NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

# NRC DISTRIBUTION FOR PART 50 DOCKET MATERIAL

DOCKET NUMBER 50-275/323

FILE NUMBER

| TO: | FROM: | DATE OF DOCUMENT |
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| Mr. John F. Stolz | Pacific Gas & Electric Company<br>San Francisco, California<br>Philip A. Crane, Jr. | 7/5/77 |
| | | DATE RECEIVED 7/21/77 |

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DESCRIPTION

DO NOT REMOVE

ACKNOWLEDGED (1-P)

PLANT NAME: Diablo Canyon Units 1 & 2

RJL 7/21/77

ENCLOSURE

Consists of requested additional information on reactor coolant system overpressure......
Supplementing material submitted in Amdt #48

(13-P)

FOR ACTION/INFORMATION

| SAFETY | | ENVIRONMENTAL | |
|---|---|---|---|
| ✓ ASSIGNED AD: | Vassallo | ASSIGNED AD: | V. MOORE (LTR) |
| ✓ BRANCH CHIEF: | Stolz | BRANCH CHIEF: | |
| ✓ PROJECT MANAGER: | Allison | PROJECT MANAGER: | |
| ✓ LICENSING ASSISTANT: | Hylton | LICENSING ASSISTANT: | |
| | | B. HARLESS | |

INTERNAL DISTRIBUTION

| | SYSTEMS SAFETY | PLANT SYSTEMS | SITE SAFETY & ENVIRON ANALYSIS |
|---|---|---|---|
| ✓ REG FILES | HEINEMAN | TEDESCO | DENTON & MULLER |
| ✓ NRC PDR | SCHROEDER | BENAROYA | CRUTCHFIELD |
| ✓ I & E (2) | | LAINAS | |
| ✓ OELD / Tonitellonte | ENGINEERING | IPPOLITO | ENVIRO TECH. |
| GOSSICK & STAFF | KNIGHT | F. ROSA | ERNST |
| HANAUER | BOSNAK | | BALLARD |
| MIPC | SIHWELL | OPERATING REACTORS | YOUNGBLOOD |
| CASE | PAWLICKI | STELLO | |
| BOYD | | EISENHUT | |
| PROJECT MANAGEMENT | REACTOR SAFETY | SHAO | SITE TECH. |
| SKOVHOLT | ROSS | BAER | GAMMILL (2) |
| P. COLLINS | ✓ NOVAK | BUTLER | |
| HOUSTON | ROSZTOCZY | GRIMES | SITE ANALYSIS |
| MELTZ | CHECK | ✓ G. Kelly | VOLLMER |
| HELTEMES | | ✓ S. Israel | BUNCH |
| SK | AT&I | ✓ D. Hubbard | J. COLLINS |
| | SALTZMAN | | KREGER |
| | RUTBERG | | |

EXTERNAL DISTRIBUTION

| | | CONTROL NUMBER |
|---|---|---|
| ✓ LPDR: San Luis Obispo, Ca | | |
| ✓ TIC | ✓ NSIC | |
| NAT LAB | | 772020204 |
| ✓ REG IV (J. HANCHETT) | | |
| ✓ 16 CYS ACRS SENT CATEGORY A | | |

NRC FORM 195 (2-76)

# PACIFIC GAS AND ELECTRIC COMPANY

PG&E 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211



July 5, 1977

Regulatory File Cy

JUL 21 1977

Mr. John F. Stolz, Chief
Light Water Reactors Branch No. 1
Division of Project Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275-OL
Docket No. 50-323-OL
Diablo Canyon Units 1 & 2

Dear Mr. Stolz:

As a result of informal requests from the Regulatory Staff, we are supplying the enclosed additional information on reactor coolant system overpressure. This additional information supplements material submitted in Amendment No. 48 to our operating license application and will be included in a future amendment.

Very truly yours,

Philip A. Crane Jr

Enclosures

772020204

REDRAFT: JWS/as
June 20, 1977

Water Solid Operation

The company is a member of a group of utilities which has been formed to examine reactor coolant system overpressurization during water solid operation. The required analyses are being performed by the NSSS supplier . The company will make any modifications which may appear to be necessary at the conclusion of the study.

In the interim, operating procedures have been incorporated that will provide relief protection for the residual heat removal system, lock out the safety injection system, restrict the starting and stopping of reactor coolant pumps, and control letdown operation.

In addition to the operating procedures, the plant computer has been programmed and a hard-wired function generator system will be installed to continually compare the reactor coolant system pressure to a pressure-temperature curve which is more restrictive than the 10 CFR 50, Appendix G pressure-temperature limit curve. The computer and the function generator system will generate an alarm signal whenever reactor coolant system pressure approaches the programmed pressure, providing advance warning to the operator of a potential overpressure condition. The pressure-temperature curve for the alarm and the 10 CFR 50, Appendix G pressure-temperature limit curve are shown in Figure 5.2-21.

The following is a description of the computer alarm logic shown in the flow chart in Figure 5.2-22:

The plant computer continuously monitors the four loop temperatures and pressures. An average temperature and pressure is calculated. Each individual parameter is checked against the average and temperatures or pressures that deviate by more than 20$^{\circ}$F or 20 psi respectively from the average are rejected.

The average RCS temperature is then used to generate a reference pressure that is below the Appendix G limit curve. If the average RCS pressure is within 20 psi of the programmed limit curve, a flashing warning that the system is approaching an overpressure condition appears on the computer CRT. If the average RCS pressure reaches the programmed limit curve, a flashing warning that the system is overpressurized appears on the computer CRT.

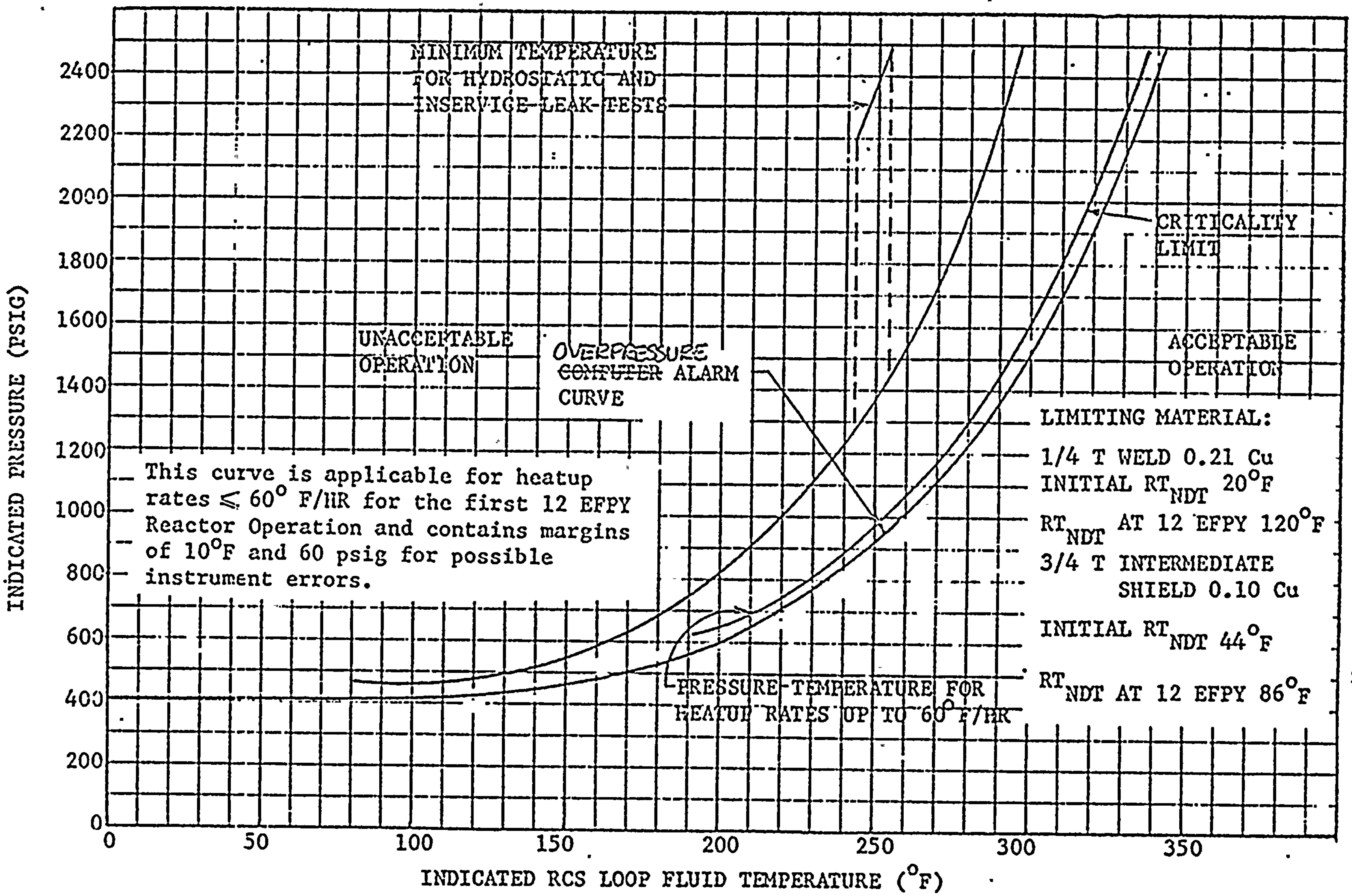
DRAFT
6/30/77
JWS

The following is a description of the function generator alarm actuation logic shown in Figure 5.2-23.

The four RCS cold leg wide range temperature channels will supply continuous analog input to an auctioneering device. The lowest and highest signal will be eliminated and the remaining two signals averaged and sent to the function generator. The function generator will calculate an allowable pressure that is lower than the Appendix G limit based on the averaged loop temperature. This set point will be compared to the actual RCS pressure monitored by the pressurizer pressure.

The error signal, based on the difference between the two pressure signals, will annunciate a main board alarm whenever the actual RCS pressure approaches within 50 psi of the allowable pressure produced by the function generator. The interim hard-wired alarm system will be installed to PG&E Class IB requirements.

The described interim overpressure protection systems provides redundant, automatically initiated alarm. By monitoring plant operation over the entire Appendix G pressure-temperature limit and the use of operating procedure, plant operational flexibility is maintained while adequately assuring that the RCS pressure will not exceed the Appendix G limits.




UNIT 1
DIABLO CANYON SITE

FIGURE 5.2 - 21
REACTOR COOLANT SYSTEM PRESSURE - TEMPERATURE LIMITS VERSUS 60°F/HOUR HEATUP RATE-CRITICALITY LIMIT AND HYDROSTATIC TEST LIMIT

Fig 5.2-22

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6/9/77

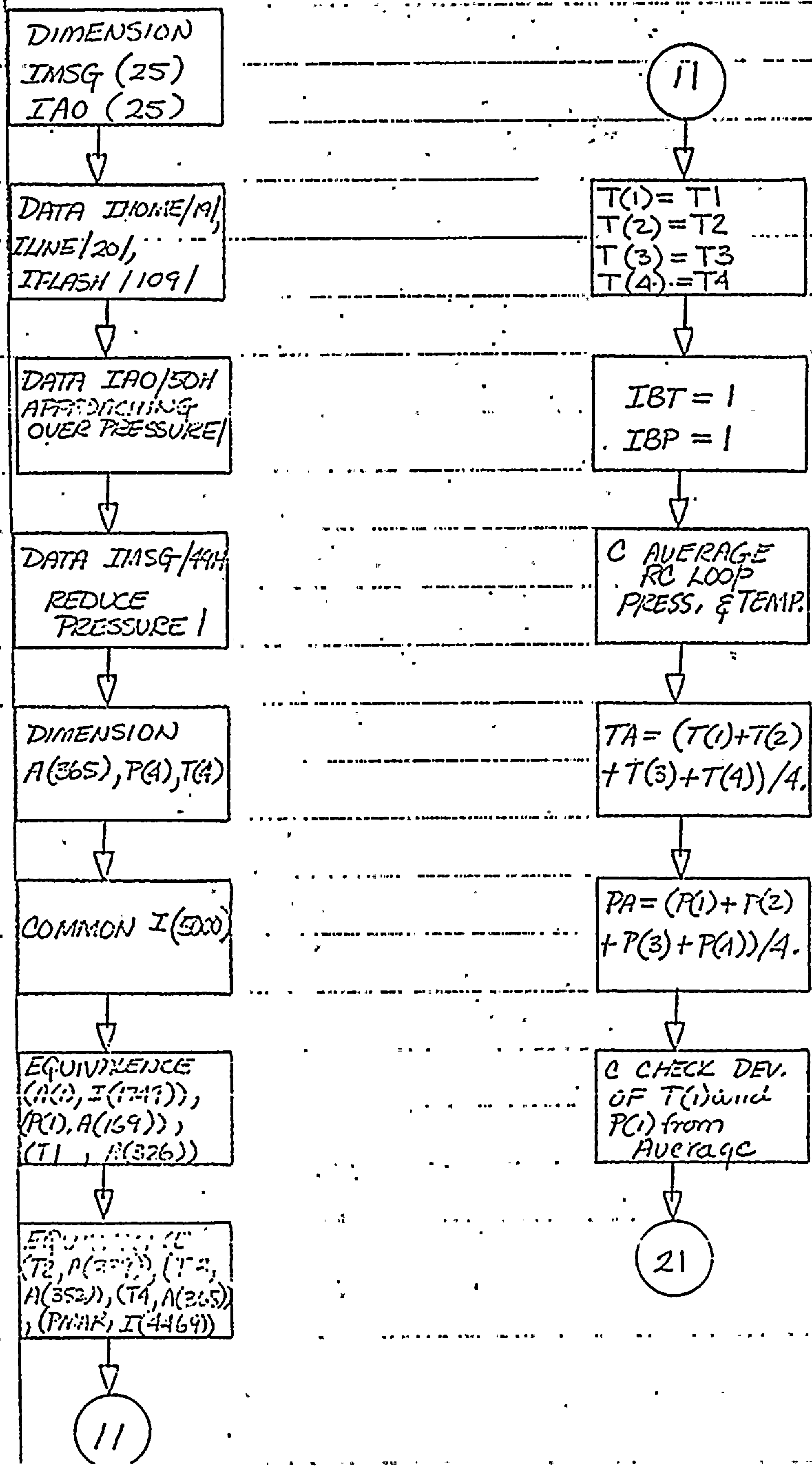

FIG 5.2-22 (cont)

JWS 5/9/77

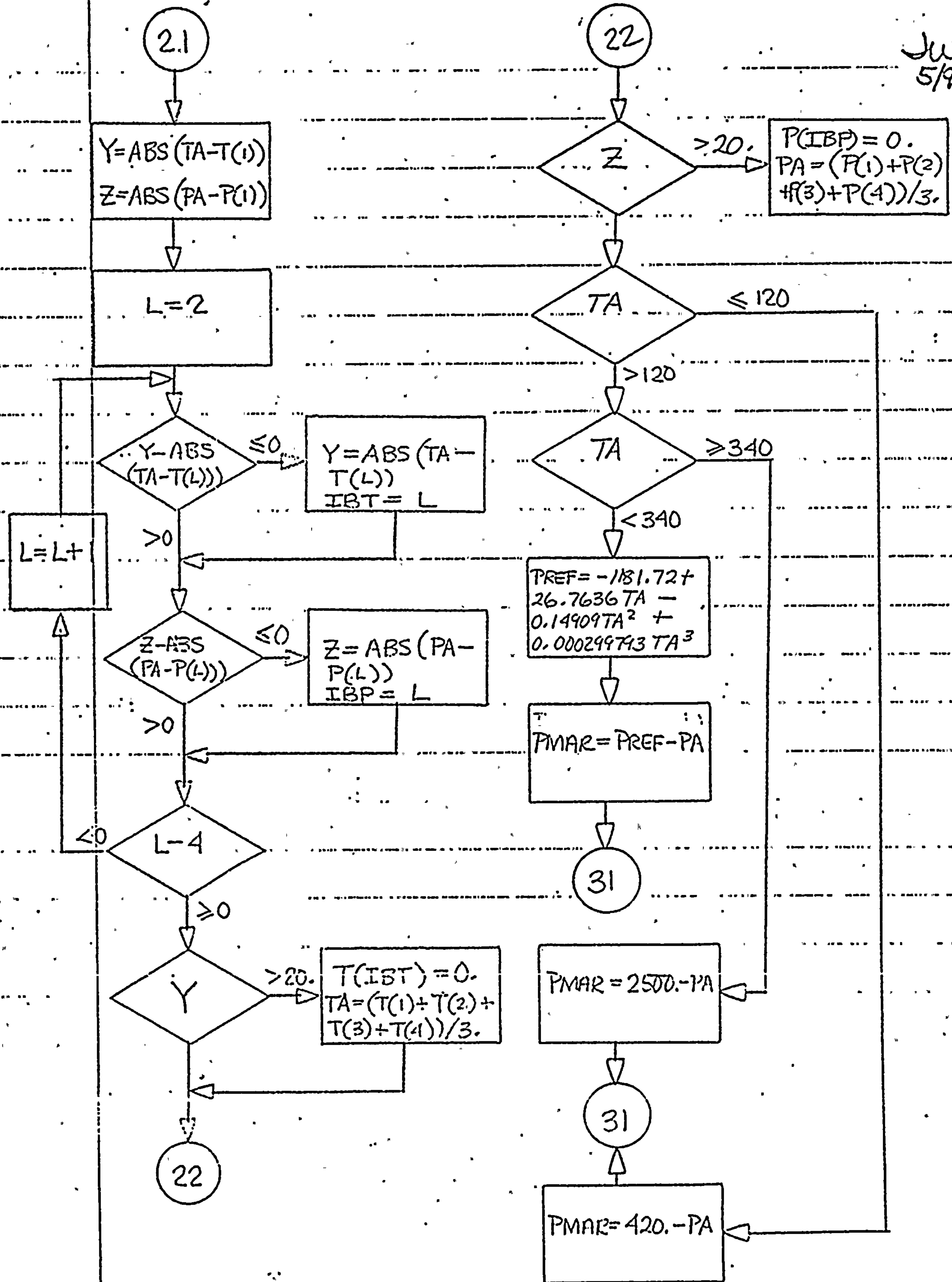

Fig 5.2-22 (cont)

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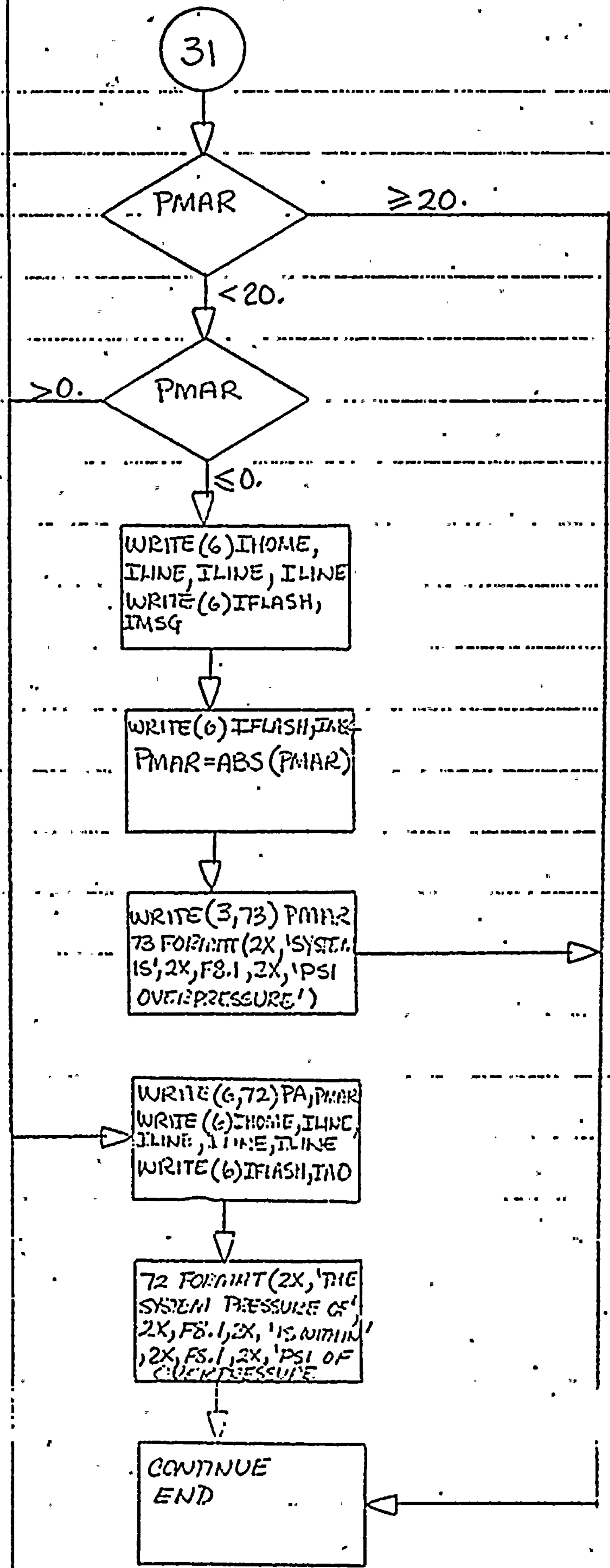
5/9/77



Pressure – Temperature Control Logic for Water Solid Alarm – Channel 2

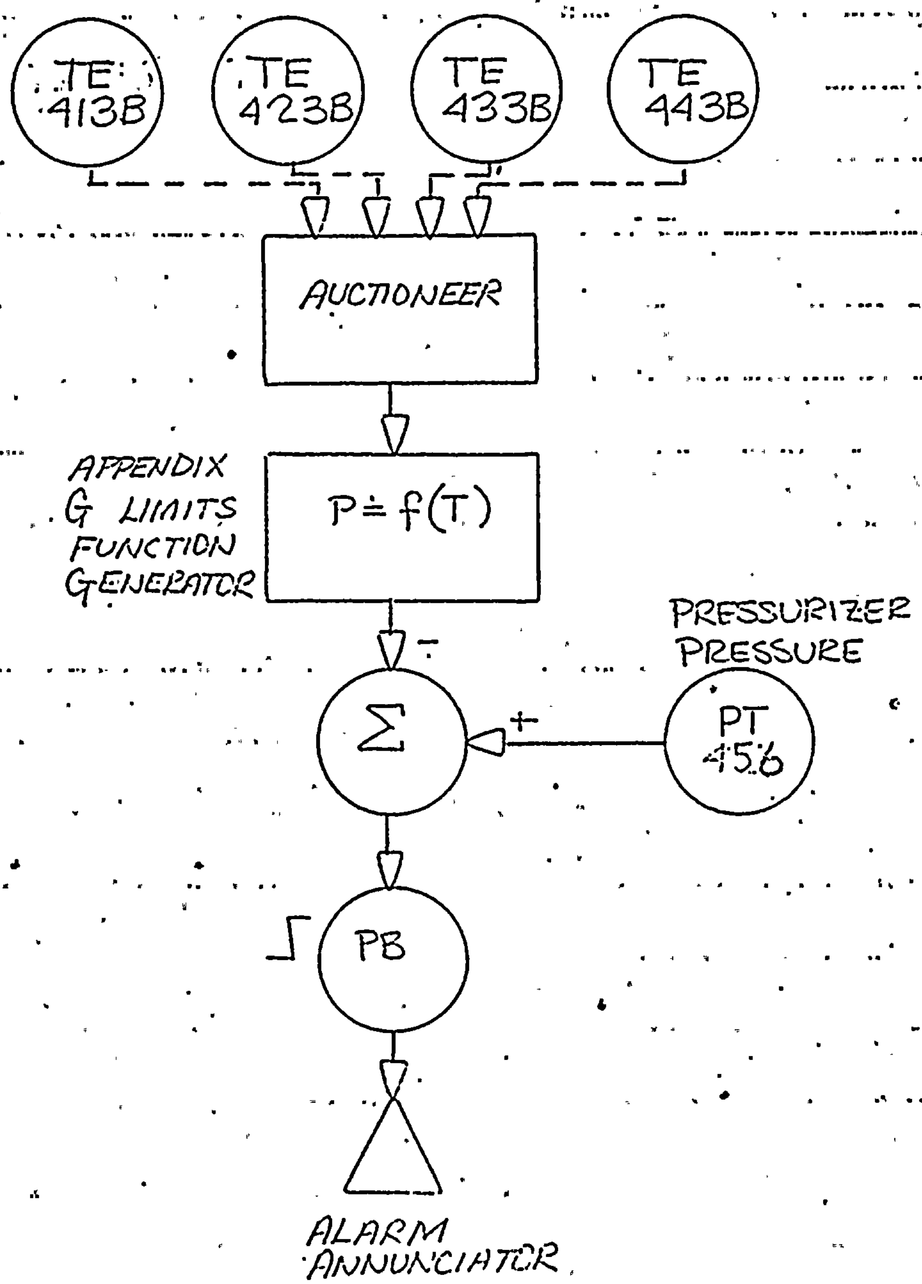



FIGURE 5.2-23

DRAFT: JWS/as
June 21, 1977

PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT

Procedural Steps to Prevent Overpressurization
During Water Solid Operation

With the realization that overpressure events had occurred throughout the industry during water solid operation, PG&E joined a group of utilities to develop a final solution for this problem. In the interim, we have established procedural and administrative controls which we believe will greately reduce the probability of an overpressure event. These procedures have been tested and found satisfactory during our recently completed hot functional test program. A list of these steps with a brief description follows. Most of these controls have been verified by Region V, I&E inspectors who have also observed their implementation. (attached)

1. Procedures now require that the time spend in the solid condition be held to a minimum. This requires that everything possible be accomplished prior to pressurization on a heatup or cooldown. Examples include completion of check-lists, preliminary verification of coolant chemistry and checkout of equipment. If problems develop on heatup, the system is cooled down and level lowered in the pressurizer. This step reduces the exposure time for overpressure events.

2. Procedures now state that the RHR system should not be isolated from the reactor coolant system (RCS) unless there is a bubble in the pressurizer or all three charging pumps are shutdown. This insures that the RHR system relief valves are available to limit possible pressure excursions. To further implement this step, we now remove the power from the RHR supply valves whenever the RCS is solid. This has been found necessary since these valves have an automatic closure signal that is suscetible to spurious operation. Power can be quickly restored to these values should the need arise.

DRAFT
JWS
6/30/77

3. During solid system operation, letdown flow is normally provided by the RHR system. To help insure that this path is fully available, the flow control valve is maintained in the full open position by procedural control. There are no automatic features that cause this valve (HCV-133) to close. Additionally, the normal letdown line is in service with all three orifices cut in to provide a backup flow path for removing water from the RCS. This step also insures that the orifice relief valve is available as another pressure relieving mechanism.

4. Additional requirements for starting reactor coolant pumps (RCP) have been established to preclude the chance of introducing accumulated cold seal injection water into a warm RCS by starting an inactive coolant pump. At least one pump must be in service whenever the system temperature is above 160°F. In addition, if all pumps are shut down for any reason, at least one pump must be returned to service within five minutes. If this requirement cannot be met, a pump may not be started until either a bubble exists in the pressurizer or the system has been cooled down to the temperature of the seal injection water.

5. Instructions have been included to make changes in the RHR system flow rate slowly. Extensive testing during our recent hot functional program allowed us to optimize the control system for the letdown pressure controller. This optimized control provides fast enough response to preclude pressure excursion due to RHR flow changes. While we have retained the precaution of making flow changes gradually, we have additional protection due to the response of the pressure control system in its automatic mode.

6. Our procedures have always included steps to keep the safety injection pumps inactive unless there is a bubble in the pressurizer. This is accomplished by physically racking out the pump motor circuit breaker. The standard technical specifications require these pumps to be operable in Modes 1, 2, and 3 which is equivalent to an RCS temperature of 350°F or greater. This temperature is also the maximum allowable with the RHR system in service,

and we are required to have the RHR system in service whenever the RCS is solid. We believe that the basis for the technical specifications is adequate justification for having this equipment inoperable when the RCS is solid. It may also be noted that the safety injection signals that cause automatic starting of these pumps are blocked during the operating conditions under discussion.

The fact that the pump motors are de-energized is alarmed in the control room and indicated by a status potential light on the control board. Additionally our operating check list for entering Mode 3 includes checking that the pumps have been made available. We believe that these controls and alarms provide adequate insurance that the pumps will not be left in an inoperable condition.

7. We are adding a procedural step to remove power from the accumulator outlet valves when the primary system is solid. During this time the valves are normally closed but capable of opening. Removing the power will prevent spurious opening either by control signal or operator error. The Standard Technical Specification and the basis therto provide adequate justification for this. Again, the safety injection signals that cause automatic opening of these valves are blocked at this time. Procedures and check lists will be used to insure that power is restored to the valves when a bubble exists in the pressurizer. Procedural controls will continue to be used to insure that the valves are opened and the power removed before reactor coolant system pressure is increased above 1000 psig. Should these controls fail, the valves are automatically opened at the P-11 set point. If, due to multiple procedural failures, the valves still have their power removed and cannot open, a separate alarm for each valve is initiated and repeated every hour until the valves have been opened. Indicating lights are also provided on the main control board.

8. Pressure and temperature are continuously recorded, are available on demand from the computer and are logged every 30 minutes by the operators during heatup and cooldown.

In summary, we believe that these procedural controls and the alarm circuits (discussed separately) provide reasonable assurance that an overpressure condition will be prevented and do not result in an undue risk to the health and safety of the public.

OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

IE Inspection Report No. 50-275/77-05

| | | | |
|---|---|---|---|
| Licensee | Pacific Gas & Electric Company | Docket No. | 50-275 |
| | 77 Beale Street | License No. | CPPR-39 |
| | San Francisco, California 94106 | Priority | |
| Facility | Diablo Canyon Unit 1 | Category | B |
| Location | San Luis Obispo County, California | | |

Type of Facility PWR 3338 MWt, Westinghouse

Type of Inspection Routine, Unannounced

Dates of Inspection March 14-16, 21-23, 1977

Dates of Previous Inspection February 24-25, 1977

Principal Inspector [signature] 3/31/77
T. Young, Jr., Reactor Inspector — Date

Accompanying Inspectors [signature] 3/31/77
P. H. Johnson, Reactor Inspector — Date

[signature] 3/31/77
A. Johnson, Reactor Inspector — Date

Other Accompanying Personnel: J. L. Crews, Chief, Reactor Operations and Nuclear Support Branch (3/23/77 only)

Reviewed by [signature] 4/1/77
J. L. Crews, Chief, Reactor Operations and Nuclear Support Branch — Date

IE:V Form 219

# DETAILS

## 1. Persons Contacted

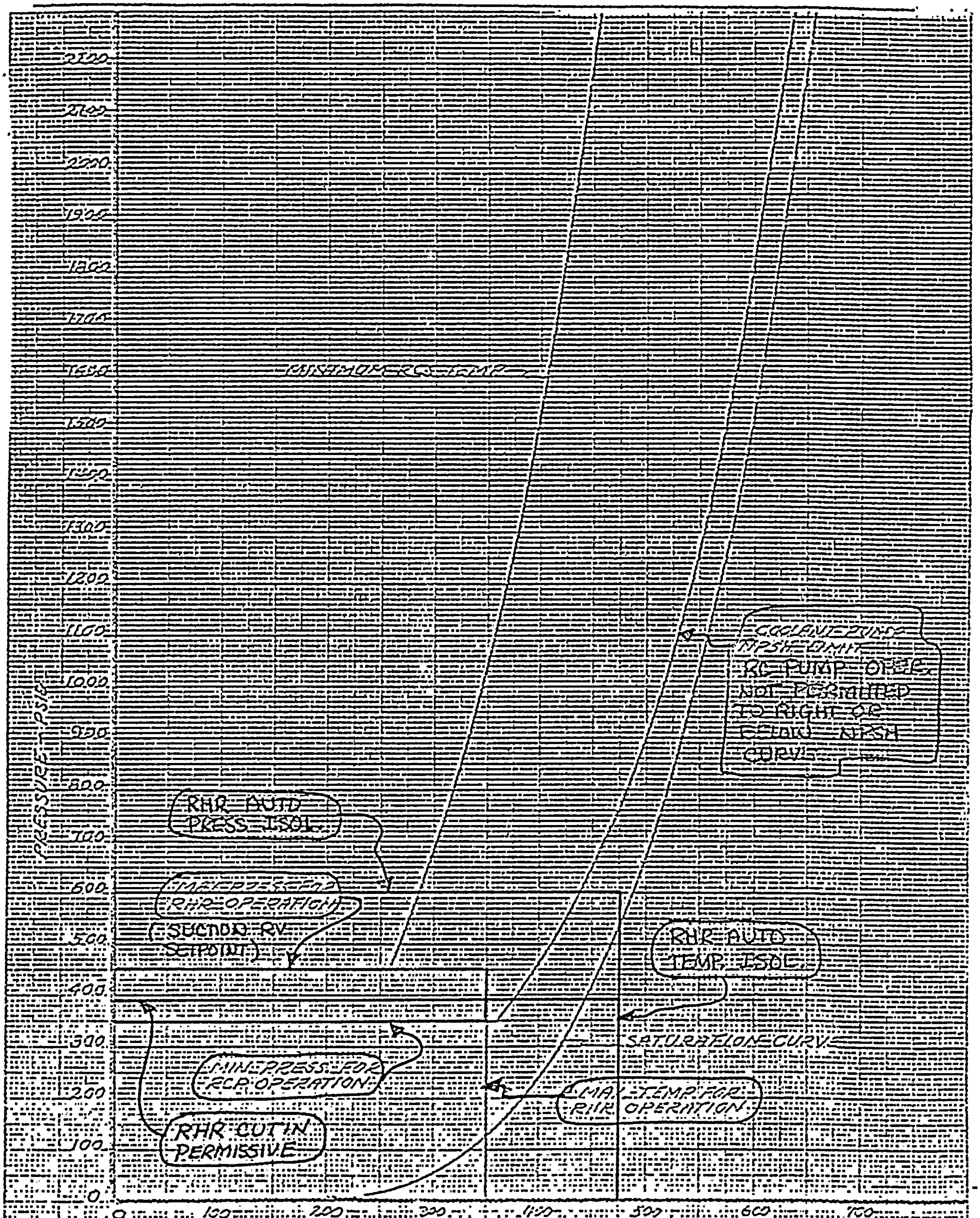
R. Ramsay, Plant Superintendent
M. Tressler, Project Superintendent
R. Patterson, Supervisor of Operations
J. Townsend, Resident Startup Engineer
J. Shiffer, Power Plant Engineer
J. Diamonon, QC Supervisor
D. Day, Coordinating QC Engineer
R. Taylor, QA Engineer
H. Maloney, Relief Shift Supervisor
J. Gisclon, Senior Power Production Engineer
M. Norem, Startup Engineer
J. Sumner, Startup Engineer
O. Sunquist, Shift Foreman
W. White, Shift Foreman
I. Lara, Control Operator
P. Morningstar, Machinist

## 2. Mini-Hot Functional Testing

The inspectors were on site to witness part of the heatup and portions of the testing of other systems and subsystems in progress at the time. Discussions were held with the operating personnel on shift and other technical plant personnel. The inspectors found that the operating procedures had been changed in accordance with the licensee's letter of February 10, 1977 to NRR. The operating personnel had been informed and were knowledgeable about the potential for overpressurization during solid reactor coolant system operation. On March 17, 1977, while still in a heatup status, a leak was discovered in a feedwater steam generator nozzle weld. The heatup was terminated and the plant subsequently brought to cold shutdown conditions (See IE Inspection Report No. 50-275/77-06). Testing will be resumed when repairs and engineering evaluations have been completed.

## 3. Pressurizer Relief Valves Seismic Restraints

A licensee employee informed the inspectors that he thought that there was not enough seismic restraints on the three pressurizer relief valves and their operators. The inspectors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(SUCTION RV SETPOINT)
RHR AUTO TEMP. ISOL.
SATURATION CURVE
MIN. PRESS. FOR RCP OPERATION
MAX. TEMP. FOR RHR OPERATION
RHR CUT IN PERMISSIVE