AFFIDAVIT OF ROBERT FITZPATRICK
AND SUPPORTING DOCUMENTS

It is an inaccurate characterization to state that the pressurizer heaters are simply added to the onsite emergency power supplies. Item II.E.3.1 of NUREG-0737 contains four positions and seven clarifications which specifically detail the manner in which this connection must be accomplished. The thrust of these positions and clarifications is to assure that the capacity, capability and reliability of the onsite emergency power suppleis will not be degraded below an acceptable level. The staff safety evaluation on this item was prepared by me and is attached.

The technical bases for the attached safety evaluation are derived from and supported by the applicant's submittal of January 26, 1981. This submittal is a letter from P. Crane (PG&E) to F. Miraglia (NRC) concerning full power license requirements. Pages II.E-12 thru II.E-19 address the pressurizer heaters and a copy is attached to this affidavit. In addition, there is no technical disagreement between the parties on the following technical points based upon the response to our proposed admissions:

1) The pressurizer heaters are a resistive load.

2) If the heaters are energized by the diesel generators (i.e. connected to the emergency bus), they will be automatically tripped upon occurence of an SIAS (safety injection actuation signal).

3) The circuit breakers used to interface the motive and control power to the heaters from the emergency buses are safety grade.

4) These same safety grade circuit breakers (52-1G-72 and 52-1H-74) are the devices used to trip the heaters upon SIAS.

Based upon my review of this aspect of the Diablo Canyon design, I have not identified anything that would degrade the capacity, capability and/or reliability of the onsite emergency power system below an acceptable level.

Robert G. Fitzpatrick

Subscribed and sworn to before me
this day of 1981

Notary Public

My Commission expires:

ATTACHMENT 1

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS
OF ROBERT G. FITZPATRICK

EDUCATION

B.S. Electrical Engineering 1971; Northeastern University, Boston, Mass.

M.S. Electrical Engineering, 1972; Northeastern University, Boston, Mass.

Major: Electrical Power Systems Engineering

PROFESSIONAL QUALIFICATIONS

I am presently Section Leader of the Electrical Section of the Power Systems Branch. In this position, I provide technical supervision and review of the work of reactor systems engineers conducting evaluations of operating reactor problems, license amandments for operating reactors, license applications, generic assessments and special project assignments.

I joined the NRC (ACE) in 1974 as a member of the Electrical, Instrumentation and Controls System Branch and in January 1977 I was assigned to the newly formed Power Systems Branch. My duties during the above periods involved the technical review of electrical systems (onsite and offsite power, and instrumentation and control). For approximately fifteen months following the March 1979 accident at Three Mile Island, I was detailed to the special Three Mile Island Support Group.

From 1972 - 1974 I worked for Yankee Atomic Electrical Company in Westboro, Massachusetts. I was assigned to the Electrical and Control Engineering Group and my duties included work on the Yankee operating nuclear plants and the Seabrook Project. (Prior to this I spent 3 years with Yankee as a cooperative education student while attending Northeastern University.)

I am a member of the IEEE and also represent the NRC as a member of IEEE Nuclear Power Engineering Committee Subcommittee 4 "Auxiliary Power Systems." This Committee is charged with developing standards for onsite and offsite power systems.

II.E.3.1 Emergency Power Supply for Pressurizer Heaters

Position

Consistent with satisfying the requirements of General Design Criteria 10, 14, 15, 17, and 20 of Appendix A to 10 CFR Part 50 for the event of loss of offsite power, the following positions shall be implemented:

(1) The pressurizer heater power supply design shall provide the capability to supply, from either the offsite power source or the emergency power source (when offsite power is not available), a predetermined number of pressurizer heaters and associated controls necessary to establish and maintain natural circulation at hot standby conditions. The required heaters and their controls shall be connected to the emergency buses in a manner that will provide redundant power supply capability.

(2) Procedures and training shall be established to make the operator aware of when and how the required pressurizer heaters shall be connected to the emergency buses. If required, the procedures shall identify under what conditions selected emergency loads can be shed from the emergency power source to provide sufficient capacity for the connection of the pressurizer heaters.

(3) The time required to accomplish the connection of the preselected pressurizer heater to the emergency buses shall be consistent with the timely initiation and maintenance of natural circulation conditions.

(4) Pressurizer heater motive and control power interfaces with the emergency buses shall be accomplished through devices that have been qualified in accordance with safety-grade requirements.

Clarification

(1) Redundant heater capacity must be provided, and each redundant heater or group of heaters should have access to only one Class IE division power supply.

(2) The number of heaters required to have access to each emergency power source is that number required to maintain natural circulation in the hot standby condition.

(3) The power sources needed not necessarily have the capacity to provide power to the heaters concurrently with the loads required for loss-of-coolant accident.

(4) Any changeover of the heaters from normal offiste power to emergency onsite power is to be accomplished manually in the control room.

(5) In establishing procedure to manually load the pressurizer heaters onto the emergency power sources, careful consideration must be given to:

(a) which ESF loads may be appropriately shed for a given situation;
(b) reset of the safety injection actuation signal to permit the operation of the heaters; and
(c) instrumentation and criteria for operator use to prevent overloading a diesel generator.

(6) The Class IE interfaces for main power and control power are to be protected by safety-grade circuit breakers (see also Regulatory Guide 1.75).

(7) Being non-Class IE loads, the pressurizer heaters must be automatically shed from the emergency power sources upon the occurrence of a safety injection actuation signal (see item 5.b above).

Discussion

All four pressurizer heater groups in the Diablo Canyon design can be supplied from the offsite power sources when they are available, and two of the four groups can be transferred to the emergency power sources when the offsite sources are not available. Each of the two selected groups (12 & 13) has access to only one Class IE diesel generator and their controls are likewise supplied from separate safety grade dc power supplies. Each heater group

(12 & 13) is comprised of seven 69 kW heaters (483 kW total). Therefore, energizing three of the seven heaters (207 kW) will be more than adequate to fulfill the calculated minimum heater requirement of 150 kW. This is in accordance with NRC position 1 and clarification items 1 and 2.

In accordance with position 4 and clarification 6, the connection of the pressurizer heater elements and controls to the Class IE buses is through safety grade circuit breakers, and the heaters are automatically tripped off of the emergency buses upon occurrence of a safety injection (SI) signal in accordance with clarification 7.

PG&E has developed procedures and implemented the training of their operators to make them aware of when and how the required heaters should be connected to the emergency buses. The procedures identify under what conditions selected loads can be shed from the emergency bus to prevent overloading the diesel generator when the pressurizer heaters are connected and also include provisions to reset the SI signal to permit the operation of the heaters. Diesel generator and pressurizer heater loading information is displayed in the control room. This covers position 2 and clarifications 3 and 5.

In order to align the pressurizer heaters to the emergency power source, an operator must be dispatched to the 100 ft level of the Auxiliary Building, three floors directly below the main control room, and manually throw a transfer switch. This action in itself does not connect the heaters to the emergency buses but allows subsequent operation of the heaters from the emergency buses using the normal control devices provided on the main control console. Although not in strict accordance with clarification item 4, this is considered an acceptable alternative since the heaters can be supplied with emergency power well within the one hour limit recommended by Westinghouse and therefore meets the criteria of position 3.

Conclusion

Based on our review, we conclude that the design for providing emergency power to the pressurizer heaters at Diablo Canyon Nuclear Generating Station Units 1 and 2 is consistent with the NRC positions and clarifications in NUREG-0737 and is acceptable.

II.E.3.1 PGandE Response

Response to Staff Position 1

All of the four pressurizer heater groups can be supplied with power from offsite power sources when they are available. In addition, power can be provided to two out of four heater groups from the emergency power source through the Engineered Safety Features (ESF) buses when offsite power is not available (see Figure II.E.3.1-1). This arrangement is adequate for establishing and maintaining natural circulation during hot standby conditions. Redundancy is provided by supplying each of the two groups of heaters from a different ESF bus.

The requirements as stated by the NRC staff relating to minimum capacity and time duration of the emergency power supply for the pressurizer heaters are well within current heater and power source design. One bank of backup heaters will be available to each emergency power train within 60 minutes after loss of offsite power. Pressurizer heat loss calculations show a minimum heater requirement of 150 kW without offsite power. This minimum capacity is more than adequate to offset the heat lost from the pressurizer at or below normal operating pressure with no allowance for continuous spray. With continuous spray, loss of subcooling would occur in five to six hours. Ability to supply emergency power to the heaters within four hours following a loss of offsite power will prevent loss of subcooling in the primary loop.

All of the equipment associated with pressurizer heater supply described in this response are seismically qualified for the Hosgri event except for those devices specifically noted as non-safety grade (see Figure II.E.3.1-1).

Circuit breakers 52-G-72 and 52-1H-74 have been added to 480 volt ESF buses 1G and 1H, respectively (see Figure II.E.1-2). These breakers have been installed and are seismically qualified to meet safety-grade requirements. The seismic qualification is based on PGandE's testing experience on similar equipment which has previously demonstrated that electromechanical equipment can withstand numerous high seismic events without damage, and that the equipment will be available to perform its safety function when called upon after the seismic event.

The heater banks will be automatically tripped off of the ESF buses upon occurrence of a safety injection (SI) actuation signal.

Response to Staff Position 2

PGandE has developed procedures and implemented the training of the operators to make the operator aware of when and how the required pressurizer heaters should be connected to the emergency buses. Loading of each ESF bus can be accomplished from the main control board (see Staff Position 3 below). Procedures have been established to identify under what conditions selected loads can be shed from the ESF bus to prevent overloading when the pressurizer heaters are connected. The procedures include provisions to ensure that the heaters are transferred to the ESF power source as described in Response to Staff Position 3 below. The procedures also include provisions to reset the Safety Injection Actuation Signal to permit the operation of the heaters. The time required to transfer the power supplies is estimated to be less than 10 minutes and is expected to expose the operator to no more than 10 mRem.

The procedures have been written and approved and have been incorporated into the Operating Procedures of the Plant Manual. Most of the operators were trained on these procedures in October 1980. One group of operators remains to be trained on these procedures. They will be trained prior to full power operation.

Response to Staff Position 3

The design (see Figures II.E.3.1-3 and II.E.3.1-4) provides for simple and rapid transfer of the heater groups to the ESF power source. The procedure for transfer of the heater groups to the ESF power source is described briefly below.

When it is determined that the pressurizer heaters are required, the Shift Foreman needs only to dispatch an operator to the 100 foot elevation in the Auxiliary Building, which is just three floors directly below the main control room (two separate stairwells are available). Once in the area, the operator simply verifies that the source breakers (52-1H-74, 52-13D-6, 52-13E-2, 52-1G-72) are open (white "Power on" lights indicate if either source is energized), and manually throws the deenergized transfer switches. This action in itself will not connect the pressurizer heaters onto the ESF buses. Only when the Shift Foreman is informed that the transfers have been made, will the heaters again be controlled using the normal control devices provided on the main control console (see Figure II.E.3.1-1). Even with manual transfer, the heaters can be supplied with emergency power well within the one hour limit recommended by Westinghouse. PGandE will provide control room indication of actual wattage being supplied to each heater group that has been transferred to the emergency power sources. Diesel generator loading parameters are also displayed in the control room.

Response to Staff Position 4

As described in the Response to Staff Position 1, qualification in accordance with safety-grade requirements has been performed for devices which supply the pressurizer heaters with motive and control power from the emergency buses. Specifically, the recently installed circuit breakers, 52-1G-72 and 52-1H-74, in the 480 volt ESF buses 1G and 1H have been seismically qualified for the Hosgri event. In addition, all of the equipment associated with the pressurizer heater power supply described above have been seismically qualified for the Hosgri event, except for those devices specifically noted as non-safety grade (Figure II.E.3.1-1).

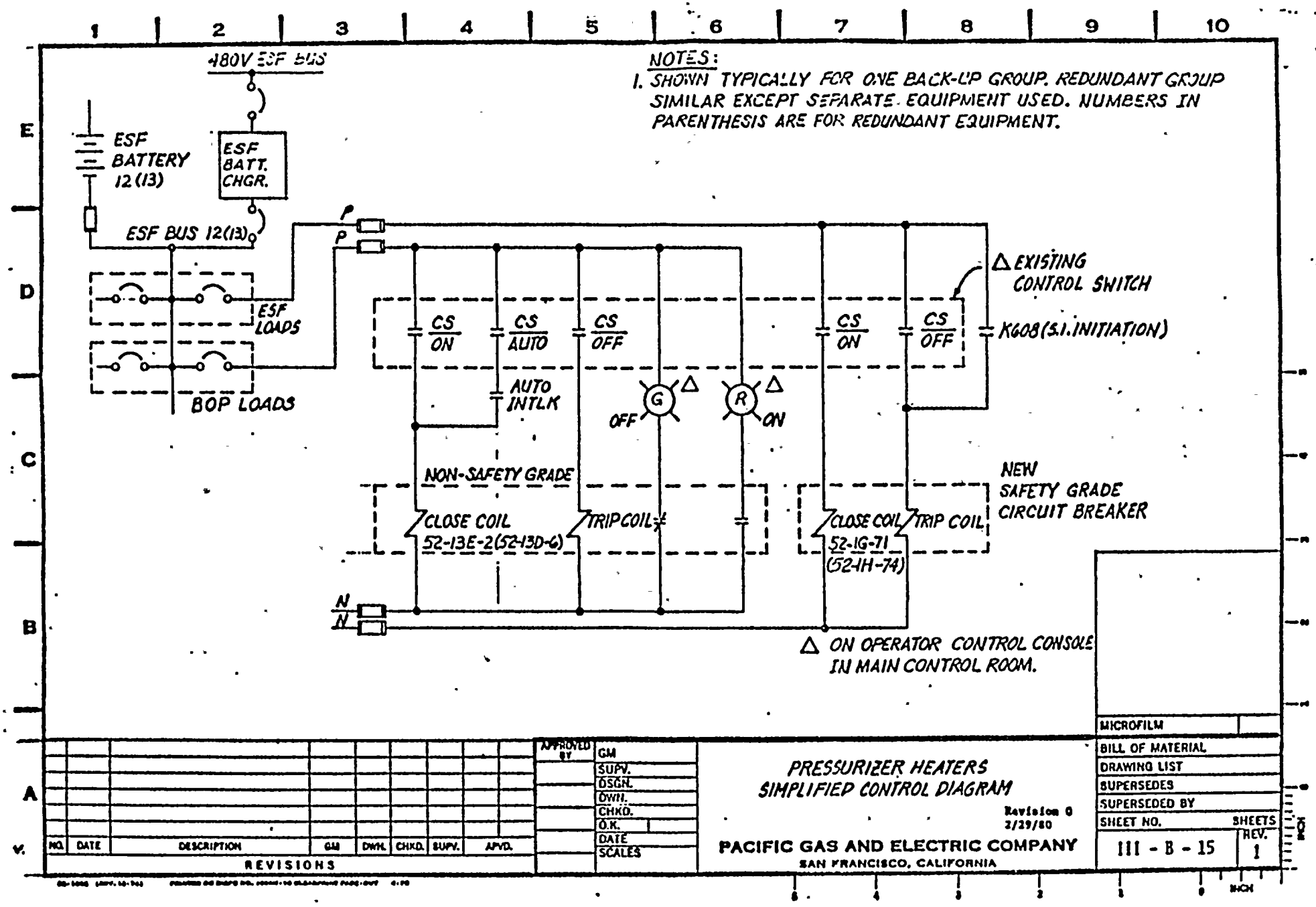
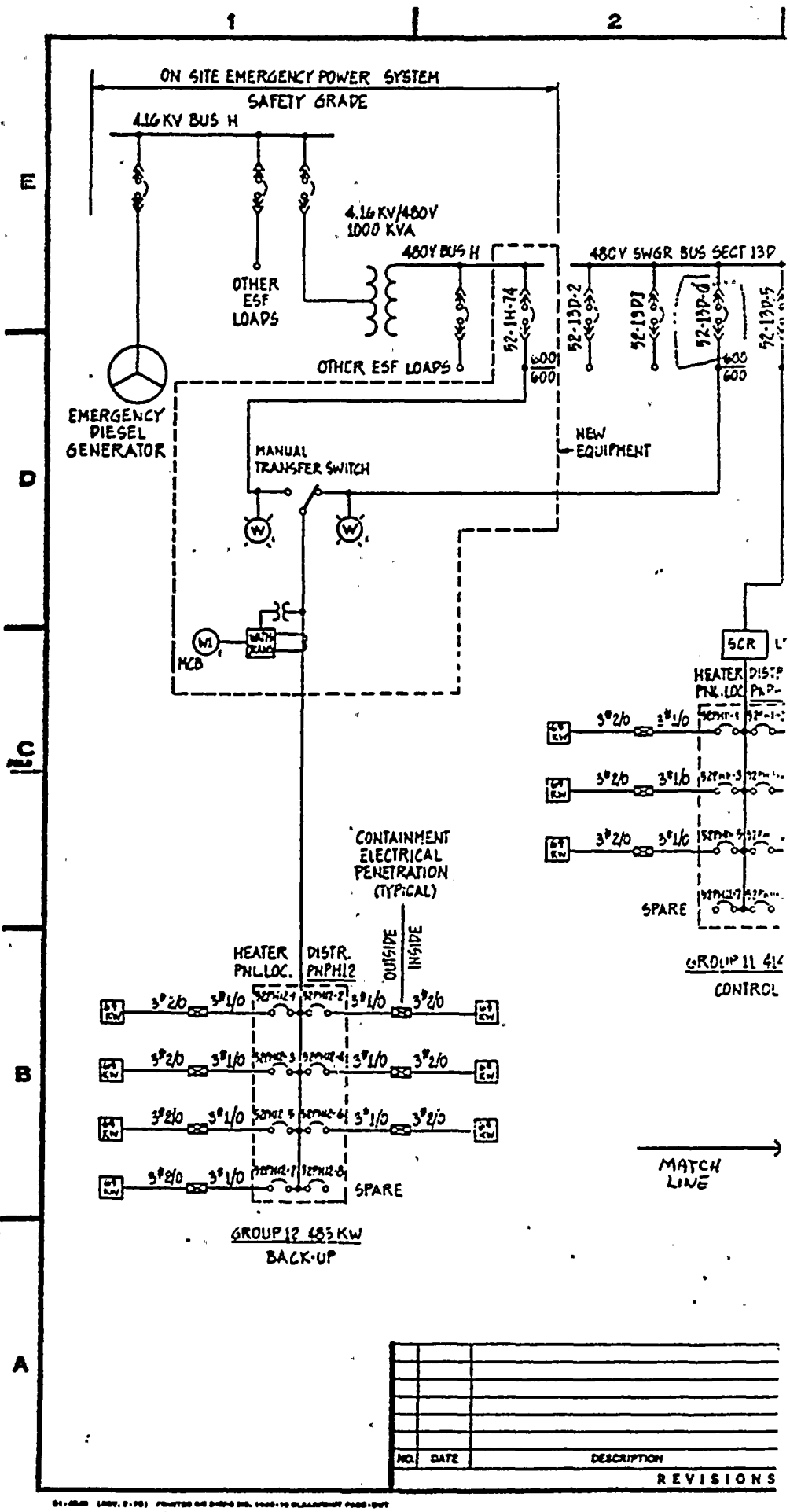

480V ESF BUS
NOTES:
1. SHOWN TYPICALLY FOR ONE BACK-UP GROUP. REDUNDANT GROUP SIMILAR EXCEPT SEPARATE EQUIPMENT USED. NUMBERS IN PARENTHESIS ARE FOR REDUNDANT EQUIPMENT.
ESF BATTERY 12 (13)
ESF BATT. CHGR.
ESF BUS 12(13)
ESF LOADS
BOP LOADS
P
N
CS ON
CS AUTO
CS OFF
AUTO INTLK
OFF
ON
EXISTING CONTROL SWITCH
K608(S.I. INITIATION)
NON-SAFETY GRADE
CLOSE COIL 52-13E-2(52-13D-6)
TRIP COIL
NEW SAFETY GRADE CIRCUIT BREAKER
CLOSE COIL 52-1G-71 (52-1H-74)
TRIP COIL
ON OPERATOR CONTROL CONSOLE IN MAIN CONTROL ROOM.
PRESSURIZER HEATERS SIMPLIFIED CONTROL DIAGRAM
Revision 0 2/29/80
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA
III - B - 15
REV. 1
MICROFILM
BILL OF MATERIAL
DRAWING LIST
SUPERSEDES
SUPERSEDED BY
SHEET NO.
SHEETS
REVISIONS
NO. DATE DESCRIPTION GM DWN. CHK'D. SUPV. APV'D.
APPROVED BY
GM
SUPV.
DSGN.
DWN.
CHK'D.
O.K.
DATE
SCALES

Fig. II.E.3.1-1


1
2
E
D
C
B
A
ON SITE EMERGENCY POWER SYSTEM
SAFETY GRADE
4.16 KV BUS H
4.16 KV/480V
1000 KVA
480V BUS H
480V SWGR BUS SECT 13D
OTHER ESF LOADS
52-1H-7A
52-13D-2
52-13D7
52-13D-6
52-13D-5
OTHER ESF LOADS
600
600
EMERGENCY DIESEL GENERATOR
MANUAL TRANSFER SWITCH
NEW EQUIPMENT
MCB
SCR
HEATER PNL.LOC
DISTR PNPH12
3#2/0
3#1/0
SPARE
CONTAINMENT ELECTRICAL PENETRATION (TYPICAL)
OUTSIDE
INSIDE
HEATER PNL.LOC.
DISTR. PNPH12
GROUP 11 41
CONTROL
MATCH LINE
GROUP 12 485 KW
BACK-UP
NO.
DATE
DESCRIPTION
REVISIONS

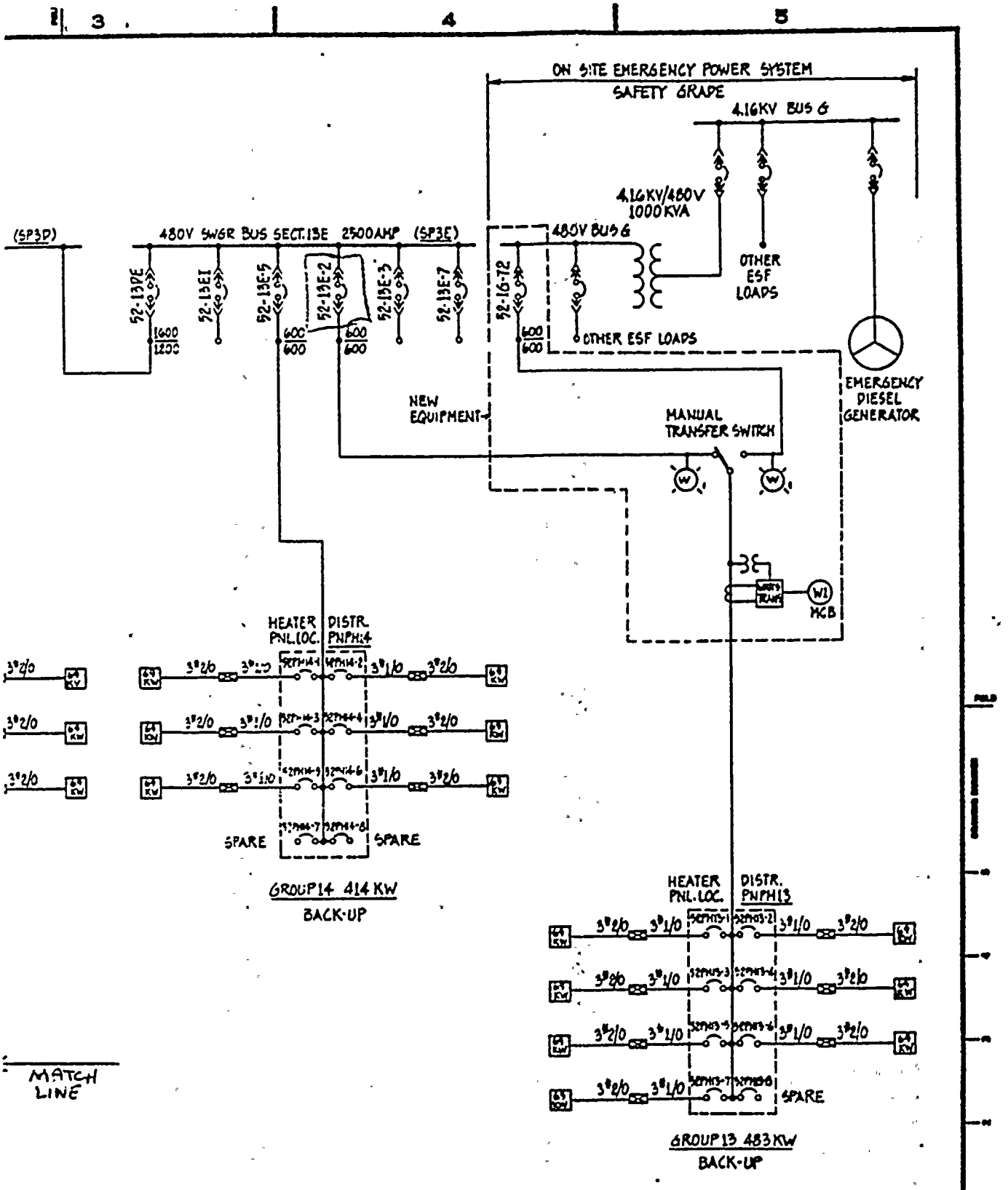


Fig. II.E.3.1-2

DWN.	CHKD.	SUPV.	APVD. BY		

APPROVED BY	G.M.
	SUPV.
	DSGN.
	DWN.
	CHKD.
	O.K.
	DATE
	SCALES

PRESSURIZER HEATERS
SINGLE LINE DIAGRAM

PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

BILL OF MATL	
DWG LIST	
SUPSDS	
SUPSD BY	
SHEET NO.	SHEETS
	REV.

Revision 2
3/31/80

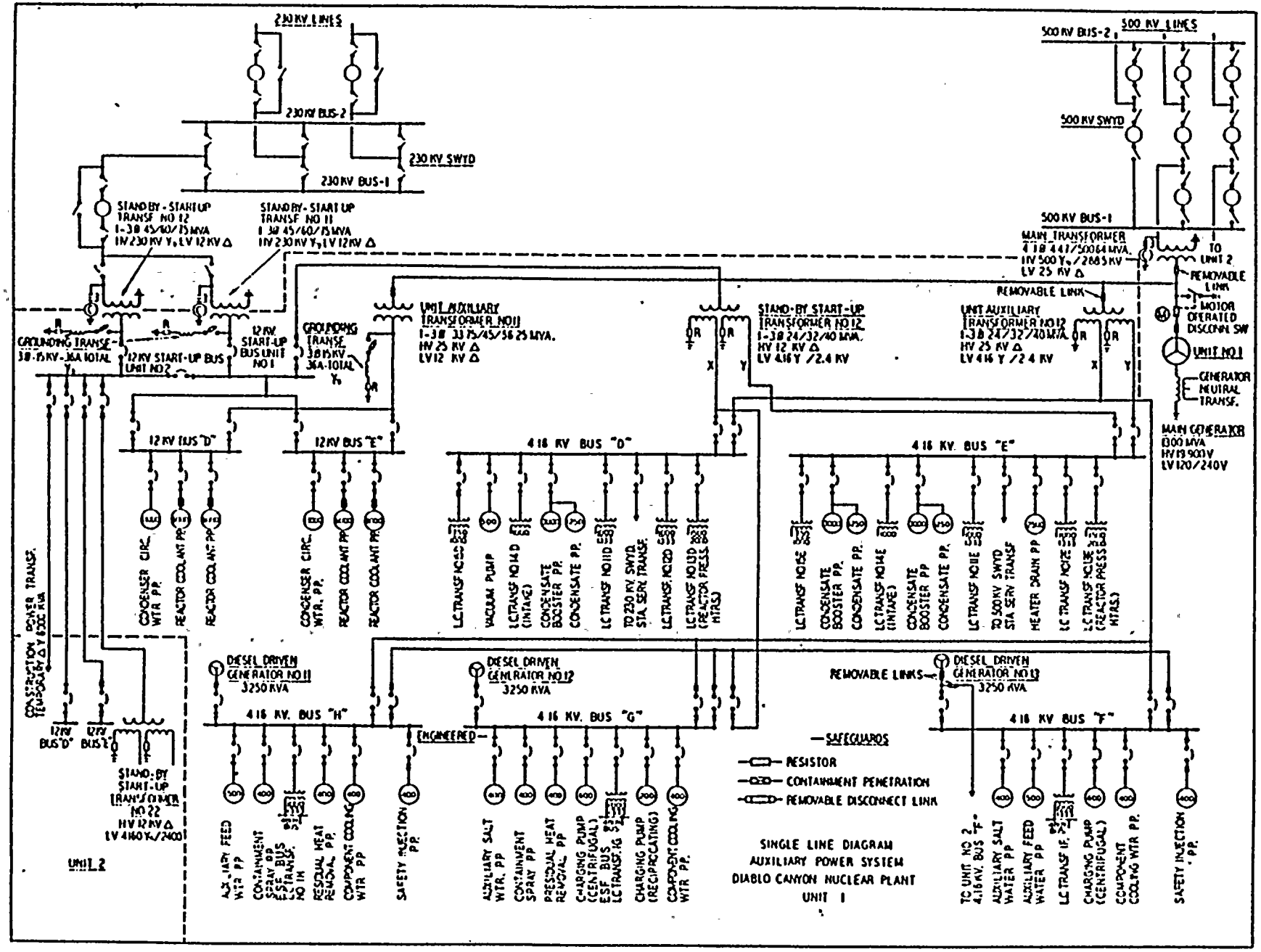

230 KV LINES
230 KV BUS-2
230 KV SWYD
230 KV BUS-1
500 KV BUS-2
500 KV LINES
500 KV SWYD
500 KV BUS-1
STAND BY - START UP TRANSF NO 12
1-3Ø 45/60/75 MVA
HV 230 KV Y, LV 12 KV Δ
STAND BY - START UP TRANSF NO 11
1-3Ø 45/60/75 MVA
HV 230 KV Y, LV 12 KV Δ
MAIN TRANSFORMER
1-3Ø 441/500/84 MVA
HV 500 Y / 288.5 KV
LV 25 KV Δ
TO UNIT 2
REMOVABLE LINK
MOTOR OPERATED DISCONN SW
UNIT NO 1
GENERATOR NEUTRAL TRANSF.
MAIN GENERATOR
1300 MVA
HV 19.900 V
LV 120/240 V
GROUNDING TRANSF 38.15 KV - 36A 10TAL
12 KV START-UP BUS UNIT NO 2
12 KV START-UP BUS UNIT NO 1
UNIT AUXILIARY TRANSFORMER NO 11
1-3Ø 33.75/45/56.25 MVA.
HV 25 KV Δ
LV 12 KV Δ
STAND-BY START-UP TRANSFORMER NO 12
1-3Ø 24/32/40 MVA.
HV 12 KV Δ
LV 4.16 Y / 2.4 KV
UNIT AUXILIARY TRANSFORMER NO 12
1-3Ø 24/32/40 MVA.
HV 25 KV Δ
LV 4.16 Y / 2.4 KV
12 KV BUS "D"
12 KV BUS "E"
4.16 KV BUS "D"
4.16 KV. BUS "E"
CONSTRUCTION POWER TRANSF. (REMOVABLE) Δ Y 6200 KVA
12 KV BUS "D"
12 KV BUS "E"
STAND-BY START-UP TRANSFORMER NO 22
HV 12 KV Δ
LV 4.160 Y / 2400
UNIT 2
DIESEL DRIVEN GENERATOR NO 11
3250 KVA
DIESEL DRIVEN GENERATOR NO 12
3250 KVA
DIESEL DRIVEN GENERATOR NO 13
3250 KVA
REMOVABLE LINKS
4.16 KV. BUS "H"
4.16 KV. BUS "G"
4.16 KV BUS "F"
ENGINEERED SAFEGUARDS
RESISTOR
CONTAINMENT PENETRATION
REMOVABLE DISCONNECT LINK
SINGLE LINE DIAGRAM
AUXILIARY POWER SYSTEM
DIABLO CANYON NUCLEAR PLANT
UNIT 1
TO UNIT NO 2 4.16 KV. BUS "F"

Fig. II.E.3.1-3

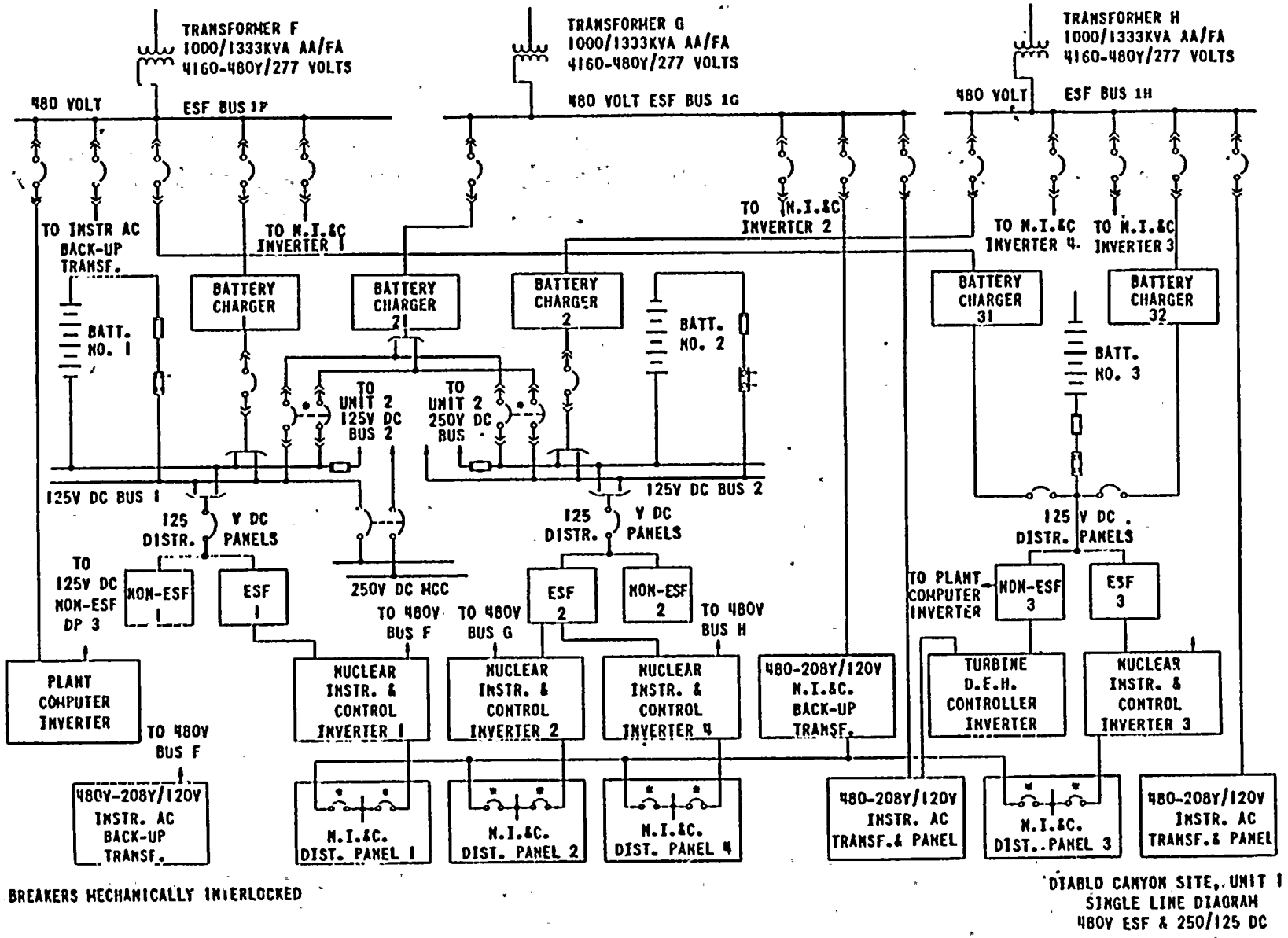

TRANSFORMER F
1000/1333KVA AA/FA
4160-480Y/277 VOLTS
TRANSFORMER G
1000/1333KVA AA/FA
4160-480Y/277 VOLTS
TRANSFORMER H
1000/1333KVA AA/FA
4160-480Y/277 VOLTS
480 VOLT ESF BUS 1F
480 VOLT ESF BUS 1G
480 VOLT ESF BUS 1H
TO INSTR AC BACK-UP TRANSF.
TO N.I.&C INVERTER 1
TO N.I.&C INVERTER 2
TO N.I.&C INVERTER 4
TO N.I.&C INVERTER 3
BATTERY CHARGER 1
BATTERY CHARGER 2
BATTERY CHARGER 2
BATTERY CHARGER 31
BATTERY CHARGER 32
BATT. NO. 1
BATT. NO. 2
BATT. NO. 3
TO UNIT 2 125V DC BUS 2
TO UNIT 2 250V DC BUS
125V DC BUS 1
125V DC BUS 2
125 V DC DISTR. PANELS
250V DC MCC
TO 125V DC NON-ESF DP 3
NON-ESF 1
ESF 1
ESF 2
NON-ESF 2
NON-ESF 3
ESF 3
TO PLANT COMPUTER INVERTER
TO 480V BUS F
TO 480V BUS G
TO 480V BUS H
PLANT COMPUTER INVERTER
NUCLEAR INSTR. & CONTROL INVERTER 1
NUCLEAR INSTR. & CONTROL INVERTER 2
NUCLEAR INSTR. & CONTROL INVERTER 4
480-208Y/120V M.I.&C. BACK-UP TRANSF.
TURBINE D.E.H. CONTROLLER INVERTER
NUCLEAR INSTR. & CONTROL INVERTER 3
480V-208Y/120V INSTR. AC BACK-UP TRANSF.
M.I.&C. DIST. PANEL 1
M.I.&C. DIST. PANEL 2
M.I.&C. DIST. PANEL 4
480-208Y/120V INSTR. AC TRANSF.& PANEL
M.I.&C. DIST. PANEL 3
480-208Y/120V INSTR. AC TRANSF.& PANEL
* BREAKERS MECHANICALLY INTERLOCKED
DIABLO CANYON SITE, UNIT 1
SINGLE LINE DIAGRAM
480V ESF & 250/125 DC

Fig. II.E.3.1-4