D.

SWM12 - Control Interlock to SWP-1A
SWM10 - Control of SWP-1A
*SWM33 - Control of SWP-1A
SWM34 - Control of SWP-1A
SWF8 - Control of SW-151-SV
SWF7 - Control of SW-151-SV
SWM16 - Control of SWP-1B
SWM18 - Control Interlock to SWP-1B
*SWM19 - Control Interlock to SWP-1B
*SWE15 - Control Interlock to SWV-35
SWE17 - Control of SWV-35
*SWE21 - Control Interlock to SWV-37
SWE22 - Control of SWV-37
*SWE31 - Control Interlock to SWV-39
SWE350 - Control of SWV-39
*SWE41 - Control Interlock to SWV-41
SWE42 - Control of SWV-41
*SWE52 - Control Interlock to SWV-43
SWE53 - Control of SWV-43
SWE61 - Control Interlock to SWV-45
SWE360 - Control of SWV-45

SWE283 - Control Interlock for SWV-353 (Sol. A)
SWE282 - Control of Solenoid A - SWV-353
*SWE280 - Control of Solenoid A - SWV-353
SWE284 - Control Interlock for SWV-353 (Sol. B)
*SWE285 - Control Interlock for SWV-353 (Sol. B)
SWE290 - Control of Solenoid B - SWV-353
*SWE280 - Control of Solenoid A - SWV-354
SWE337 - Control of Solenoid A - SWV-354
SWE338 - Control Interlock for SWV-354 (Sol. A)
SWE339 - Control Interlock for SWV-354 (Sol. B)
*SWE340 - Control Interlock for SWV-354 (Sol. B)
SWE345 - Control of Sol. B, SWV-354

Case 2 - Control Complex HVAC Equipment Room

No isolation is required for the circuits listed in this section. The safe shutdown function of these components and circuits will be replaced by dedicated HVAC unit

Air Handling System (AH)

Components

Control Complex Normal Duty Supply Unit 3A (AHF-17A)
Control Complex Normal Duty Supply Unit 3B (AHF-17B)
Control Complex Return Air Fan 3A (AHF-19A)
Control Complex Return Air Fan 3B (AHF-19B)
Control Complex Chilled Water Pump 3A (CHP-1A)
Control Complex Chilled Water Pump 3B (CHP-1B)
Air Compressor (AHP-1A)
Air Compressor (AHP-1B)
Control Complex Water Chiller 3A (CHHE-1A)
Control Complex Water Chiller 3B (CHHE-1B)
Dryer, Refrig. Unit & Fan (AHDR-1A)
Disconnect Switch For AHDR-1A
Starter for Chiller 3A
Starter for Chiller 3B
Control Stations CH-1 & CH-2
HVAC Control Cab. 26A
Controlled Acces Area Exhaust Fan 3A (AHF-20A)
Controlled Acces Area Exhaust Fan 3B (AHF-20B)
HVAC Control Cab. 9A
Control Station AH-21
Terminal Box AH-15
Limit Switch AH-185-KS1B
Limit Switch AH-186-KS1B
Terminal Box AH-48
Control Station AH-22
HVAC Control Cab. 9B
Limit Switch AH-187-KS1B
Limit Switch AH-188-KS1B
Limit Switch AH-177-KS1B
Limit Switch AH-178-KS1B
Limit Switch AH-179-KS1B
Limit Switch AH-180-KS1B
HVAC Control Cab 9AB
Pressure Switch AH-506-PS
CHHE-1A Control Cab.
CHHE-1B Control Cab.
Flow Switch CH-378-FS
Flow Switch CH-379-FS

Air Handling System (AH) (cont'd)

Circuit I.D.

AHC561 - 480 Volt 3Ø Power to AHF-17A
AHC563 - Control of AHF-17A (Term. Box AH-15)
AHC564 - Control of AHF-17A (Cont. Sta. AH-21)
AHC565 - Control of AHF-17A (HVAC Cont. Cab. 9A)
AHC566 - Control Interlock of AHF-17A from AH-185-KS1B
AHC567 - Control Interlock of AHF-17A from AH-186-KS1B
AHC581 - 480 Volt 3Ø Power to AHF-17B
AHC583 - Control of AHF-17B (Term. Box AH-48)
AHC584 - Control of AHF-17B (Cont. Sta. AH-22)
AHC585 - Control of AHF-17B (Cont. Cab. 9B)
AHC586 - Control Interlock of AHF-17B from AH-187-KS1B
AHC587 - Control Interlock of AHF-17B from AH-188-KS1B
AHC641 - 480 Volt 3Ø Power to AHF-19A
AHC643 - Control of AHF-19A (Term. Box AH-15)
AHC644 - Control of AHF-19A (Cont. Sta. AH-21)
AHC645 - Control of AHF-19A (Cont. Cab. 9A)
AHC646 - Control Interlock of AHF-19A from AH-177-KS1B
AHC647 - Control Interlock of AHF-19A from AH-178-KS1B
AHC656 - 480 Volt 3Ø Power to AHF-19B
AHC658 - Control of AHF-19B (Term. Box AH-48)
AHC659 - Control of AHF-19B (Cont. Sta. AH-22)
AHC660 - Control of AHF-19B (Cont. Cab. 9B)
AHC661 - Control Interlock of AHF-19B from AH-179-KS1B
AHC662 - Control Interlock of AHF-19B from AH-180-KS1B
AHF61 - 120 VAC Control Power for Damper Sol. Valves to HVAC Cont. Cab. 9AB
AHF65 - 120 VAC Cont. Pwr. for Damper Sol. Valves from 9AB to HVAC Cont. Cab. 10AB
AHF72 - 120 VAC Cont. Pwr. for Damper Sol. Valves from 9AB
AHC852 - 480 Volt 3Ø Pwr. for AHP-1A from Cont. Cab. 26A
AHC853 - 480 Volt 3Ø Pwr. for AHP-1B from Cont. Cab. 26A
AHC851 - 480 Volt 3Ø Pwr. Source to Cont. Cab. 26A
AHC855 - Control Interlock for AHP-1A & 1B (AH-506-PS)
AHF401 - 120 VAC Pwr. to Disc. Sw. for AHDR-1A
AHF402 - 120 VAC Pwr. to AHDR-1A from Disc. Sw.
CHL1 - 480 Volt 3Ø Pwr. to CHHE-1A Local Motor Starter
CHL2 - 480 Volt 3Ø Pwr. to CHHE-1B Local Motor Starter
CHC1 - 480 Volt 3Ø Pwr. to CHP-1A
CHC3 - Control of CHP-1A from Cont. Sta. CH-1
CHC11 - 480 Volt 3Ø Pwr. to CHP-1B
CHC13 - Control of CHP-1B from Cont. Sta. CH-2
CHF2 - 480 Volt 3Ø Pwr. to CHHE-1A from Local Starter
CHF4 - Control of CHHE-1A
CHF5 - Remote Control of CHHE-1A
CHF6 - Control Interlock from CH-378-FS for CHHE-1A
CHF1 - Control Interlock for CHHE-1A
CHF12 - 480 Volt 3Ø Pwr. to CHHE-1B From Local Starter
CHF14 - Control of CHHE-1B
CHF17 - Control Interlock for CHHE-1B
CHF15 - Remote Control of CHHE-1B
CHF16 - Control Interlock to CHHE-1B from CH-379-FS

NOTES

1. Circuits will be isolated from the main control room when dedicated shutdown capability is being used. Control will be from the respective switchgear room.

2. These circuits will be isolated from the main control room. Automatic operation of the diesel generators is being relied upon for dedicated shutdown operation.

3. These circuits do not require isolation because they are used to supply power to control board sections in the main control room.

4. Circuits will be isolated from the main control room when dedicated shutdown capability is being used. Control will be from the respective motor control center.

5. These circuits do not require isolation. RR1A, RR1B, RR3A and RR3B are relay racks located in the relay room. Any redundant relays located in the relay room will be physically separated, and one of the redundant relays will be separately powered with circuits bypassing the main control room and cable spreading room.

6. Circuits will be isolated from the main control room when dedicated shutdown capability is being used. Control will be from local control stations.

7. Circuits do not require isolation. The main oil pump will be relied upon when dedicated shutdown capability is being used.

8. The chemical addition system is not required for safe shutdown. The operability of valve CAV-126 will provide a method of obtaining a reactor coolant sample to determine boration. The installation of the post accident sampling system will provide an additional means of determining boration.

9. These circuits do not require isolation. The turbine driven emergency feedwater pump is being relied upon when dedicated shutdown capability is being used.

10. These circuits do not require isolation. MUP-1A and 1B are being relied upon when dedicated shutdown capability is being used.

11. These circuits do not require isolation. Each diesel generator room is provided with two 100% capacity fans. Only one fan in each room is being relied upon when dedicated shutdown capability is being used. AHF-22A is being relied upon for the "A" diesel generator room, and AHF-22C is being relied upon for the "B" diesel generator room.

12. These circuits do not require isolation. Components will fail-safe.

EXPLANATION OF THE USE OF TABLE 1, FIGURES 2 THROUGH 6, BLOCKS AND ELEMENTARIES

Table 1 lists new circuits for the dedicated shutdown system by circuit number and function. The letter "X" in the column entitled "Normal Shutdown Method" indicates the circuits is needed for normal shutdown from the Control Room. The letter "X" in the column entitled "Dedicated Shutdown Method" indicates the circuit is needed when the Remote Shutdown Panel is used. An "X" in both columns means the particular circuit is required when either normal or dedicated shutdown is used. The letter designation shown in the column entitled "Fire Areas Where Ckt. is Located" is to be compared to the same letter shown on Figure 2. This identifies which components of the dedicated shutdown equipment the circuit connects to, and whether or not the circuit is located in either the main control room or cable spreading room. The main control room and cable spreading room are the two fire areas for which the dedicated shutdown method is provided. Table 1 along with Figure 2 show that any circuit required for dedicated shutdown is not located in either the main control room or cable spreading room.

EXAMPLE:

(1) Circuit AHC925 - Table 1 shows this circuit is needed for normal and dedicated shutdown. The Letter H shows this circuit connects from Dedicated Shutdown Relay Cabinet A to local equipment. This circuit does not enter either the main control room or cable spreading room.

(2) Circuit AHC926 - Table 1 shows that this circuit is only needed for normal shutdown. The letter "A" on Figure 2 shows that this circuit connects from the main control board to dedicated Shutdown Relay Cabinet A. From Figure 2, it is also shown that this circuit is located in the main control room and cable spreading room, however, this is acceptable since Table 1 indicates this circuit is not required for dedicated shutdown.

Figures 3 and 6 show the actual location of the dedicated shutdown components and the approximate routing of the circuits. Figures 4 and 5 show the cable spreading room and main control room fire areas. Figures 3, 4, 5, and 6 also verify that no dedicated shutdown components and circuits are located in either the main control room or cable spreading room.

The following is an example of how the actual circuit isolation is provided.

EXAMPLE - Circuit AHC925

The circuit function from Table 1 shows this circuit is used for RB Fan AHF-1A. The block diagram for AHF-1A is drawing SS-211-005 Sh. AH-28. Circuit AHC925 shows on this drawing connecting ES MCC3A2 to Remote Shutdown Panel Relay Cabinet "A". The designation 1-9-14 indicates that this "1" cable of "9" conductors

of size "14" AWG. The numbers 1, 2, 3, 5, 7, 26, 27 indicate the wire mark numbers of each conductor (2 conductors are spare). This drawing refers to Elementary Diagram B-208-005, AH-28. This elementary shows where each of the conductors is used in the control circuit. i.e. Wire mark Number 1 (which shows up as a solid circle with the number 1 next to it on the elementary diagram) connects relay contact 3-RRRSPA-1 terminal 8a and terminal 4a in the remote shutdown panel to contact 42/4CR terminal 5 in ES MCC 3A2.

TABLE 1
NEW CIRCUITS PROVIDED FOR THE DEDICATED SHUTDOWN SYSTEM

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
AHC925	Control for Reactor Building Fan 3A (AHF-1A)	X	X	H	
AHC926	Control for Reactor Building Fan 3A (AHF-1A)	X		A	
AHC927	Control for Reactor Building Fan 3B (AHF-1B)	X	X	M	
AHC928	Control for Reactor Building Fan 3B (AHF-1B)	X		E	
ASE21	Control for Turbine Driven Emergency Feedwater Pump Stop Valve ASV-5		X	K	
ASE22	Control for Turbine Driven Emergency Feedwater Pump Stop Valve ASV-5		X	G	
ASE23	Control for Turbine Driven Emergency Feedwater Pump Stop Valve ASV-5	X		E	
ASE24	Control for Turbine Driven Emergency Feedwater Pump Stop Valve ASV-5	X	X	M	
DCL15	Control DH Closed Cycle Cooling Pp. 3A (DCP-1A)	X	X	H	
DCL16	Control DH Closed Cycle Cooling Pp 3A (DCP-1A)	X		A	
DCL13	Control DH Closed Cycle Cooling Pp 3B (DCP-1B)	X	X	M	
DCL14	Control DH Closed Cycle Cooling Pp 3B (DCP-1B)	X		E	
DHM13	Control for Decay Heat Pump 3A (DHP-1A)	X	X	H	
DHM14	Control for Decay Heat Pump 3A (DHP-1A)		X	F	
DHM15	Control for Decay Heat Pump 3A (DHP-1A)	X		A	
DHM16	Control for Decay Heat Pump 3B (DHP-1B)	X	X	M	
DHM17	Control for Decay Heat Pump 3B (DHP-1B)		X	G	
DHM18	Control for Decay Heat Pump 3B (DHP-1B)	X		E	
DHC133	Control for Decay Heat Removal Outlet Valve DHV-3	X		A	See Note 1
DHC134	Control for Decay Heat Removal Outlet Valve DHV-3		X	F	See Note 1
DHC135	Control for Decay Heat Removal Outlet Valve DHV-3	X	X	H	See Note 1
DHC137	Control for Decay Heat Removal Outlet Valve DHV-4	X		E	See Note 1
DHC138	Control for Decay Heat Removal Outlet Valve DHV-4		X	G	See Note 1
DHC139	Control for Decay Heat Removal Outlet Valve DHV-4	X	X	M	See Note 1
DHC141	Control for Low Press. Inj. Containment Iso. Valve DHV-5	X	X	H	See Note 1
DHC142	Control for Low Press. Inj. Containment Iso. Valve DHV-5	X		A	See Note 1
DHC143	Control for Low Press. Inj. Containment Iso. Valve DHV-5		X	F	See Note 1
DHC144	Control for Low Press. Inj. Containment Iso. Valve DHV-6	X	X	M	See Note 1
DHC145	Control for Low Press. Inj. Containment Iso. Valve DHV-6	X		E	See Note 1
DHC146	Control for Low Press. Inj. Containment Iso. Valve DHV-6		X	G	See Note 1

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
DHC147	Control for Decay Heat Discharge Valve DHV-110	X	X	H	See Note 1
DHC148	Control for Decay Heat Discharge Valve DHV-110	X	X	H	See Note 1
DHC149	Control for Decay Heat Discharge Valve DHV-110	X		A	See Note 1
DHC173	Control for Decay Heat Discharge Valve DHV-110		X	F	See Note 1
DHC150	Control for Decay Heat Discharge Valve DHV-111	X	X	M	See Note 1
DHC151	Control for Decay Heat Discharge Valve DHV-111	X	X	M	See Note 1
DHC152	Control for Decay Heat Discharge Valve DHV-111	X		E	See Note 1
DHC153	Control for Decay Heat Discharge Valve DHV-111		X	G	See Note 1
DHC154	Control for Decay Heat Suction Valve DHV-34 From BWST	X	X	H	See Note 1
DHC155	Control for Decay Heat Suction Valve DHV-34 From BWST		X	F	See Note 1
DHC156	Control for Decay Heat Suction Valve DHV-34 From BWST	X		A	See Note 1
DHC157	Control for Decay Heat Suction Valve DHV-35 From BWST		X	G	See Note 1
DHC158	Control for Decay Heat Suction Valve DHV-35 From BWST	X		E	See Note 1
DHC159	Control for Decay Heat Suction Valve DHV-35 From BWST	X	X	M	See Note 1
DHC162	Control for Decay Heat Removal Outlet Iso. Valve DHV-41	X		C	See Note 1
DHC163	Control for Decay Heat Removal Outlet Iso. Valve DHV-41	X	X	K	See Note 1
DHC164	Control for Decay Heat Removal Outlet Iso. Valve DHV-41	X	X	See Note 2	See Note 1
DHC160	Control for Decay Heat Removal Outlet Iso. Valve DHV-41	X	X	K	See Note 1
DHC165	Control for Decay Heat Suction Valve DHV-42 From RB Sump	X	X	H	See Note 1
DHC166	Control for Decay Heat Suction Valve DHV-42 From RB Sump	X		A	See Note 1
DHC167	Control for Decay Heat Suction Valve DHV-42 From RB Sump		X	F	See Note 1
DHC168	Control for Decay Heat Suction Valve DHV-43 From RB Sump	X	X	M	See Note 1
DHC169	Control for Decay Heat Suction Valve DHV-43 From RB Sump	X		E	See Note 1
DHC170	Control for Decay Heat Suction Valve DHV-43 From RB Sump		X	G	See Note 1

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
EFC23	Control for Motor Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-3	X	X	K	See Note 3
EFC24	Control for Motor Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-3		X	K	See Note 3
EFC25	Control for Motor Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-3	X		C	See Note 3
EFC26	Control for Turbine Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-4	X	X	K	See Note 3
EFC27	Control for Turbine Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-4	X		C	See Note 3
EFC28	Control for Turbine Driven EF Pump to Condensate Storage Tank Iso. Valve EFV-4		X	K	See Note 3
EFC29	Control for Motor Driven EF Pump Discharge Valve EFV-7	X	X	K	See Note 3
EFC30	Control for Motor Driven EF Pump Discharge Valve EFV-7	X		C	See Note 3
EFC31	Control for Motor Driven EF Pump Discharge Valve EFV-7		X	K	See Note 3
EFC32	Control for Turbine Driven EF Pump Disch. Valve EFV-8	X	X	K	See Note 3
EFC33	Control for Turbine Driven EF Pump Disch. Valve EFV-8	X		C	See Note 3
EFC34	Control for Turbine Driven EF Pump Disch. Valve EFV-8		X	K	See Note 3
EFC65	Control for Turbine Driven EF Pump to Hotwell Iso. Valve EFV-1	X		C	See Note 3
EFC66	Control for Turbine Driven EF Pump to Hotwell Iso. Valve EFV-1	X	X	K	See Note 3
EFC67	Control for Turbine Driven EF Pump to Hotwell Iso. Valve EFV-1	X	X	K	See Note 3
EFC68	Control for Turbine Driven EF Pump to Hotwell Iso. Valve EFV-1		X	K	See Note 3
EFC69	Control for Motor Driven EF Pump to Hotwell Iso. Valve EFV-2	X		C	See Note 3
EFC70	Control for Motor Driven EF Pump to Hotwell Iso. Valve EFV-2	X	X	K	See Note 3
EFC71	Control for Motor Driven EF Pump to Hotwell Iso. Valve EFV-2	X	X	K	See Note 3
EFC72	Control for Motor Driven EF Pump to Hotwell Iso. Valve EFV-2		X	K	See Note 3

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
EFE73	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-11		X	G	
EFE74	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-11	X		E	
EFE75	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-11	X	X	M	
EFE76	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-14		X	F	
EFE77	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-14	X		A	
EFE78	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-14	X	X	H	
EFE79	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-32		X	G	
EFE80	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-32	X		E	
EFE81	Control for Turbine Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-32	X	X	M	
EFE82	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-33		X	F	
EFE83	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-33	X		A	
EFE84	Control for Motor Driven EF Pump Discharge to Steam Generator Iso. Valve EFV-33	X	X	H	
MSE71	Control for Steam Gen. Iso. Valve MSV-56 to EF Pump Turbine	X	X	M	
MSE72	Control for Steam Gen. Iso. Valve MSV-56 to EF Pump Turbine	X		E	
MSE73	Control for Steam Gen. Iso. Valve MSV-56 to EF Pump Turbine		X	G	
MSE74	Control for Steam Gen. Iso. Valve MSV-55 to EF Pump Turbine	X	X	M	
MSE75	Control for Steam Gen. Iso. Valve MSV-55 to EF Pump Turbine	X		E	
MSE76	Control for Steam Gen. Iso. Valve MSV-55 to EF Pump Turbine		X	G	
MUM41	Control for Makeup & Purification Pump 3A (MUP-1A)	X	X	H	
MUM42	Control for Makeup & Purification Pump 3A (MUP-1A)		X	K	
MUM43	Control for Makeup & Purification Pump 3A (MUP-1A)	X		A	
MUM44	Control for Makeup & Purification Pump 3B (MUP-1B)	X	X	H	
MUM45	Control for Makeup & Purification Pump 3B (MUP-1B)	X		A	
MUM46	Control for Makeup & Purification Pump 3B (MUP-1B)		X	K	

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
MUM47	Control for Makeup & Purification Pump 3B (MUP-1B)	X	X	M	
MUM48	Control for Makeup & Purification Pump 3B (MUP-1B)		X	K	
MUM49	Control for Makeup & Purification Pump 3B (MUP-1B)	X		E	
MUC325	Control for MU&P Iso. Valve MUV-27 to Reactor Inlet Lines	X		K	
MUC326	Control for MU&P Iso. Valve MUV-27 to Reactor Inlet Lines	X	X	C	
MUC327	Control for H.P. Pp. Suction Valve MUV-58 from BWST	X	X	M	
MUC328	Control for H.P. Pp. Suction Valve MUV-58 from BWST	X		E	
MUC329	Control for H.P. Pp. Suction Valve MUV-58 from BWST		X	G	
MUC330	Control for BWST to Makeup Pump Valve MUV-73	X	X	H	
MUC331	Control For BWST to Makeup Pump Valve MUV-73		X	F	
MUC332	Control for BWST to Makeup Pump Valve MUV-73	X		A	
MUC341	Control for H.P. Inj. Control Valve MUV-25 to React. Inlet Lines	X	X	M	
MUC342	Control for H.P. Inj. Control Valve MUV-25 to React. Inlet Lines		X	G	
MUC343	Control for H.P. Inj. Control Valve MUV-25 to React. Inlet Lines	X	X	M	
MUC344	Control for H.P. Inj. Control Valve MUV-25 to React. Inlet Lines	X		E	
MUC345	Control for H.P. Inj. Control Valve MUV-26 to React. Inlet Lines	X	X	M	
MUC346	Control for H.P. Inj. Control Valve MUV-26 to React. Inlet Lines	X	X	M	
MUC347	Control for H.P. Inj. Control Valve MUV-26 to React. Inlet Lines		X	G	
MUC348	Control for H.P. Inj. Control Valve MUV-26 to React. Inlet Lines	X		E	
RCC301	Control for Pressurizer Relief Block Valve RCV-11	X	X	K	See Note 4
RCC302	Control for Pressurizer Relief Block Valve RCV-11	X		C	See Note 4
RCC303	Control for Pressurizer Relief Block Valve RCV-11	X	X	K	See Note 4
RCE 85	Control for Pressurizer Electromatic Relief Valve RCV-10	X	X	K	See Note 4
RCE86	Control for Pressurizer Electromatic Relief Valve RCV-10	X		C	See Note 4
RCR231	Pressurizer Level Transmitter Signal	X	X	J	

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
RCR232	Pressurizer Level Transmitter Signal		X	R	
RCR233	Pressurizer Level Transmitter Signal	X		B	
RCR235	Pressurizer Level Transmitter Signal	X	X	L	
RCR236	Pressurizer Level Transmitter Signal		X	S	
RCR237	Pressurizer Level Transmitter Signal	X		D	
RCR263	Reactor Coolant Pressure Transmitter Signals		X	J	
RCR264	Reactor Coolant Pressure Transmitter Signals		X	R	
RCR266	Reactor Coolant Pressure Transmitter Signals		X	J	
RCR267	Reactor Coolant Pressure Transmitter Signals		X	R	
RCR269	Reactor Coolant Pressure Transmitter Signals		X	L	
RCR270	Reactor Coolant Pressure Transmitter Signals		X	S	
RCR272	Reactor Coolant Pressure Transmitter Signals		X	L	
RCR273	Reactor Coolant Pressure Transmitter Signals		X	S	
RCR247	Reactor Coolant Outlet & Unit Temperature Signals	X	X	J	
RCR248	Reactor Coolant Outlet & Unit Temperature Signals		X	R	
RCR249	Reactor Coolant Outlet & Unit Temperature Signals	X		B	
RCR251	Reactor Coolant Outlet & Unit Temperature Signals	X	X	L	
RCR252	Reactor Coolant Outlet & Unit Temperature Signals		X	S	
RCR253	Reactor Coolant Outlet & Unit Temperature Signals	X		D	
RCR255	Reactor Coolant Temp. Signals (Wide Range)	X	X	J	
RCR256	Reactor Coolant Temp. Signals (Wide Range)		X	R	
RCR257	Reactor Coolant Temp. Signals (Wide Range)	X		B	
RCR259	Reactor Coolant Temp. Signals (Wide Range)	X	X	L	
RCR260	Reactor Coolant Temp. Signals (Wide Range)		X	S	
RCR261	Reactor Coolant Temp. Signals (Wide Range)	X		D	
RSF1	120V ac Power for Dedicated Shutdown Relay Cab."A"		X	N	
RSF5	120V ac Power for Dedicated Shutdown Relay Cab."B"		X	P	
RSF2	Control for Dedicated Shutdown System		X	F	
RSF3	Control for Dedicated Shutdown System		X	T	
RSF4	Control for Dedicated Shutdown System		X	T	
RSF6	Control for Dedicated Shutdown System		X	G	
RSF7	Control for Dedicated Shutdown System		X	U	
RSF8	Control for Dedicated Shutdown System		X	U	
RSF9	120 V ac Power For Dedicated Shutdown Panel		X	K	
RSC1	120 V ac Power for Dedicated Shutdown Panel		X	K	
RWM41	Control for Emerg. Nuc. Serv. Sea Wtr. Pp. 3A (RWP-2A)	X		A	
RWM42	Control for Emerg. Nuc. Serv. Sea Wtr. Pp. 3A (RWP-2A)	X	X	H	
RWM43	Control for Emerg. Nuc. Serv. Sea Wtr. Pp. 3B (RWP-2B)	X		E	
RWM44	Control for Emerg. Nuc. Serv. Sea Wtr. Pp. 3B (RWP-2B)	X	X	M	

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
RWM45	Control for Decay Heat Serv Sea Wtr Pp. 3A(RWP-3A)	X	X	H	
RWM46	Control for Decay Heat Serv Sea Wtr. Pp. 3A (RWP-3A)	X		A	
RWM47	Control for Decay Heat Serv Sea Wtr. Pp. 3B (RWP-3B)	X	X	M	
RWM48	Control for Decay Heat Serv Sea Wtr. Pp. 3B (RWP-3B)	X		E	
SWM43	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A)	X	X	H	
SWM44	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A)		X	F	
SWM45	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3A (SWP-1A)	X		A	
SWM46	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B)	X	X	M	
SWM47	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B)		X	G	
SWM48	Control for Emerg. Nuc. Serv. Closed Cycle Cooling Pump 3B (SWP-1B)	X		E	
SWE383	Control for Reactor Bldg. Fan 3A Inlet Valve SWV-35		X	K	
SWE384	Control for Reactor Bldg. Fan 3A Inlet Valve SWV-35	X	X	H	
SWE385	Control for Reactor Bldg. Fan 3A Inlet Valve SWV-35	X		A	
SWE386	Control for Reactor Bldg. Fan 3B Inlet Valve SWV-37		X	K	
SWE387	Control for Reactor Bldg. Fan 3B Inlet Valve SWV-37	X	X	M	
SWE388	Control for Reactor Bldg Fan 3B Inlet Valve SWV-37	X		E	
SWE392	Control for Reactor Bldg. Fan 3A Disch. Valve SWV-41		X	K	
SWE393	Control for Reactor Bldg. Fan 3A Disch. Valve SWV-41	X	X	H	
SWE394	Control for Reactor Bldg. Fan 3A Disch. Valve SWV-41	X		A	
SWE395	Control for Reactor Bldg. Fan 3B Disch. Valve SWV-43	X		E	
SWE396	Control for Reactor Bldg. Fan 3B Disch. Valve SWV-43	X	X	M	
SWE397	Control for Reactor Bldg. Fan 3B Disch. Valve SWV-43		X	K	
SWE514	Control for RB Fan Assembly Transfer VAlve SWV-353 ("A"Solenoid)	X	X	H	
SWE515	Control for RB Fan Assembly TRansfer Valve SWV-353 ("A"Solenoid)		X	F	
SWE516	Control for RB Fan Assembly Transfer Valve SWV-353 ("A"Solenoid)		X	K	
SWE528	Control for RB Fan Assembly Transfer Valve SWV-353 ("A"Solenoid)	X		A	
SWE511	Control for RB Fan Assembly Transfer Valve SWV-353 ("B" Solenoid)		X	K	
SWE512	Control for RB Fan Assembly Transfer Valve SWV-353 ("B" Solenoid)	X	X	M	

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
SWE513	Control for RB Fan Assembly Transfer Valve SWV-353 ("B" Solenoid)	X		E	
SWE519	Control for RB Fan Assembly Transfer Valve SWV-354 ("A" Solenoid)		X	K	
SWE525	Control for RB Fan Assembly Transfer Valve SWV-354 ("A" Solenoid)	X	X	H	
SWE526	Control for RB Fan Assembly Transfer VAlve SWV-354 ("A"Solenoid)		X	F	
SWE527	Control for RB Fan Assembly Transfer Valve SWV-354 ("A"Solenoid)	X		A	
SWE522	Control for RB Fan Assembly Transfer Valve SWV-354 ("B"Solenoid)		X	K	
SWE523	Control for RB Fan Assembly Transfer Valve SWV-354 ("B" Solenoid)	X	X	M	
SWE524	Control for RB Fan Assembly Transfer Valve SWV-354 ("B" Solenoid)	X		E	
SWE554	Control for RB Fan Assembly Transfer Valve SWV-354 ("A" Solenoid)		X	W	
SWE555	Control for RB Fan Assembly Transfer Valve SWV-353 ("A" Solenoid)		X	W	
RSF10	Control for Dedicated Shutdown System		X	W	
RSF11	Control for Dedicated Shutdown System		X	W	
RSF12	Control for Dedicated Shutdown System		X	X	
RSF13	Control for Dedicated Shutdown System		X	X	
MTM178	Control for 4 kV ES Swgr. Breaker 3209	X	X	H	
MTM179	Control for 4 kV ES Swgr. Breaker 3209	X		A	
MTM180	Control for 4 kV ES Swgr. Breaker 3210	X	X	M	
MTM181	Control for 4 kV ES Swgr. Breaker 3210	X		E	
MTM186	Control for 4 kV ES Swgr. Breaker 3205	X		A	
MTM187	Control for 4 kV ES Swgr. Breaker 3205	X		A	
MTM188	Control for 4 kV ES Swgr. Breaker 3205	X	X	H	
MTM189	Control for 4 kV ES Swgr. Breaker 3206	X	X	M	
MTM190	Control for 4 kV ES Swgr. Breaker 3206	X		E	
MTM191	Control for 4 kV ES Swgr. Breaker 3206	X		E	
MTM182	Control for 4 kV ES Swgr. Breaker 3221	X	X	H	
MTM183	Control for 4 kV ES Swgr. Breaker 3221	X		A	
MTM184	Control for 4 kV ES Swgr. Breaker 3220	X	X	M	
MTM185	Control for 4 kV ES Swgr. Breaker 3220	X		E	
MTL111	Control for 480V ES Swgr. Breaker 3310	X	X	M	
MTL112	Control for 480V ES Swgr. Breaker 3310	X		E	
MTL113	Control for 480V ES Swgr. Breaker 3311	X	X	H	
MTL114	Control for 480V ES Swgr. Breaker 3311	X		A	

CIRCUIT NO.	CIRCUIT FUNCTION	NORMAL SHUTDOWN METHOD	DEDICATED SHUTDOWN METHOD	FIRE AREAS WHERE CKT. IS LOCATED (REF. FIGURE 2)	COMMENTS
AHC929	Control of Diesel Gen. Rm. Air Handling Fan 3C (AHF-22C)	X	X	M	
AHC930	Control of Diesel Gen. Rm. Air Handling Fan 3C (AHF-22C)	X		E	
AHC931	Control of Diesel Gen. Rm. Air Handling Fan 3A (AHF-22A)	X	X	H	
AHC932	Control of Diesel Gen. Rm. Air Handling Fan 3A (AHF-22A)	X		A	
MUC390	Control of Makeup & Purification Pump 3A Main Lube Oil Pump (MUP-2A)	X	X	H	
MUC391	Control of Makeup & Purification Pump 3A Main Lube Oil Pump (MUP-2A)	X		A	
MUC392	Control of Makeup & Purification Pump 3B Main Lube Oil Pump (MUP-2B)	X	X	K	
MUC393	Control of Makeup & Purification Pump 3B Main Lube Oil Pump (MUP-2B)	X		C	
MUC394	Control of Makeup & Purification Pump 3A Main Gear Oil Pump (MUP-4A)	X		A	
MUC395	Control of Makeup & Purification Pump 3A Main Gear Oil Pump (MUP-4A)	X	X	H	
MUC396	Control of Makeup & Purification Pump 3B Main Gear Oil Pump (MUP-4B)	X		C	
MUC397	Control of Makeup & Purification Pump 3B Main Gear Oil Pump (MUP-4B)	X	X	K	
CAC111	Control of RC Letdown Sampling Iso. Valve CAV-126	X	X	H	
CAC112	Control of RC Letdown Sampling Iso. Valve CAV-126	X		A	
CAC113	Control of RC Letdown Sampling Iso. Valve CAV-126	X		A	
EGM54	Metering CT Circuit for 4 kV ES Bus 3A, Unit 3A14	X	X	H	
EGM55	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14	X	X	H	
EGM56	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14	X		A	
MTM194	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14	X		A	
MTM195	Metering PT Circuit for 4 kV ES Bus 3A, Unit 3A14	X	X	H	
EGM51	Metering CT Circuit for 4 kV ES Bus 3B, Unit 3B2	X	X	M	
EGM52	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2	X	X	M	
EGM53	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2	X		E	
MTM192	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2	X		E	
MTM193	Metering PT Circuit for 4 kV ES Bus 3B, Unit 3B2	X	X	M	

NOTES:

1. This equipment is required only for cold shutdown operation. For fires occurring in fire areas other than the main control room or cable spreading room, manual operation will be relied upon in lieu of protecting the circuits and components as required to meet the criteria of Appendix R Section III.G.2. These components and circuits are listed in Table 1 because if the fire occurs in either the main control room or the cable spreading room, remote control of these components will be retained and will be utilized at the time the components must operate.

2. This circuit is internal to the Dedicated Shutdown Panel.

3. There is sufficient time to use manual operation when these components need to actuate. For fires occurring in fire areas other than the main control room or cable spreading room, manual operation will be relied upon in lieu of protecting the circuits and components as required to meet the criteria of Appendix R, Section III, G. 2. These components are listed in the Table 1 because if the fire occurs in either the main control room or cable spreading room, remote controlof these components will be retained and will be utilized at the time the components must operate.

4. For the purpose of shutting down in the event of a fire, RCV-10 and RCV-11 are considered redundant to the Emergency Feedwater System. For fires occurring in fire areas other than the main control room or cable spreading room the EF system will be relied upon for shutdown, and the circuits and components of RCV-10 and 11 are not considered to be required to meet the criteria of Appendix R Section III. G.2. RCV-10 and 11 are included in Table 1 because if a fire occurs in either the main control room of cable spreading room, remote control of these valves will be retained and thus the valves may be used if desired.

5/29/82

TABLE 2

Circuit Identification for Typical Elementary Diagrams

ELEMENTARY DIAGRAM NO.	CIRCUIT NO	CIRCUIT LOCATION (Ref. Figure 2)	WIRE MARK NOS.
AH-28	AHC925	H	1. 2, 3, 5, 7, 26, 27
AH-28	AHC926	A	21, 22, 23, 24, 25
DC-01	DCL15	H	1, 3, 4, 5, 6, 11
DC-01	DCL16	A	16, 17, 18, 19, 20, 21
RC-17A,GP-7	RCC313	A	22, 23
RC-17A,GP-7	RCC314	F	24, 25
RC-17A,GP-7	RCC315	H	15, 16, 21
RC-17A,GP-8	RCC316	C	24, 25
RC-17A,GP-8	RCC317	K	17, 18
RC-17A,GP-9	RCC318	C	26, 27
RC-17A,GP-9	RCC319	K	19, 20
RC-17A,GP-10	RCC320	E	22, 23
RC-17A,GP-10	RCC321	G	24, 25
RC-17A,GP-10	RCC322	M	13, 14, 21
RC-17A,GP-11	RCC323	C	24, 25
RC-17A,GP-11	RCC324	K	15, 16
RC-17A,GP-12	RCC325	C	26, 27
RC-17A,GP-12	RCC326	K	17, 18
RC-17A,GP-13	RCC327	C	28, 29
RC-17A,GP-13	RCC328	K	19, 20
RW-03	RWM43	E	1, 4, 18, 20, 21, 22
RW-03	RWM44	M	5, 6, 7, 11, 17, 19

SPEC 200 VOLTAGE-TO-CURRENT CONVERTER
Model 2AO-V2I, Isolated, 4 to 20 mA dc

GENERAL

The Voltage-to-Current Converter, shown in Figure 1, provides the interface between the SPEC 200 system voltage signals and the current signals to the field. The converter is a dual unit with two independent circuits, capable of performing two separate conversions.

Each converter has a linear 4 to 20 mA dc output signal for a 0 to 10 volt dc input signal. The output signals are isolated from the input signals. The converter receives power from the power bus-bar plug located in the nest assembly. The power is common to both converter circuits. The field circuits are powered by isolated voltage derived from a dc-to-dc conversion of the nest field bus-bar power. Jumpers on the board assembly allow for selecting the internal or external power supply.

The converter is available with intrinsically safe output circuits which can be extended into Class I, Groups B, C or D, Division 1 Hazardous Locations. The load equipment, however, must be that which has been certified by an appropriate testing agency or otherwise certified for use with the SPEC 200 intrinsically safe system.

Bypass plugs are available as options. Each bypass plug permits a signal from a standby unit to be connected (by means of a phone type jack) into one of the two output circuits of the converter. Each bypass plug can then be removed from the converter with the output load wires attached. This permits the converter and associated loop components to be serviced while the signal to the output load is maintained by the standby unit via the bypass plug. Note: this option can only be used when the load is powered from the nest bus. Two bypass plugs are required to permit removal of the dual converter if both circuits are in operation.

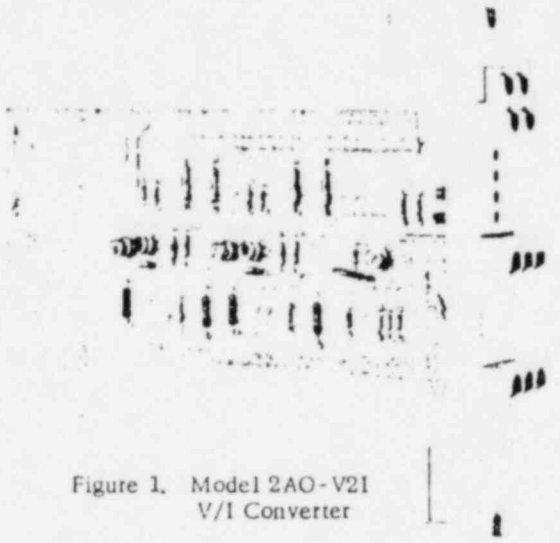


Figure 1. Model 2AO-V2I V/I Converter

SPECIFICATIONS

Model Number:
2AO-V2I
+P*
+P+P
*Bypass plugs ordered separately (insert prefix 2AX)
Example: 2AX+P

Intrinsic Safety:
Certified units for use in intrinsically safe systems specified by adding appropriate suffix to Model Number as follows:
-BGA (BASEEFA, UK) Refer to TI 200-257
-CGB (CSA, Canada) Refer to TI 200-255
-FGB (FM, US) Refer to TI 200-255
-PGA (PTB, Germany) Refer to TI 200-256
Examples: 2AO-V2I-FGB
2AO-V2I-FGB+P-FGB
2AO-V2I-FGB+P-FGB+P-FGB
2AX+P-FGB (bypass plug ordered separately)

Mounting:
Occupies one space in SPEC 200 nest (See TI 200-275)

Electrical Classification: Ordinary Locations

Power Requirements (Total for dual-circuit card):
+15 and -15 V dc ±5% at 80 mA when totally powered from system supply via nest bus-bar, or 40 mA when output is connected to external supply in series with load

Input Signals: 0 to 10 V dc (two per converter)

Input Resistance: 500 kilohms minimum

Output Signals: 4 to 20 mA dc (each output)

Output Load:
For total power from nest power bus-bar or 24 V dc external power supply in series with load: 600 ohms maximum
For 48 V dc external power supply in series with load: 1800 ohms maximum
Note: Use of bypass plug 2AX+P reduces load capacity by 50 ohms, 2AX+P-FGB by 150 ohms, 2AX+P-BGA or 2AX+P-PGA by 350 ohms

Adjustments (Front Panel):
Zero: ±2.5% of output span
Span: ±7.5% of output span

Accuracy: ±0.5% of output span

Repeatability: Less than 0.1% of output span

Supply Voltage Effect:
±0.5% of output span for a ±5% change within normal operating limits of +15 and -15 V dc supply

Ambient Temperature Range: 5 to 50°C (40 to 120°F)

Ambient Temperature Effect:
Less than ±0.5% of output span maximum for a 25°C (50°F) change within normal operating limits

Printed in U.S.A.

FOXBORO

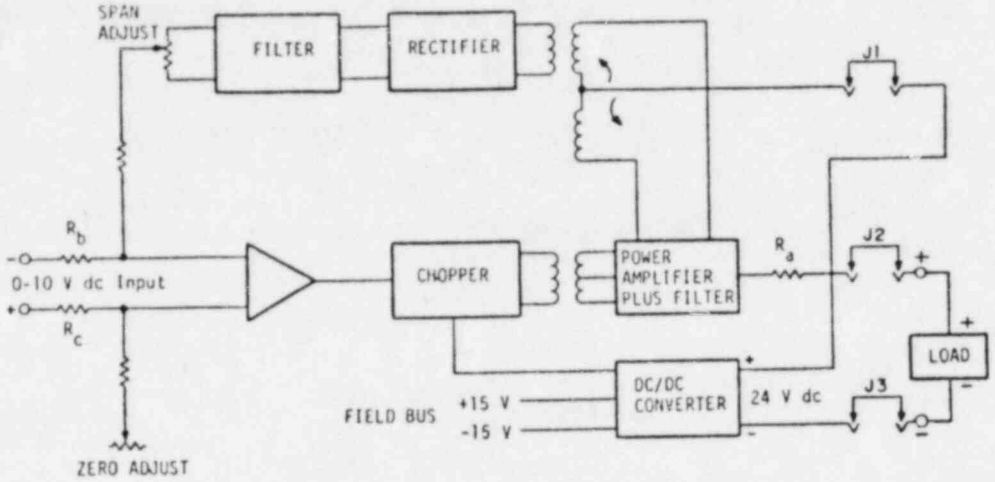


Figure 2. Model 2AO-V2I Converter Diagram

PRINCIPLE OF OPERATION

Isolated, 4 to 20 mA dc Output Unit

Figure 2 shows one of the two channels of a dual voltage-to-current converter. The other channel is identical.

The input voltage (0 to 10 volts dc) is applied to a high impedance operational amplifier. The signal from the amplifier is "chopped" (interrupted and polarized to appear as an ac signal) and fed to the primary of the output power amplifier transformer. The output of the transformer is amplified and filtered to produce the 4 to 20 mA dc converter output signal. The output voltage is simultaneously stepped-down and rectified/filtered to provide a negative feedback voltage to the input amplifier for adjustment and control of span.

For intrinsically safe applications, the voltage on the field bus-bar is limited by a specially designed high voltage limiting circuit in the nest power distribution component. Current limiting is provided by Resistor R_a in the output circuit. Resistors R_b and R_c protect against accidental fault voltages (up to 250 volts nominal) from the system circuits.

The converter circuits, including the associated output signal loads, are powered from the SPEC 200 system field bus-bar located in the nest. The 24 volt dc field requirement is generated by a dc-to-dc converter, a part of the circuit card. To power the field load from an external source, the converter is easily changed by relocating jumpers on the printed circuit card, as shown in Figure 3. An external power supply CANNOT be used if the field circuits are to be intrinsically safe.

The output capability can be extended when an external power supply is used if the external power source is greater than 24 volts dc. The maximum voltage which can be used is 48 volts dc without seriously overheating the output transistors (in the case of a short circuit fault across the output transducer). If 48 volts dc is used as the external power source, the load capacity is increased to 1800 ohms.

Since only one field bus-bar voltage is available per nest, care must be exercised when different models are used in a single nest.

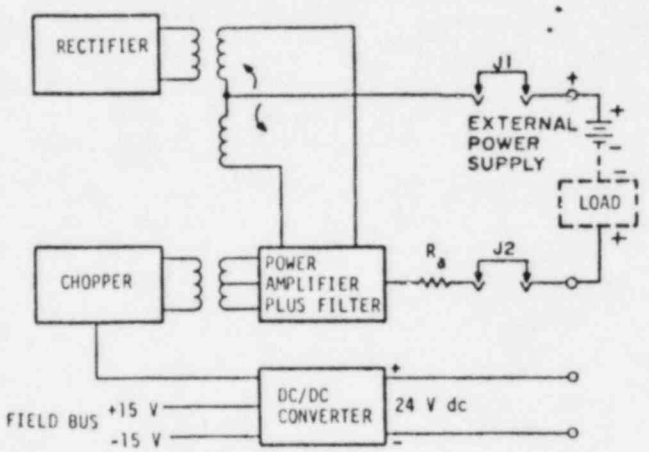
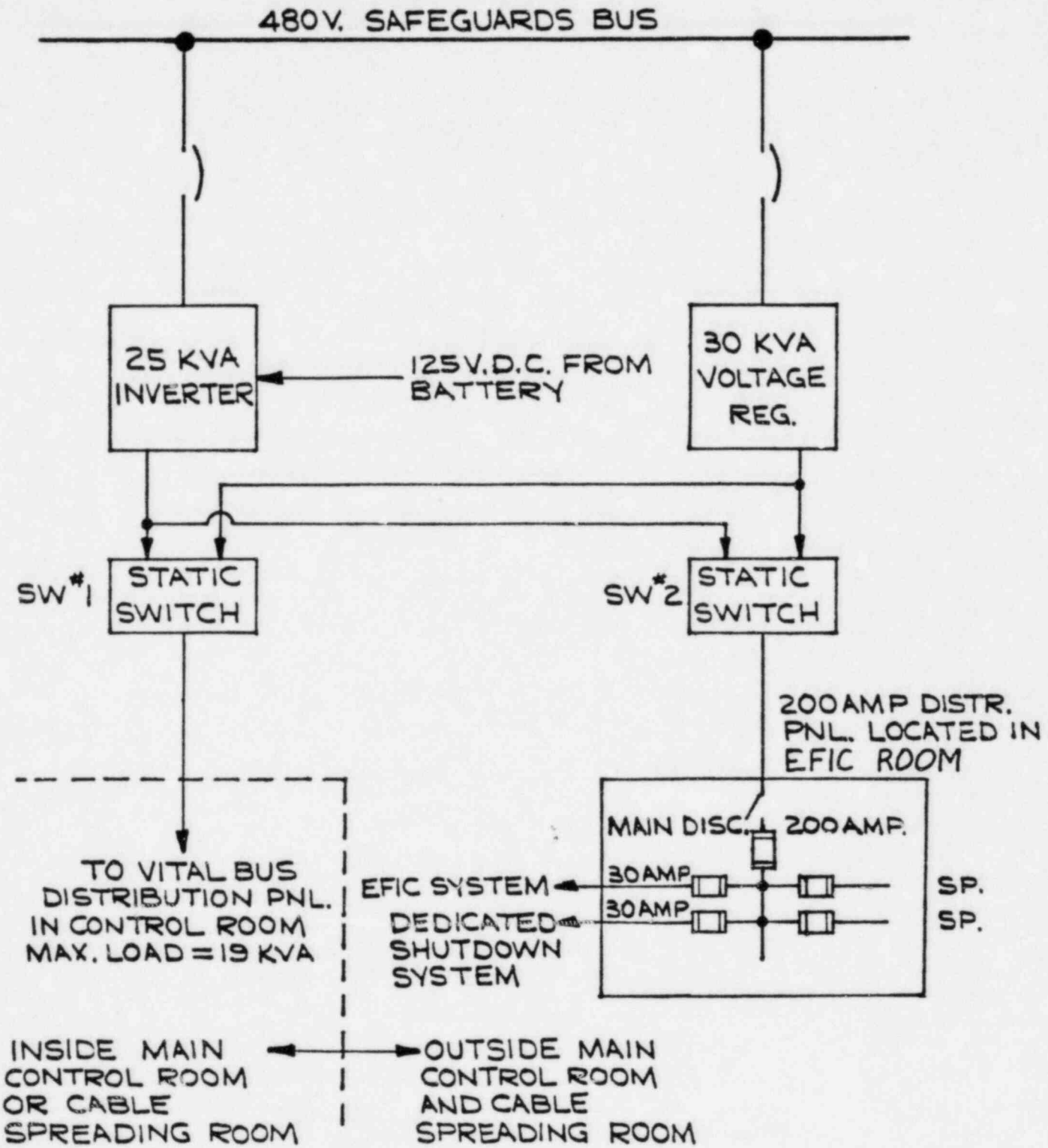


Figure 3. External Power Supply

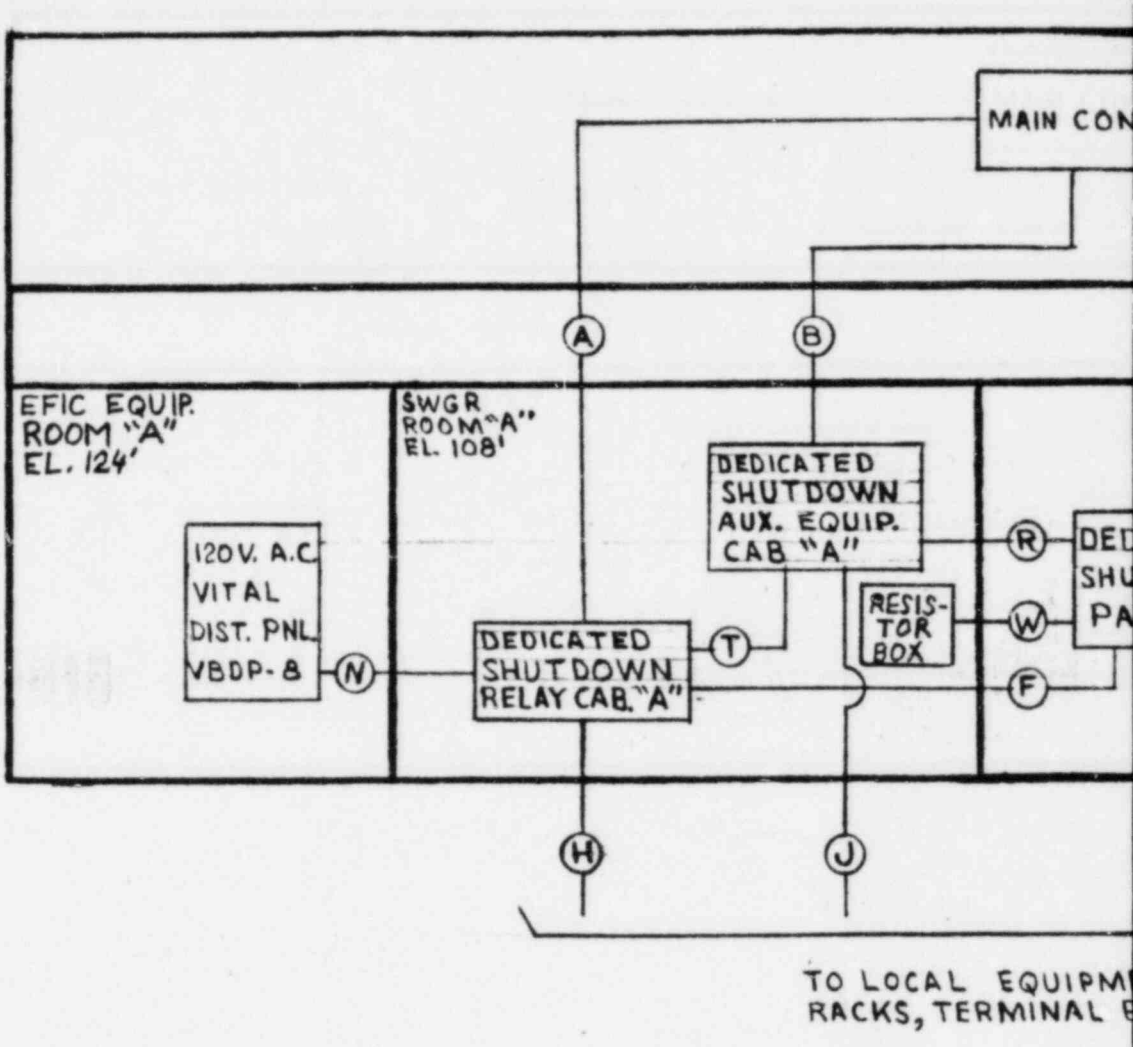
FIGURE 1

DEDICATED SHUTDOWN PANEL POWER



FOR REFERENCE ONLY

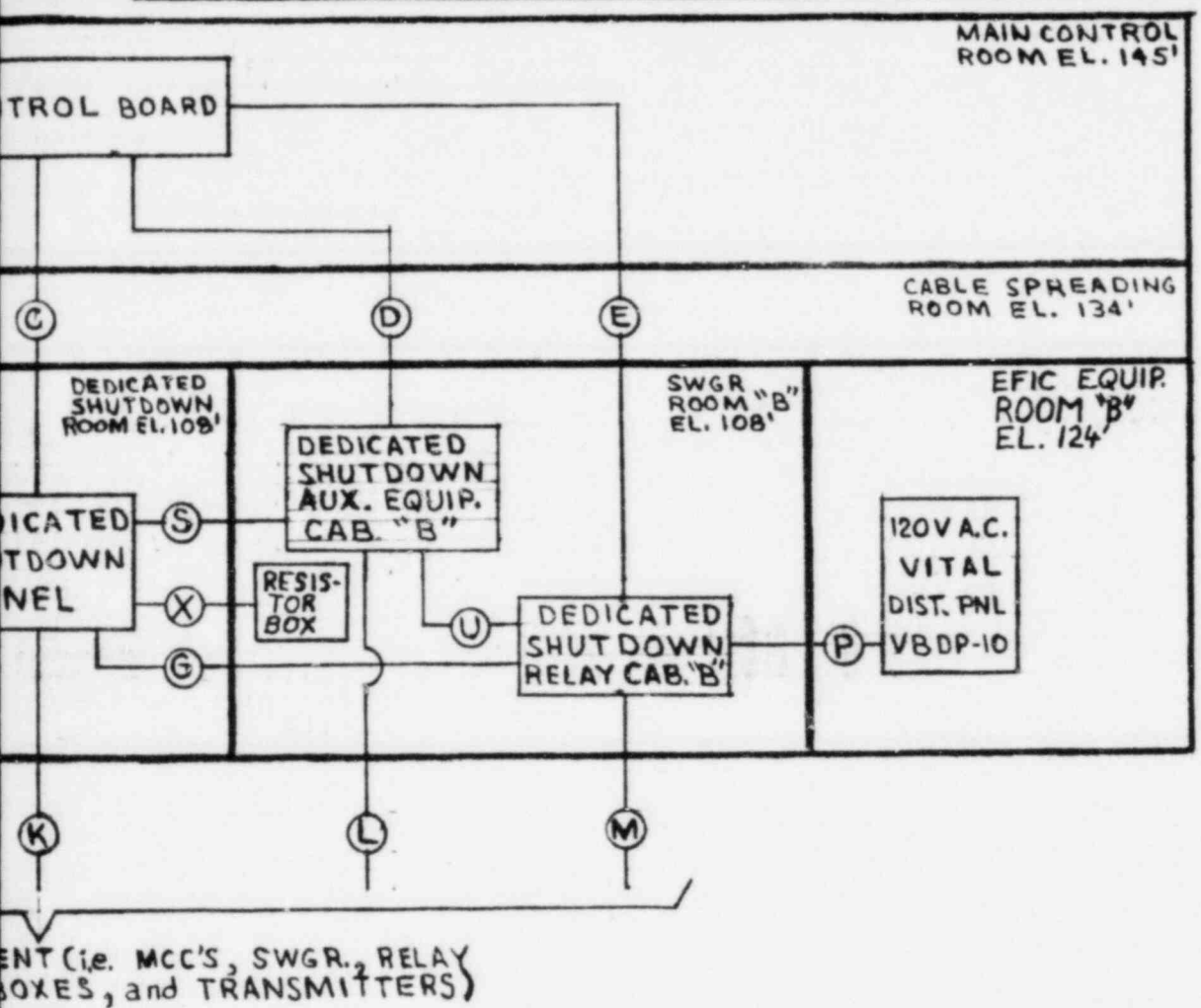
FIGURE 2



NOTES:

1. EACH ROOM SHOWN ABOVE IS A SEPARATE FIRE AREA
2. REF. FIGURE 3 FOR ACTUAL LAYOUT OF ROOMS AND DEDICATED SHUTDOWN EQUIPMENT ON E
3. FIGURES 4 & 5 ARE THE CABLE SPREADING ROOMS AND MAIN CONTROL ROOM RESPECTIVE THESE ARE THE TWO FIRE AREAS FOR WHICH THE DEDICATED SHUTDOWN SYSTEM IS PR CONSEQUENTLY NO DEDICATED SHUTDOWN CIRCUITS ARE ROUTED THR THESE FIRE AREAS.

FLORIDA POWER CORPORATION CRYSTAL RIVER UNIT 3	MADE E.L.H. CHK'D. SQ. CF. CF. DFN.	GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS READING, PENNA.
BLOCK DIAGRAM DEDICATED SHUTDOWN SYSTEM	ENG. DaR 9/24/82 REV. CH. APP. DATE	WORK ORDER / SIZE / DRAWING / REV.



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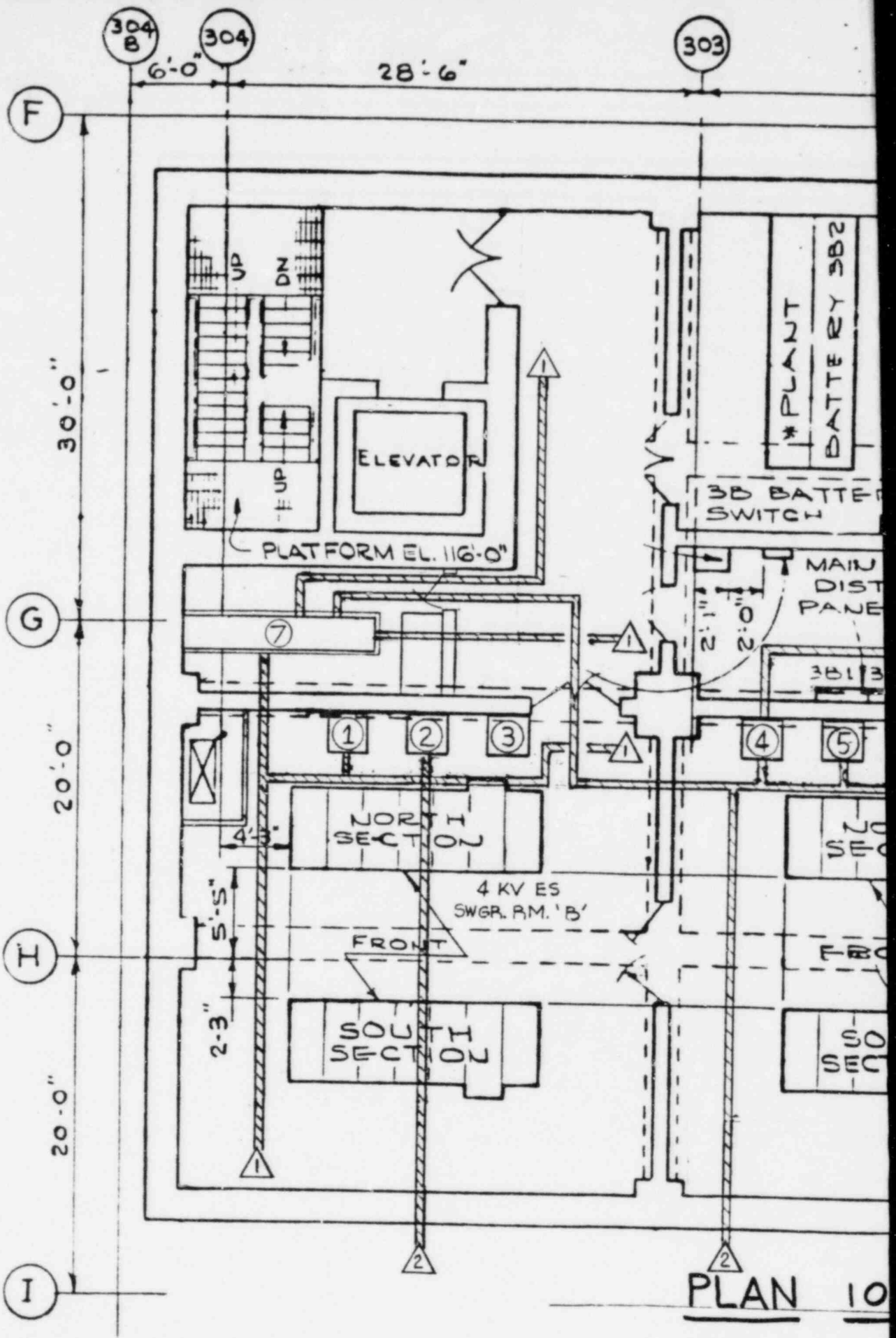

304 B
304
303
6'-0"
28'-6"
F
G
H
I
30'-0"
20'-0"
20'-0"
UP
DN
UP
ELEVATOR
PLATFORM EL. 116'-0"
PLANT
BATTERY 382
3B BATTE
SWITCH
MAIN
DIST
PANE
2'-0"
2'-0"
3B1 3
1
2
3
4
5
7
NORTH
SECTION
4'-3"
5'-5"
2'-3"
4 KV ES
SWGR. RM. 'B'
FRONT
SOUTH
SECTION
PLAN 10

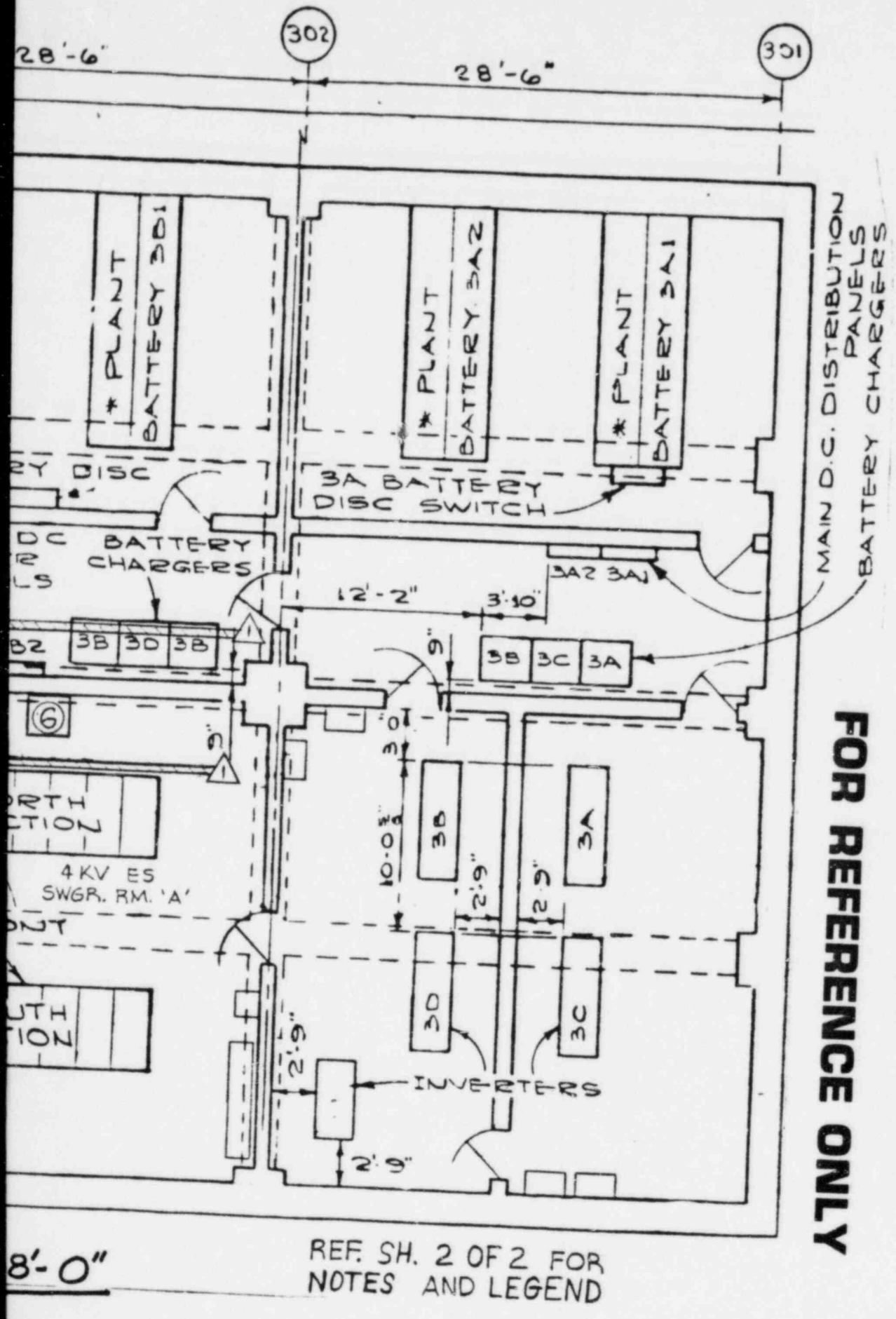


FIGURE 3, SH. 1 OF 2

FIGURE 3, SH. 2 of 2

LEGEND:

(1) - Dedicated Shutdown Relay Cabinet "B"

(2) - Dedicated Shutdown Auxiliary Equipment Cabinet "B"

(3) - Future Dedicated Shutdown Relay Cabinet

(4) - Dedicated Shutdown Relay Cabinet "A"

(5) - Dedicated Shutdown Auxiliary Equipment Cabinet "A"

(6) - Future Dedicated Shutdown Relay Cabinet

(7) - Dedicated Shutdown Panel

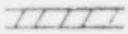
(8) - Vital Bus Distribution PNL-VBDP-8

(9) - Vital Bus Distribution PNL-VBDP-10

△1 - Circuits run vertically to either the relay racks on El. 124' or to the main control room equipment on El. 145'.

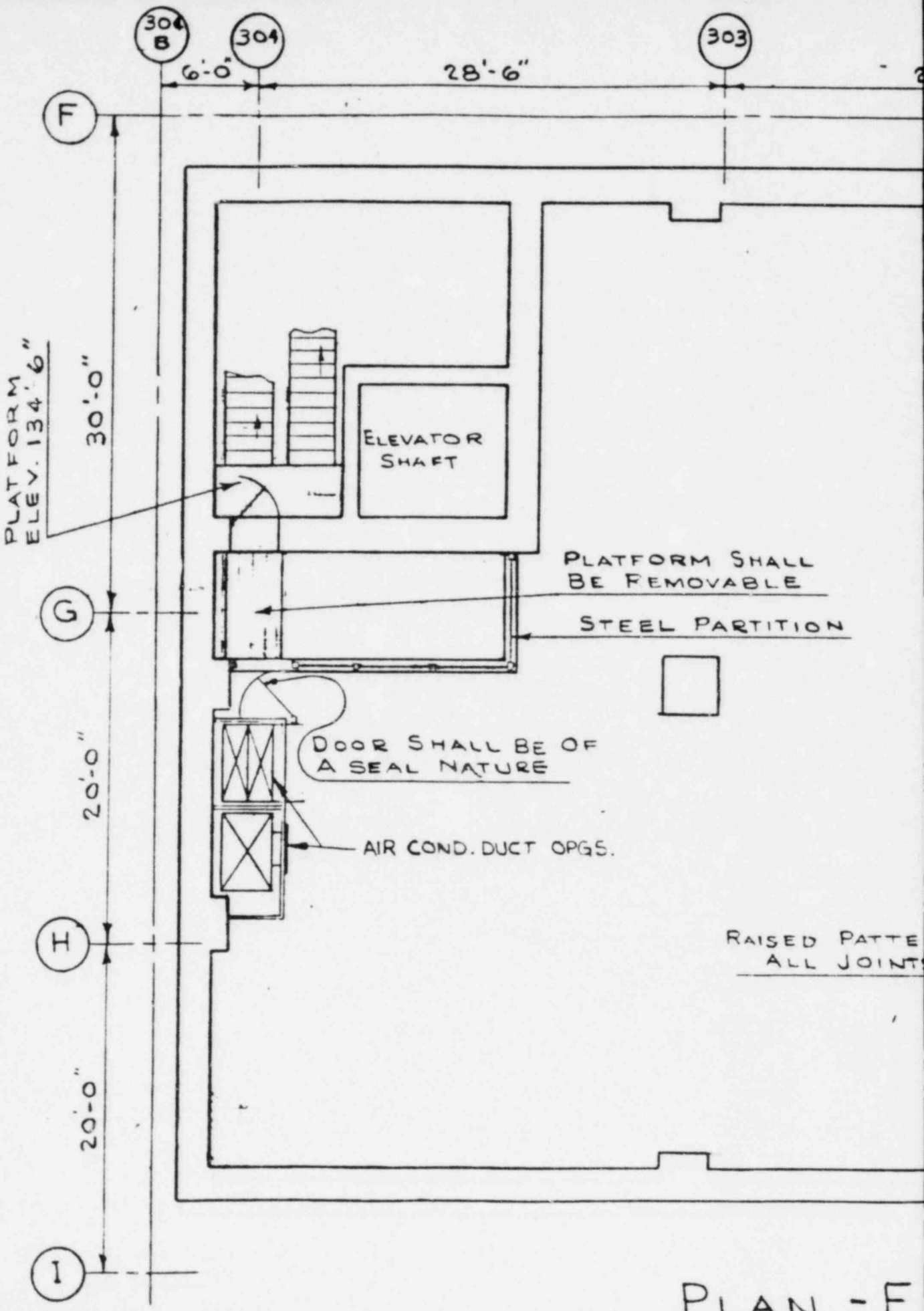
△2 - Circuits run out to local equipment (MCC's, switchgear, terminal boxes and transmitters).

△3 - Circuits run vertically to dedicated shutdown relay cabinets on El. 108'-0".

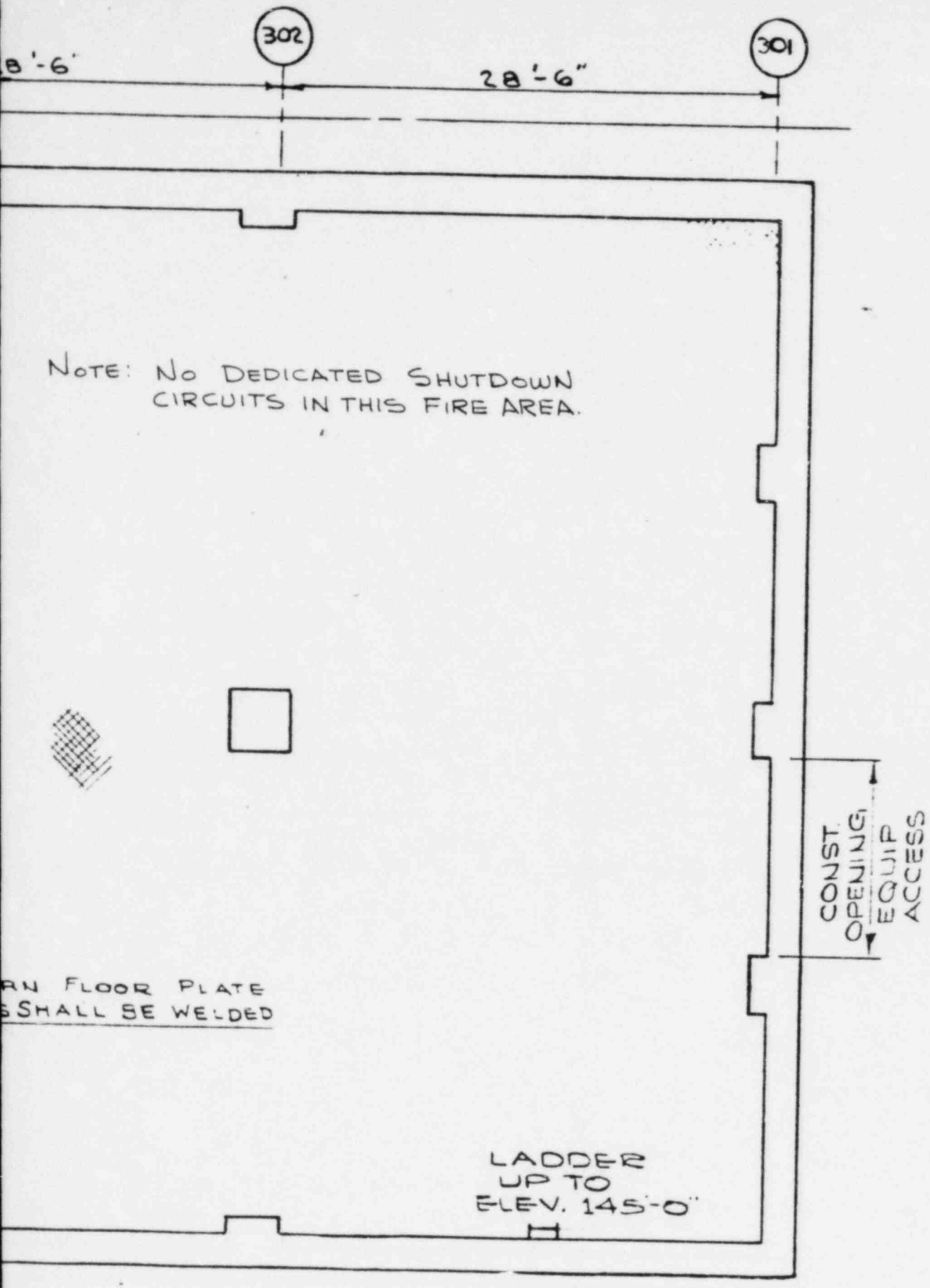
 Approximate location of dedicated shutdown circuits (see Note 1).

NOTES:

1. Figure 3 shows the approximate physical location of the conduit banks for the dedicated shutdown circuits.


304 B
304
303
6'-0"
28'-6"
F
G
H
I
30'-0"
20'-0"
20'-0"
PLATFORM ELEV. 134'-6"
ELEVATOR SHAFT
PLATFORM SHALL BE REMOVABLE
STEEL PARTITION
DOOR SHALL BE OF A SEAL NATURE
AIR COND. DUCT OPGS.
RAISED PATTE
ALL JOINT

PLAN - E



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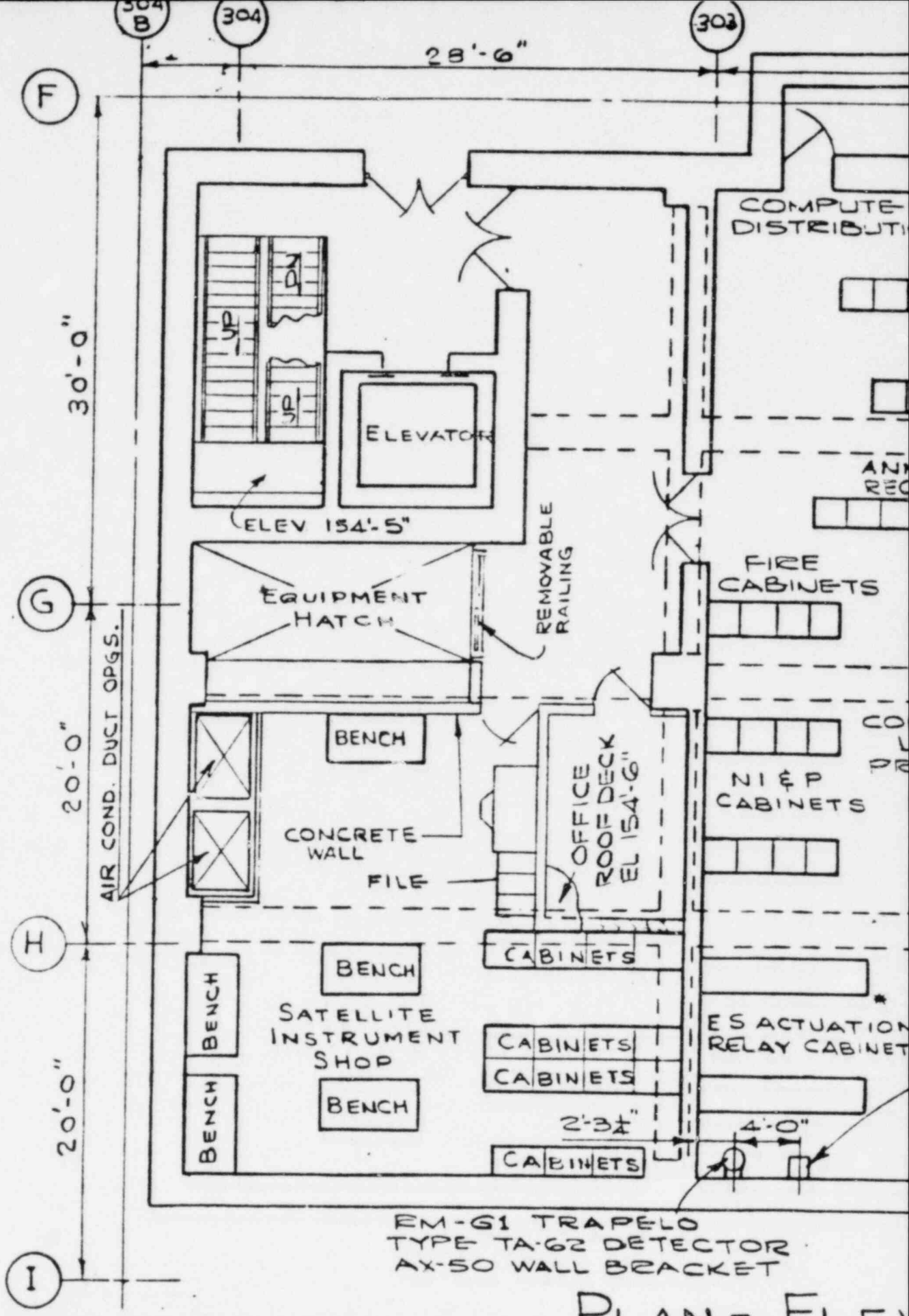
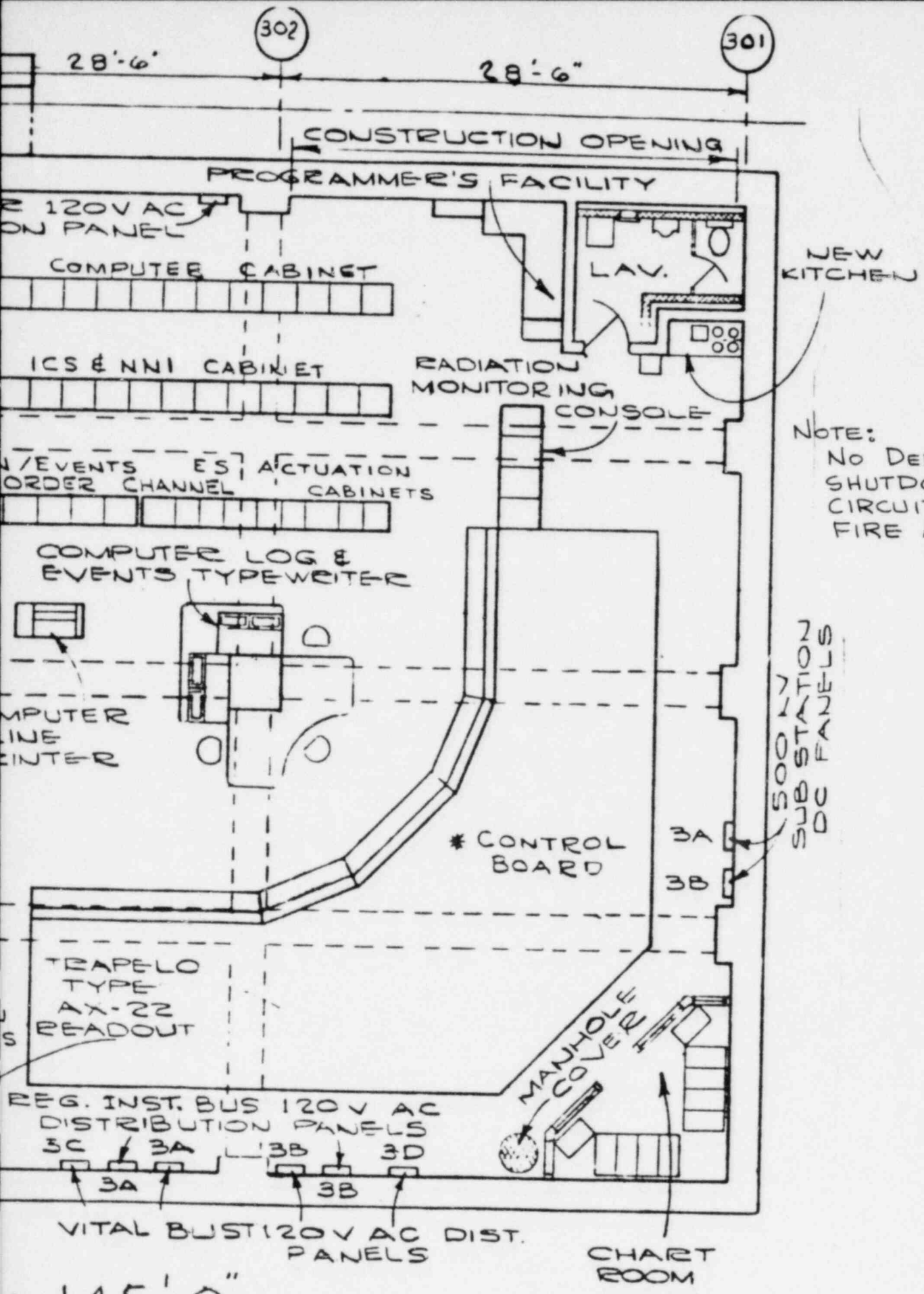
LEV. 134'-0" (●60 PSF)

FIGURE 4



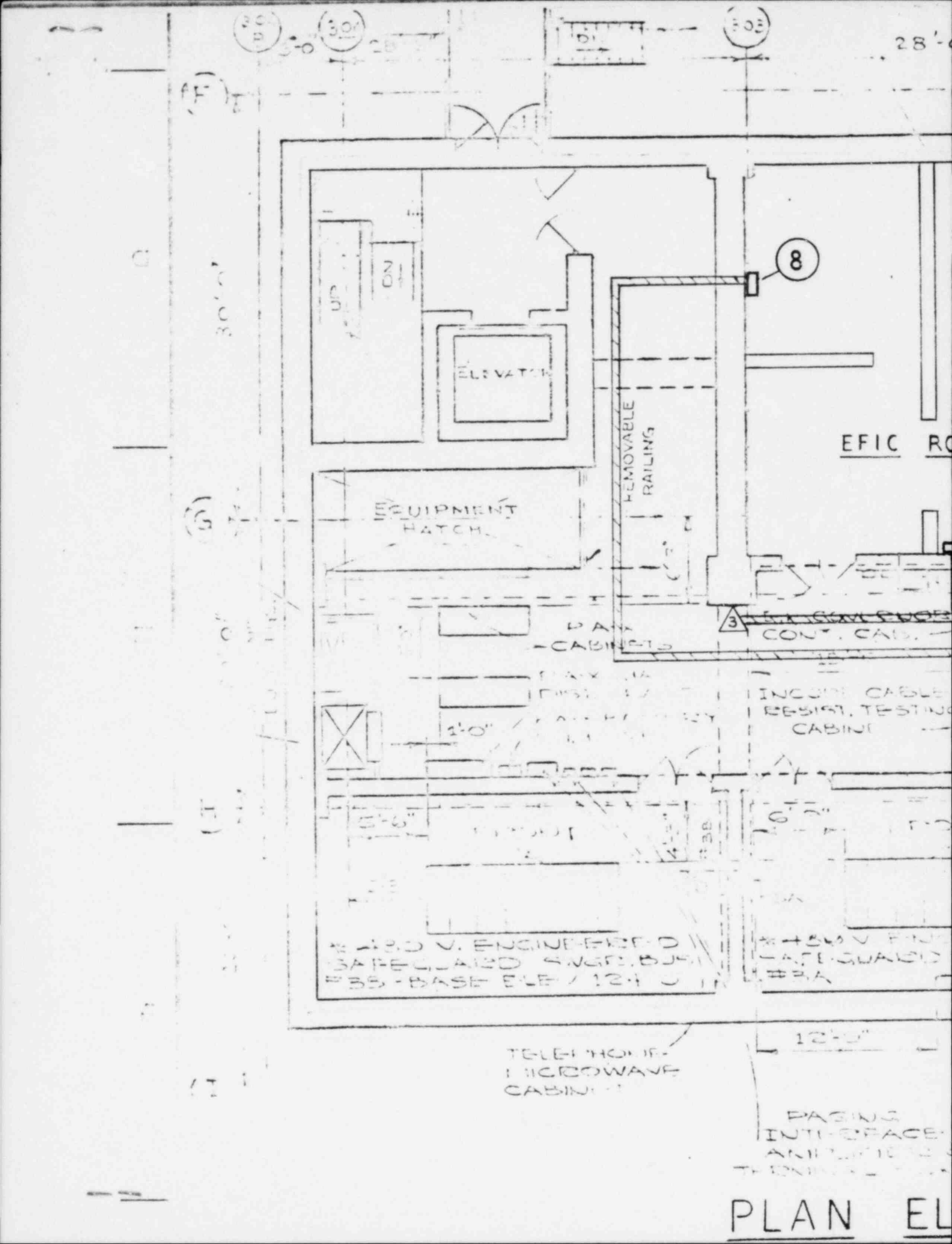
FOR REFERENCE ONLY

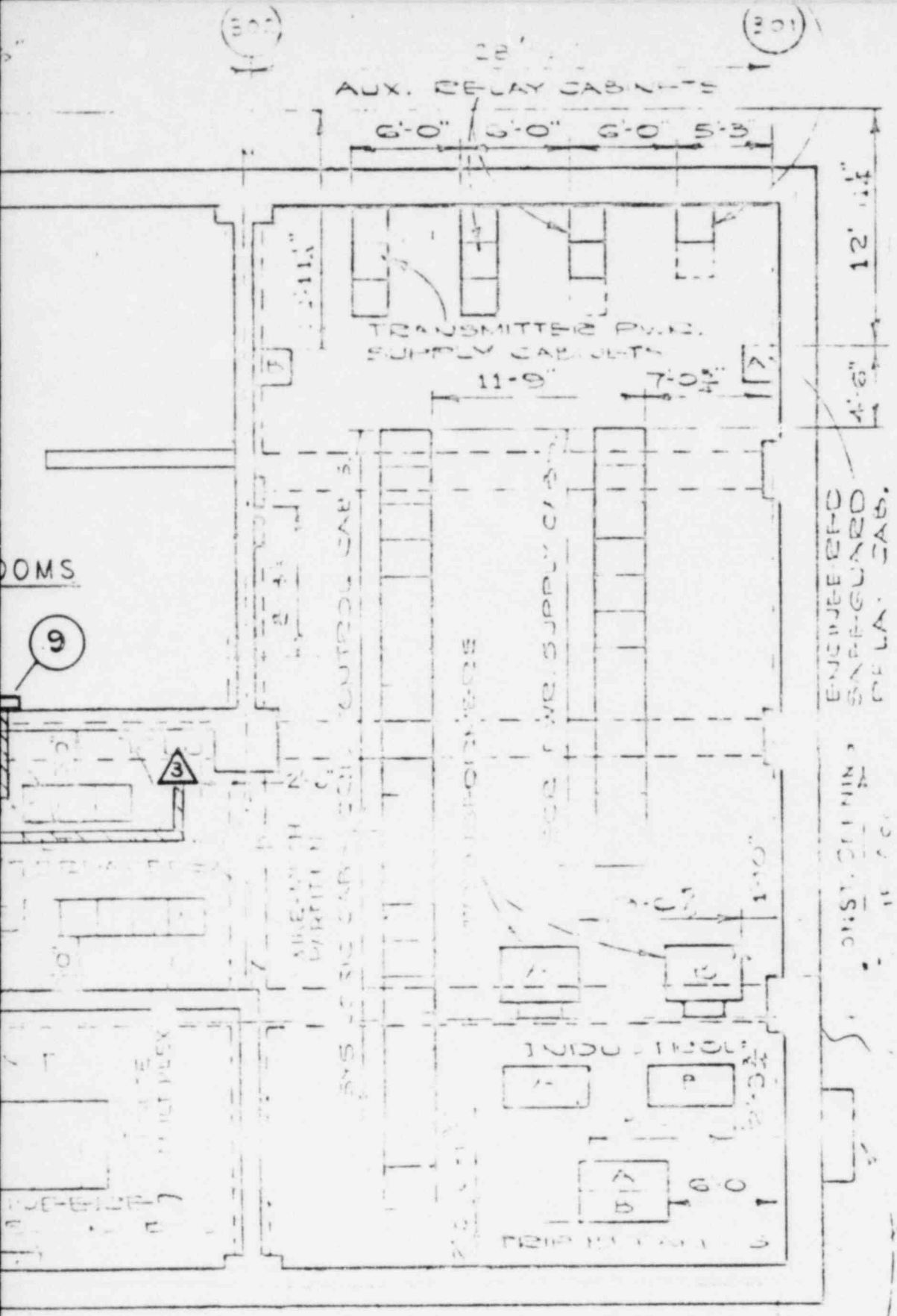
PLAN - ELEV



NOTE:
NO DEDICATED SHUTDOWN CIRCUITS IN THIS FIRE AREA.

FIGURE 5


8
ELEVATOR
REMOVABLE RAILING
EQUIPMENT HATCH
3
CONT. CAB.
CABINETS
1'-0"
5'-6"
12'-0"
TELEPHONE
MICROWAVE
CABINET
PLAN



FOR REFERENCE ONLY

FIGURE - 6

Request for Additional Information
By October 19, 1982 Teleconference

Item 1: Can cold shutdown be achieved in 72 hours with only on-site power?

Response 1: From the time the fire damage is assessed and control has been transferred to the Dedicated Shutdown Panel, cold shutdown along with any required repairs and/or manual operations can be achieved within 72 hours. Should a loss of off-site power occur coincidental with a start of a fire, cold shutdown can likewise be achieved with only on-site power.

Item 2: The NRC stated that Source Range Nuclear Instrumentation (NI) is required on the Dedicated Shutdown Panel.

Response 2: FPC feels that Boron sampling is a method to assure that the reactor is shut down. FPC requires further clarification on this item.

Item 3: Are components on the Dedicated Shutdown Panel the minimum required or is there additional optional equipment?

Response 3: Many components have been included on the panel for operator convenience. Only one channel is required for shutdown in the main control room and a separate isolated channel on the Dedicated Shutdown Panel. Instead, two channels along with other equipment have been included on the Dedicated Shutdown Panel for operational flexibility. For further details refer to Attachments 1 and 2. These documents were included with the previous submittal of 6/30/82 (FPC letter #3F-0682-37); however, they have been updated to include more detail to differentiate between required vs. optional equipment.

Item 4: Has FPC provided all necessary tank level indications for shutdown on the Dedicated Shutdown Panel?

Response 4: All the necessary tank level indications have been included in the design of the Dedicated Shutdown Panel (see Attachment 2 of this submittal entitled "Systems, Instrumentation and Controls Required To Go To Cold Shutdown From Outside The Control Room").

Item 5: How can FPC assure that there will be adequate Boron concentration for cold shutdown?

Response 5: The Makeup and Purification system will maintain the Boron concentration at adequate levels for shutdown. Sufficiently high concentrations of Boron are maintained in the Borated Water Storage Tank (BWST) and Boric Acid Storage Tanks (BAST's) to assure cold shutdown.

Item 6: How can Reactor Coolant System pressure and inventory be maintained for hot and cold shutdown from the Dedicated Shutdown Panel?

Response 6: The Makeup and Purification System, High Pressure Injection System, Letdown System, and Pressurizer Heaters and Controls are used to maintain pressure and inventory. Attachment 2 addresses the controls of these systems.

Item 7: Provide a list of "A" and "B" Dedicated Shutdown equipment.

Response 7: The following listing provides a breakdown of equipment into redundant channels of "A" and "B" engineered safeguards power. The list is presented on a system basis and includes the components required to achieve cold shutdown in the event of a fire occurring in any fire area of the plant.

"A"	"B"	Non-Class 1E
EFP-1	EFP-2	EFV-2
EFV-14	EFV-11	EFV-1
EFV-33	EFV-32	EFV-3*
EFV-57	EFV-55	EFV-4*
EFV-58	EFV-56	EFV-7*
		EFV-8*

*Power to these valves will be locked out at the MCC. EFV-7 and 8 will be locked open and will remain open throughout plant shutdown operation. EFV-3 and 4 will be locked open. If switchover from the Condensate Storage Tank to the Hotwell becomes necessary, EFV-1, 2, 3 and 4 will be operated manually. Any spurious operation of EFV-1 and 2 that might occur during the initial states of the fire will not affect shutdown operation.

Main Steam System

"A"	"B"	Non-Class 1E
MSV-411 ("A" Solenoid)	MSV-411 ("B" Solenoid)	MSV-25*
MSV-412 ("A" Solenoid)	MSV-412 ("B" Solenoid)	MSV-26*
MSV-413 ("A" Solenoid)	MSV-413 ("B" Solenoid)	
MSV-414 ("A" Solenoid)	MSV-414 ("B" Solenoid)	
	MSV-55	
	MSV-56	

*Valves will fail safe closed and will be manually operated to open.

Auxiliary Steam System

"B"
ASV-5

Nuclear Service Seawater System

"A"	"B"
RWP-2A	RWP-2B
RWP-3A	RWP-3B

Nuclear Service Closed Cycle Cooling System

"A"	"B"
SWP-1A	SWP-1B
SWV-35	SWV-37
SWV-41	SWV-43
SWV-353 ("A" Solenoid)	SWV-353 ("B" Solenoid)
SWV-354 ("A" Solenoid)	SWV-354 ("B" Solenoid)

Decay Heat Removal System

"A"	"B"	"AB"
DHP-1A	DHP-1B	DHV-41
DHV-3	DHV-4	
DHV-5	DHV-6	
DHV-11	DHV-12	
DHV-34	DHV-35	
DHV-39	DHV-40	
DHV-42	DHV-43	
DHV-110	DHV-111	

Decay Heat Closed Cycle Cooling System

"A"	"B"	Non-Class 1E
DCP-1A	DCP-1B	DCV-17*
		DCV-18*
		DCV-177*
		DCV-178*

*Valves DCV-17 and 18 will fail safe closed, and DCV-177 and 178 will fail safe open. Sufficient time is available for manual operation if required.

"A"	"B"	"AB"	Non-Class 1E
MUP-1A	MUP-1C	MUP-1B*	MUV-3**
MUV-73	MUV-58	MUV-25	MUV-9***
MUP-2A	MUP-2C	MUV-26	MUV-62**
MUP-4A	MUP-4C	MUV-27	MUV-69**
		MUP-2B	
		MUP-4B	

*MUP-1B is the swing pump capable of being powered from either the ES "A" or ES "B" 4 kV switchgear.

** Spurious operation of MUV-3 and 62 will not affect shutdown operation unless MUP-1B is being used in place of MUP-1C. Whenever this particular pump alignment is used, MUV-3 and 62 will be locked

open at the MCC to preclude any detrimental effects. Likewise, spurious operation of MUV-69 will not affect shutdown operation unless MUP-1B is being used in place of MUP-1A. Whenever this particular pump alignment is used, MUV-69 will be locked open to preclude any detrimental effects.

*** MUV-9 will be locked open at the MCC and will remain open throughout plant shutdown operation.

Core Flooding System

"AB"
CFV-5
CFV-6

Air Handling System

"A"	"B"
AHF-1A	AHF-1B
AHF-22A	AHF-22C
AHF-15A	AHF-15B

Electrical Power System

"A"	"B"
4.16 kV ES Swgr. Bus 3A	4.16 kV ES Swgr. Bus 3B
480V ES Swgr. Bus 3A	480V ES Swgr. Bus 3B
480V ES Motor Control Ctr. 3A1	480V ES Motor Control Center 3B1
480V ES Motor Control Ctr. 3A2	480V ES Motor Control Center 3B2
208/120V Dist. Pnl. ACDP-39	208/120V Dist. Pnl. ACDP-42
208/120V Dist. Pnl. ACDP-40	208/120V Dist. Pnl. ACDP-43
480V Dist. Pnl. ACDP-41	480V Dist. Pnl. ACDP-44
125V dc Dist. Pnl. DPDP-4A	125V dc Dist. Pnl. DPDP-5B
125V dc Dist. Pnl. DPDP-5A	125V dc Dist. Pnl. DPDP-8B
125V dc Dist. Pnl. DPDP-8A	125V dc Dist. Pnl. DPDP-6B
125V dc Dist. Pnl. DPDP-6A	
250/125V Battery DPDP-1A	250/125V Battery DPDP-1B
Battery Charger DBBC-1A	Battery Charger DBBC-1B
Battery Charger DCCB-1C	Battery Charger DBBC-1D
Battery Charger BBBC-1E	Battery Charger DBBC-1F
Diesel Generator EGDG-1A	Diesel Generator EGDG-1B
DG Control Panel EGCP-1A	DG Control Panel EGCP-1B
DG ac Air Compr. EGM-1A	DG ac Air Compr. EGM-1B
DG ac Air Compr. EGM-2A	DG dc Air Compr. EGM-2B
DG ac Fuel Oil Pump DFP-1A	DG ac Fuel Oil Pump DFP-1B
DG dc Fuel Oil Pump DFP-1C	DG dc Fuel Oil Pump DFP-1D

Item 8: Provide a point by point set of answers to concerns expressed in the NRC May 4, 1982 letter.

Response 8: FPC submitted a point by point response to the NRC May 4, 1982 letter in our June 30, 1982 letter with a commitment to submit the detailed design information on October 30, 1982. The complete information in response to the NRC May 4, 1982 letter is supplied in this submittal.

Item 9: Does FPC need any exemptions to III.G of Appendix R.

Response 9: FPC does not need any exemptions to III.G of Appendix R.

Item 10: Concern has been expressed about high/low pressure interfaces. Show that there is no problem.

Response 10: High/low pressure interfaces were considered in the Appendix R review. Our response to the high-low pressure interface is answered in our response to Item 2.a,b, and c. of Attachment 2 to Enclosure 2 of the NRC Letter Dated 5/4/82.

Item 11: Show that we can manually operate the Diesel Generators and all other automatic systems not isolated from fires in the Control Room.

Response 11: This item will be addressed at a later date. FPC did not want to delay this Appendix R Submittal by taking time to respond to this item. The NRC agreed to allow a delay in responses to these additional questions so that we could make the Appendix R Submittal on its due date.

Item 12: Automatic operation of EFW in case of spurious opening of the PORV, cannot be assumed unless the auto circuitry is isolated from the Control Room.

Response 12: As stated in the Response to Item 2.c of Attachment 2 to Enclosure 2 of the NRC Letter Dated 5/4/82, the necessary modifications to comply with Section III.G.2 will be implemented. Therefore, a spurious opening of the PORV is not considered.

Item 13: Are repairs needed during Mode 4?

Response 13: Item 7 on page 11 of Attachment 2 discusses the details of the pressurizer heaters control. Wire jumpers may be required for manual control during cooldown. This is the only item that might be considered a repair during Mode 4.

Item 14: Do we have heater controls for BAST's and BWST? Are these backed up by the diesels generators? Can the BAST's and BWST remain hot enough to keep the boron from crystalizing until we reach cold shutdown?

Response 14: The BAST's and BWST have heater controls, however, the heaters are not backed up by the diesels.

With loss of offsite power the BWST will remain hot enough to keep the boron from crystalizing until we reach cold shutdown. The BWST contains a 1.3 weight percent boric acid solution with a minimum solution temperature of 40°F before crystalization. With loss of offsite power, the BAST's will not remain hot enough to keep the boron from crystalizing until cold shutdown is reached. However, if the 7 wt. percent boric acid solution is required from the BAST's, heater and heat tracing repairs can be made before the BWST is expended and cold shutdown is achieved.

Item 15: Is control of instrument air for shutdown provided on the Dedicated Shutdown Panel?

Response 15: There are no controls for instrument air provided on the Dedicated Shutdown Panel. Essential pneumatic equipment and valves have fail safe provisions including air locks, air bottles, air trip valves, etc. as required to avoid major plant upset.

Item 16: Are the Decay Heat Pumps each 100% capacity?

Response 16: The Decay Heat Pumps are each 100% capacity.

Item 17: Does Crystal River Unit 3 need power to drop rods?

Response 17: No, the rods drop by gravity when power to the holding coils is interrupted.

Item 18: Does the 4160v switchgear room meet III.G.2.

Response 18: Yes, the redundant switchgear are housed in separate rooms within three-hour fire barriers as stated in the Crystal River Unit 3 Fire Safety Evaluation report dated July 27, 1979.

Item 19: Why doesn't the Makeup and Purification (MUP) Pump C circuits need isolation?

Response 19: The MUP pumps A, B, and C are each 100% capacity pumps and since only one needs to operate, redundant MUP Pumps A and B will be isolated.

Item 20: Are the power supplies for the 120 v.a.c. circuits listed on page 2 of Attachment 1 in FPC's June 30, 1982 letter (Attachment 4 of this submittal) being isolated? Justify Note 3 "These circuits do not require isolation because they are used to supply power to control board sections in the main control room" for these 120 v.a.c. circuits.

Response 20: The power to the Dedicated Shutdown Panel is from the 120 V ac vital distribution panels located in the EFIC Equipment Rooms. One 30 amp branch fuse on each of the two vital distribution panels feeds the Dedicated Shutdown Panel. No other circuits are fed by these two fuses. (Figure 1 is a one-line sketch of the power distribution scheme which is typical for each of the two distribution panels feeding the dedicated shutdown system).

Item 21: Provide a legend defining the circuit identification numbers.

Response 21: The first two letters of the number designate the system in which the equipment is located for which the circuit is written. The third letter is a code letter on the type of the circuit. The following code letters are used:

A - Computer
C - Motor Control centers
E - D.C. Circuits
F - A.C. Dircuits (Misc. Dist. Pnls.)
G - Turbine - Generator - Exciter
H - Reactor Protection
K - Events Recording
L - 480 Volt Switchgear
M - 6900 & 4160 Volt Switchgear
P - Communications
R - Reactor Plant Instrumentation
S - Secondary Plant Instrumentation
T - Transformers
U - 230 kV Substation
V - 500 kV Substation

The numerical portion of the circuit number is the unique identification number of each circuit of the same type used in a particular system.

Item 22: Check how automatic circuits are protected and how are the effects of false signals mitigated?

Response 22: The response to Item 1.d of the "Fire Area Approach" section of Attachment 2 to Enclosure 2 of the NRC letter dated May 4, 1982, addresses spurious signals or open circuits caused by fire and how maloperation or non-operation are prevented.

Item 23: The circuits requiring manual actuation in Item 1e of page 5 of FPC's June 30, 1982 submittal were discussed and the NRC wanted to know if repairs were needed during Mode 4.

Response 23: No repairs are needed for these circuits during Mode 4.

Item 24: Are all components needed for replacement just for cold shutdown?

Response 24: The only components that may need replacement will only have to be replaced during cold shutdown. No replacements are required during Mode 4.

Item 25: Note 3 on page 6 of FPC's June 30, 1982 submittal gave two options recommended to meet Appendix R. Which option will FPC follow?

Response 25: FPC plans to protect these required circuits.

LIST OF BLOCK DIAGRAMS

211-005, AH-28, AH-29, AH-35, AH-35N, AH-74, AH-77, AH-150; 211-007, AR-10, AR-10A, AR-11, AR-11A; 211-008, AS-01; 211-009, BS-I3, BS-I3A; 211-010, CA-12, CA-16, CA-17, CA-17A; 208-077, CI-20, CI-21, CI-22, CI-23; 211-019, DC-01, DC-02; 211-021, DH-01, DH-02, DH-03, DH-04, DH-05, DH-06, DH-09, DH-10, DH-11, DH-12, DH-13, DH-14, DH-15, DH-16, DH-I, DH-I1A, DH-I3, DH-I6; 211-026, EF-01, EF-01B, EF-02, EF-03, EF-04, EF-05, EF-06, EF-07, EF-08, EF-09, EF-10, EF-11; 211-028, ESAB0613, MS-09, MS-10, MT-09, MT-10, MT-13, MT-14, MT-24, MT-25, MT-34, MT-35, MT-132, MT-133; 211-041, MU-01, MU-02, MU-03, MU-04, MU-05, MU-06, MU-08, MU-09, MU-11, MU-12, MU-13, MU-14, MU-15, MU-16, MU-17, MU-18, MU-19, MU-20, MU-21, MU-22, MU-23, MU-24, MU-25, MU-26, MU-27, MU-28, MU-29, MU-33, MU-44A, MU-44B, MU-55, MU-55A, MU-57, MU-58, MU-59, MU-60, MU-I1, MU-I2, MU-I5, MU-I11, MU-I11A; 211-047, RC-01, RC-01A, RC-02, RC-02A, RC-03, RC-03A, RC-04, RC-04A, RC-13, RC-14, RC-14A, RC-15, RC-16, RC-16A, RC-17F, RC-17G, RC-17H, RC-17I, RC-17J, RC-17K, RC-17L, RC-25, RC-I, RC-I1, RC-I1A, RC-I2, RC-I6; 211-082, RS-00, RS-01, RS-02, RS-03; 211-050, RW-02, RW-03, RW-04, RW-05; 211-056, SW-01, SW-02, SW-03, SW-04, SW-05, SW-06, SW-06A, SW-07, SW-07A, SW-08, SW-08A, SW-09, SW-10, SW-10A, SW-11, SW-11A, SW-12, SW-12A, SW-13, SW-13A, SW-14, SW-14A, SW-15, SW-15A, SW-16, SW-16A, SW-17, SW-17A, SW-18, SW-18A, SW-19, SW-19A, SW-20, SW-20A, SW-21, SW-21A, SW-22, SW-22A, SW-23, SW-23A, SW-24, SW-24A, SW-25, SW-26, SW-25A, SW-26A, SW-29, SW-29A, SW-30, SW-30A; 211-060, WDI7

LIST OF ELEMENTARY DRAWINGS

208-005, AH-28, AH-29, AH-35, AH-74, AH-77, AH-150; 208-007, AR-10, AR-11; 208-008, AS-1; 208-010, CA-12, CA-16, CA-17; 208-077, CI-20, CI-21, CI-22, CI-23; 208-019, DC-01, DC-02; 208-021, DH-01, DH-02, DH-03, DH-04, DH-05, DH-06, DH-09, DH-10, DH-11, DH-12, DH-13, DH-14, DH-15, DH-16; 208-026, EF-01, EF- 02, EF-03, EF-04, EF-05, EF-06, EF-07, EF-08, EF-09, EF-10, EF-11; 209-028, ESAB06; 208-039, MS-09, MS-10; 208-040, MT-09, MT-10, MT-13, MT-14, MT-24, MT-25, MT-34, MT-35; 208-041, MU-01, MU-02, MU-03, MU-04, MU-05, MU-06, MU-08, MU-09, MU-11, MU-12, MU-13, MU-14, MU-15, MU-16, MU-17, MU-18, MU-19, MU-20, MU-21, MU-22, MU-23, MU-24, MU-25, MU-26, MU-27, MU-28, MU-29, MU-33, MU-44, MU-55, MU-58, MU-59, MU-60, MU-61; 208-047, RC-01, RC-02, RC-03, RC-04, RC-13, RC-14, RC-15, RC-16, RC-17, RC-17A, RC-25; 208-082, RS-00, RS-01, RS-02, RS-03, RS-04, RS-05, RS-06, RS-07, RS-08, RS-09, RS-10, RS-11, RS-12, RS-13, RS-14; 208-050, RW-02, RW-03, RW-04, RW-05; 208-056, SW-01, SW-02, SW-03, SW-04, SW-05, SW-07, SW-08, SW-09, SW-10, SW-11, SW-12, SW-13, SW-15, SW-17, SW-19, SW-21, SW-06, SW-14, SW-16, SW-18, SW-20, SW-22, SW-23, SW-24, SW-25, SW-26, SW-29, SW-30; 207-014

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