

50-315

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TO: Mr B C Rusche

FROM: Indiana & Michigan Pwr Co
New York, NY
G P MaloneyDATE OF DOCUMENT
3-3-77

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DESCRIPTION

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....trans the following:

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REACTOR VESSEL OVERPRESSURIZATION
DISTRIBUTION PER G. ZECH 10-21-76

PLANT NAME: Cook #1

ENCLOSURE

Info concerning implementation option re installation of acceptable long-term improvements to mitigate overpressurization transients.....

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DO NOT REMOVE

ACKNOWLEDGED

SAFETY

FOR ACTION/INFORMATION

3-11-77 ehf

BRANCH CHIEF: (5)

Ziemann

LIC. ASST:

Diggs

PROJECT MANAGER:

Fletcher

INTERNAL DISTRIBUTION

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EXTERNAL DISTRIBUTION

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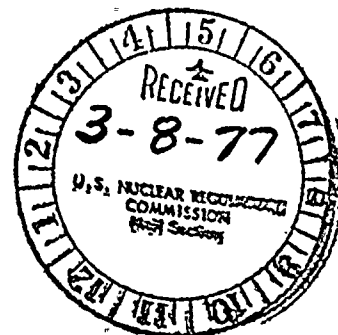
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INDIANA & MICHIGAN POWER COMPANY

P. O. BOX 18
BOWLING GREEN STATION
NEW YORK, N. Y. 10004

March 3, 1977

Donald C. Cook Nuclear Plant Unit No. 1
Docket No. 50-315
DPR No. 58



Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Rusche:

This letter is in response to Mr. Dennis L. Ziemann's letter dated January 10, 1977 which requested that we identify the implementation option we have selected for the installation of acceptable long-term improvements to mitigate overpressurization transients. There were also staff positions and requests for additional information listed in enclosure 1 to Mr. Ziemann's letter. Our responses to the staff positions and requests for information are provided in Attachment 1.

Attachment 2 presents two sketches which represent the control function - logic diagram for the circuits to be installed at the Cook Nuclear Plant to mitigate the effects of an overpressurization transient. This control scheme will be duplicated on both existing RCS wide range pressure transmitters with each train actuating one Pressurizer Power Operated Relief Valve.

This control scheme will be the long-term solution for RCS overpressure protection. The selection and ordering of hardware (e.g. - Block-Unblock switch) is currently underway. The estimated delivery for the hardware is late September 1977. The remaining equipment that is needed is already available or can be fabricated on site.

The mitigating system we have designed incorporates controls for two (2) of our existing Pressurizer Power Operated Relief Valves and the control scheme of Attachment 2. The mitigating system will represent good engineering practice and will not adversely affect plant safety or introduce potential common mode failures that could both cause a pressure transient and disable the protection system.



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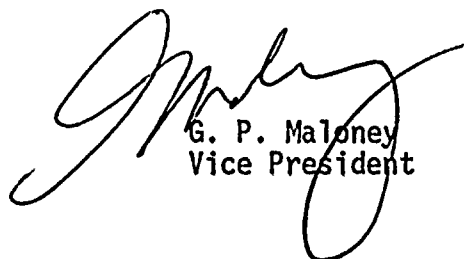
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March 3, 1977

We will have all the necessary equipment available and be prepared to do the installation work by December 31, 1977. We will install the equipment at the first system depressurization subsequent to having all of the equipment available on site. We believe this to be the most logical approach since there is no need for the mitigating system until the reactor coolant system is depressurized from operating conditions.

Your August 13, 1976 letter required us to provide "an analysis of the RCS response to pressure transients." We expect that the analysis, when completed by Westinghouse, will show that our existing relief capacity is adequate to mitigate all the anticipated pressure transients. We will advise you as to the results of the analysis when they become available.

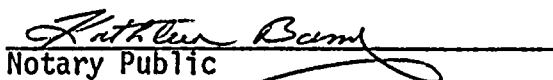
Very truly yours,



G. P. Maloney
Vice President

GPM:mam
Attachment

Sworn and subscribed to before me on
this 3rd day of March 1977 in
New York County, New York


Notary Public
KATHLEEN BARRY
NOTARY PUBLIC, State of New York
No. 41-4606792
Qualified in Queens County
Certificate filed in New York County
Commission Expires March 30, 1977

cc: G. Charnoff
R. J. Vollen
R. C. Callen
P. W. Steketee
R. Walsh
R. S. Hunter
R. W. Jurgensen - Bridgman

1. The first part of the report is a general
description of the project and its objectives.
2. The second part is a detailed description
of the methods used in the study.
3. The third part is a description of the
results of the study.
4. The fourth part is a discussion of the
results and their implications.
5. The fifth part is a conclusion and
recommendations for future research.

1. The first part of the report is a general
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Attachment 1

Response to Item 1:

Discussion of PWR overpressurization transients will be conducted as a part of the Licensed Operator Regualification Program. The program is conducted on a one shift per week basis. The required personnel attendance is normally all RO and SRO licensed operators on shift. For the purpose of overpressurization discussions, attendance will also be required of shift auxiliary equipment operators and C&I Technicians. The regualification program, year three, will start in March, 1977.

- a) It is estimated that all plant operators will have participated in formal discussions of overpressure transients by May 15, 1977.
- b) A formal discussion of overpressure transients at PWR's will be conducted as a part of the licensed operator regualification program. The discussions will cover in detail the following subjects:
 - 1. The causes of past pressure transients that have occurred at other PWR facilities.
 - 2. Plant conditions at the time of the pressure transients.
 - 3. The mitigating action that could have been or was taken.
 - 4. The preventive measures that could have been taken to avoid the event.
 - 5. The steps that have been taken to prevent similar occurrences.
 - 6. Cook Nuclear Plant similarities and differences with other PWR facilities and how these relate to overpressure events which occurred at these other facilities.
- c) We have been able to collect details of eleven overpressure events at PWR facilities. These have been analyzed as to their possibility of occurrence at the Cook Nuclear Plant and the results are summarized in the following table.

1974

1974

The following information was obtained from the records of the Department of the Interior, Bureau of Land Management, regarding the land owned by the United States in the State of California, as of January 1, 1974.

The total land owned by the United States in the State of California, as of January 1, 1974, was 1,140,000 acres.

The land is owned by the United States in several different categories, including National Forest Land, National Monument Land, and National Preserve Land.

The following table shows the distribution of land ownership by category:

Category of Land Ownership

Acres

National Forest Land

Acres

National Monument Land

National Preserve Land

Table of Overpressure Events
(Item 1(c) & (d))

Donald C. Cook Nuclear Plant

<u>Plant Name</u>	<u>Cause of Event</u>	<u>Event Nature</u>	<u>Water-Solid Operation*</u>	<u>Steam-Bubble Operation**</u>
Indian Point 3	Component Failure	RHR-Letdown Isolation	Credible	Not-Credible
Indian Point 2 (2 events)	Component Failure	Loss of Instrument Air	Not-Credible (Redundant Dryer Trains)	Not-Credible
St. Lucie 1	Defective Procedure	RCP Start	Credible	Not-Credible
D. C. Cook 1	Defective Procedure	Letdown Isolation	Credible	Not-Credible
Beaver Valley 1 76-13/3L	Personnel Error	SIS plus Letdown Isolation	Insufficient Information to draw a conclusion.***	
Point Beach 2	Defective Procedure	Letdown Isolation Deliberate Operator Action	Credible	Not-Credible
Beaver Valley 1 76-11/3L	Personnel Error	Letdown Isolation Electronic Instr. Spike	Insufficient Information to draw a conclusion.***	

*This column reflects the Cook Nuclear Plant prior to the revision of the three major operating procedures described in Item 2 response.

**This column reflects the Cook Nuclear Plant with its current operating procedures which provide for a steam cushion in the pressurizer.

***The description of the event in the available reports did not contain enough information to be able to determine the event credibility at the Cook Nuclear Plant.

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1. PURPOSE AND SCOPE

The purpose of this document is to provide a comprehensive overview of the current status of the project, including the progress made to date, the challenges encountered, and the proposed solutions. The scope of the document covers the entire project lifecycle, from initial planning to final delivery.

The document is organized into several sections, each focusing on a specific aspect of the project. The first section provides an overview of the project goals and objectives. The second section details the project plan, including the timeline, milestones, and resource allocation. The third section discusses the current status of the project, highlighting the progress made and the challenges encountered. The fourth section outlines the proposed solutions and the next steps to be taken.

The document is intended for use by all project stakeholders, including the project manager, team members, and senior management. It serves as a key reference point for the project and is updated regularly to reflect the latest information. The document is classified as "Secret" and should be handled accordingly.

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Table cont'd....

Donald C. Cook Nuclear Plant

<u>Plant Name</u>	<u>Cause of Event</u>	<u>Event Nature</u>	<u>Water-Solid Operation*</u>	<u>Steam-Bubble Operation**</u>
St. Lucie 1	Component Failure	Hot Functional Test	Insufficient Information to draw a conclusion.***	
Zion 1	Operator Error	Letdown Isolation	Credible	Not-Credible
Turkey Point 3	Insufficient Information	RHR-Letdown Isolation	Credible	Not-Credible
Indian Point 2	Defective Procedure	RCP Start	Credible	Not-Credible



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- d) To reduce the likelihood of occurrence of the events which are listed as credible in the preceeding table, we have revised three major operating procedures to include non-water-solid operation of the reactor coolant system (RCS) and have installed an "operator alert" alarm. The description of the details of the procedural changes and the alarm function are provided in the response to Items 2 and 5 below.

THE
FEDERAL
BUREAU
OF
INVESTIGATION
OF
THE
DEPARTMENT
OF
JUSTICE
WASHINGTON
D. C.

Response to Item 2:

Three major operating procedures in which the plant would experience a water solid condition have been re-written. These procedures cover plant heatup, cooldown, and reactor coolant system fill and vent. As a result of the revisions to these operating procedures described below, it is not anticipated that the Cook Nuclear Plant will be operated or maintained in a water solid condition. Therefore the possibility of an overpressurization during these plant conditions has been greatly reduced.

a) Revised Plant Operating Procedures:

1. Filling and Venting Reactor Coolant System-OHP 4021.002.001

Prior to revising this procedure the pressurizer (PZR) and coolant loops were filled to a condition in which four air pockets remained in the steam generator tubes. The RCS pressure was then increased to about 400 psig using the charging pumps. While maintaining this pressure with the charging pumps and letdown through RHR, each reactor coolant pump (RCP) was bumped and the RCS was vented. After this venting the RCS was in a water solid condition using charging and letdown to control pressure and RHR system to control temperature. After the first vent the reactor coolant pumps were run again for 1 minute and the system vented. This cycle was repeated two (2) more times for 5 and 10 minute runs on the reactor coolant pumps. After completing the ten minute run/vent cycle the fill and vent procedure was considered complete and the plant remained in this condition until plant heatup, at which time a pressurizer bubble was drawn during heatup.

The revised procedure fills the RCS using the charging system to the condition where four air pockets remain in the steam generator tubes. At this point instead of pressurizing the system, bumping reactor coolant pumps and venting to a water solid condition, the pressurizer heaters are energized and a steam bubble is formed in the pressurizer. Pressurizer temperature is then increased to bring system pressure up to about 325 psig for reactor coolant pump operation. The

pressurizer steam space is put on sample recirculation to the volume control tank to remove air and N₂ from pressurizer. The reactor coolant pump run/vent cycle is now performed using steam bubble for pressure control. After the last RCP is run, the reactor coolant system pressure is reduced to 50-100 psig for final vent, to remove more N₂ from solution at lower pressure. After venting at 100 psig the fill and vent procedure is complete and the system will remain in this condition until heatup. Using this revised fill and vent method, which makes use of the air pockets in the four steam generator tubes, the RCS will never be in a water solid condition. Previous experience has shown that this procedure provides a "soft" system while drawing the steam bubble.

2. Plant Heatup from Cold Shutdown to Hot Standby-OHP 4021.001.001

This procedure was revised so that initial conditions for the heatup are that the RCS pressure is being maintained by a pressurizer steam bubble. The steam bubble has already been established during the fill and vent, therefore, the heatup procedure is not involved with water solid operation under any conditions.

3. Plant Cooldown from Hot Standby to Cold Shutdown-OHP 4021.001.004

Prior to revising the cooldown procedure the RCS was placed in a water solid condition during the last phase of plant cooldown. The first phase of plant cooldown remains the same, since water solid condition is not a concern during this part of the cooldown. The RCS temperature is reduced to about 150°F in the reactor vessel and loops, and 425°F in the pressurizer (which maintains system pressure at about 325 psig), by dumping steam to the condenser and placing RHR system in service at 425 psig/350°F. During the first phase of cooldown the following pertinent steps are taken at the indicated system conditions.

i) System Pressure < 1000 psig:

Accumulator isolation valves IMO-110, 120, 130, 140 are closed and breakers are racked out and tagged.

ii) System temperature < 350°F:

SI pump breakers are racked out and tagged.

Note: A revision is now being made to add the following valves to condition (ii), (system temp. < 350°F).

Close the following valves, rack out and tag supply breakers for each:

SI Pump discharge Valves - ICM-260
ICM-265

Cold Leg SI Valves - IM0-51
IM0-52
IM0-53
IM0-54

The steps listed above will completely disable the SIS system.

A major revision was made to the last phase of the cooldown procedure to cool the pressurizer down and depressurize the system using Auxiliary spray with a maximum level in pressurizer of 85%, instead of filling the pressurizer to water solid condition for cooldown. The revised procedure completes the plant cooldown as follows:

Plant Conditions:

Loop and vessel temperature - 150°F

Pressurizer temperature - 420°F

Pressurizer pressure - 325 psig

1 reactor coolant pump running, RHR in service.

First the running RCP is secured and the PZR heaters are de-energized. Using Auxiliary spray the PZR level is slowly increased, cooling the PZR and depressurizing

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the system. The PZR level is allowed to increase to 85% maximum level and recirculated using Auxiliary and letdown through RHR until a steam space temperature of 250°F to 275°F is reached. When this condition is established, the PZR level is reduced by increasing letdown through RHR system and the charging system is secured. Draining of the RCS to necessary level for maintenance and/or refueling can be started at this point and the cooldown is considered complete.

For all other conditions which do not require opening of the RCS a low pressure steam bubble will be maintained during the cold shutdown condition.

- b) With the revision of the above three procedures, it is not anticipated that the RCS will be operated or maintained in a water solid condition at any time during further operations.
- c) It is not anticipated that the need will exist to operate the RCS in a water solid condition.

[illegible]

Response to Item 3:

The safety injection system (SIS) pumps will be de-energized during cold shutdown operation as required. However, our current Technical Specifications (3.5.2 & 3.5.3) require that surveillance testing of the SIS be performed during cold shutdown and hence the SIS pumps must be operated during this mode. We will not be able to de-energize the SIS pumps during this testing period but they will be de-energized at all other times during cold shutdown.

- a) Figures 1 and 2 (attached) show the SIS flow paths into the RCS.
- b) Figures 3 and 4 show the head-flow characteristics of both (North & South) SIS Pumps.
- c) The valves and pumps to be closed and de-energized are shown on Figure 1 by being circled with a dotted line. Items are identified as North and South ("N" and "S") pumps, valves V-9 (ICM-265) & V-10 (ICM-260) and valves IMO-51, IMO-52, IMO-53, IMO-54.
- d) The present revision of the plant cooldown procedure requires the accumulator valves to be closed and the breakers for each to be racked out and tagged. The SIS pumps are also de-energized and the supply breakers racked out and tagged.

A temporary sheet has added the following valves to the cooldown procedure:

Cold leg injection valves IMO-51, 52, 53, and 54

SI pump discharge valves ICM-265 and 260 (V-9 & V-10 respectively)

The change requires these valves to be closed and the breakers for each racked out and tagged.

- e) All equipment identified in 3(c) will remain closed and/or de-energized during cold shutdown operation, except when technical specification surveillance testing is being performed. It is felt that by closing and de-energizing

[illegible]

WASH. STATE UNIV., PULLMAN, WASH. (continued) S 105 J continued

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הענין הזה נשקף לנו בפרט בלשון חזקיהו הנביא
במקום הזה: "והיה כי יבנה בית ה' ויהיה
ביתו של עמלק ויהיה ביתו של מדין ויהיה
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ביתו של אלהים".

2. The following information is provided for the year ended 31/12/2017:
 (a) The company's revenue is £1,000,000.
 (b) The company's expenses are £800,000.
 (c) The company's profit is £200,000.
 (d) The company's assets are £1,200,000.
 (e) The company's liabilities are £1,000,000.
 (f) The company's equity is £200,000.
 (g) The company's cash is £100,000.
 (h) The company's debt is £900,000.
 (i) The company's revenue is £1,000,000.
 (j) The company's expenses are £800,000.
 (k) The company's profit is £200,000.
 (l) The company's assets are £1,200,000.
 (m) The company's liabilities are £1,000,000.
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 (p) The company's debt is £900,000.

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ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
DATE 08-11-2010 BY 60322 UCBAW

[illegible]

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

the cold leg injection valves IMO-51, 52, 53, 54 that SIS injection would be prevented in the event of an inadvertent operation of the SIS during cold shutdown condition.

- f) Safety Injection Pump "S" is supplied from circuit breaker T11A1 located in the Bus A and Bus B 4kV switchgear room. Safety injection pump "N" is supplied from circuit breaker T11D5 located in the Bus C and Bus D 4kV switchgear room. Both switchgear rooms are on elevation 609'. These circuit breakers are normally operated from the control room. Disconnecting these circuit breakers, which makes them inoperable, is done at the 4 kV switchgear rooms.

The north safety injection pump shutoff valve, ICM-260, is supplied from MCC-1-ABV-D and the south safety injection pump shutoff valve, ICM-265, is supplied from MCC-1-ABV-A. Both motor control centers (MCC) are located on elevation 587'. The valve motor operators are normally controlled from the control room. Opening the circuit breakers to the valve controller, which will disable the valve operator, is done at the motor control center.

- g) Disconnecting the circuit breakers for the safety injection pump motors will turn off both the red and green breaker position indicating lights and the white breaker closing status light. The status monitor lights are still operable and will indicate a failure of the safety injection pump motors to start if a safety injection is initiated.

The red and green valve position indicating lights will both go out on both valves. The status monitoring lights will indicate the valves closed if a safety injection is initiated.

- h) The plant cooldown procedure will provide the administrative control necessary to insure that each designated valve and pump is de-energized and/or closed at the correct time during cooldown. When the equipment is placed in the indicated position the step in the procedure will be signed off. The equipment will also be tagged out in

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accordance with the plant tagging procedure, which provides another administrative control. When the equipment is tagged, it can not be energized or its position changed without first obtaining authorization from the shift operating engineer.

When the plant is returned to power, proper equipment alignment and operability is administratively controlled by the technical specification surveillance signoff sheets. These data sheets are attached to the plant heatup and startup procedures and require that all equipment associated with a mode change are OPERABLE prior to that mode change. All equipment listed above will be checked and verified OPERABLE in this manner.

Each shift operating engineer is responsible for plant operation and control of plant equipment on his shift. It is the shift operating engineer's responsibility to insure that designated equipment is closed, de-energized and tagged out in accordance with plant procedures.

- i) The accumulator isolation valves will be closed when the RCS pressure is at 1000 psig or less.

The supply breakers for the motor operated accumulator isolation valves are located on Motor Control Centers 1-EZC-A,B,C, and D. These MCC's are located in the electrical bay mezzanine. The switches for the isolation valves are located on the control room panel SIS. The supply breakers are opened and closed locally at the MCC's.

Disabling the valve motor operators will cause the red and green valve position lights to go out. The annunciator "accumulator valve not fully open" will be operable when operating above P11 interlock and the status monitor lamps will be operable.

- j) The overall impact on plant operation, to lower accumulator nitrogen pressure for each cooldown, would be the possible increase in time to either the cooldown or heatup cycle due to depressurization or pressurization of accumulators.

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Also the increased usage and availability of N₂ could effect plant operation.

There is also a remote chance that the N₂ would have to be vented to the gas system due to high gaseous activity which would overload the waste gas system.

We believe that closing the isolation valves, de-energizing and tagging the breakers supply power to the motor operated valves is sufficient protection.

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 3, 1862.

2. The second part is a report from the Secretary of the Interior, dated January 10, 1862, on the subject of the land grant to the State of California.

3. The third part is a report from the Secretary of the Interior, dated January 10, 1862, on the subject of the land grant to the State of California.

Response to Item 4:

- a) The charging system and the safety injection system are routinely tested while in cold shutdown.
- b) For extra measures taken see the response to Item 3.

Response to Item 5:

A high pressure alarm ("operator alert") used during low RCS temperature operation is presently installed at the Cook Nuclear Plant.

- a) The "operator alert" alarm was installed prior to the December 23, 1976 refueling outage.
- b) The system modifications are shown in Figure 5 (attached).
- c) The alarm setpoint, mode of annunciation and sensor are shown in Figure 5.
- d) It is not anticipated that the Cook Nuclear Plant will be operated in a water-solid condition.

2-12-1941

1. The first part of the report is a summary of the work done during the last year.

2. The second part is a description of the work done during the last year.

3-12-1941

1. The first part of the report is a summary of the work done during the last year.

2. The second part is a description of the work done during the last year.

3. The third part is a description of the work done during the last year.

4. The fourth part is a description of the work done during the last year.

5. The fifth part is a description of the work done during the last year.

Response to Item 6:

- a) RHR Design pressure is 600 psig.
- b) Figure 2 identifies the RHR isolation valves relevant to overpressure incidents by means of two hexagons. The valves are Copes-Volcan, double disk, motor operated gate valves.
- c) RHR - Interlocks, setpoints, alarms:
RHR pump suction valves: IMO-128 and ICM-129.
 - 1. IMO-128 is interlocked with RCS wide range pressure channel NPS-122. When pressure drops below 425 psi, a permissive signal allows the operator to manually open this valve. If the pressure increases above 600 psi, this valve is closed automatically.

An RCS high pressure alarm in the control room is energized whenever pressure is above 600 psi, as sensed on either wide range pressure channel, NPS-121 or NPS-122. An RCS low pressure alarm is energized whenever both pressure channels are below 425 psi.
 - 2. ICM-129 is interlocked with RCS wide range pressure channel NPS-121. Operation and setpoints are as above.
- d) The nominal stroke time for these valves is 35 seconds.
- e) The setpoint and capacity of the relevant RHR safety valve is 450 psig and 900 gpm, respectively. This safety valve is designated on Figure 2 by an asterisk(*) .
- f) The other alarms and setpoints associated with RHR not discussed in (c) above are as follows:

Pressure alarms; IPA-310, IPA-320

RHR pump discharge pressure high alarms annunciate in the control room above 590 psi.

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• 1950 年 1 月 1 日 起 施 行

The undersigned hereby certifies that the above is a true and correct copy of the original as the same appears in the records of the Department of the Interior, Bureau of Land Management, at Washington, D.C.

SECRET

1. The first of these is the fact that the Commission has not yet received any information from the Government of the United Kingdom regarding the proposed changes to the law.

[illegible][illegible]

(The following information was obtained from the above source.)

(b) directing a person to provide information or evidence

1. The following information was obtained from the records of the
 2. Bureau of the Federal Bureau of Investigation (FBI) at Washington, D.C.

THE UNIVERSITY OF CHICAGO PRESS

המחברת מודה כי היא לא יודעת להעריך את חשיבות המחקר הזה, אך היא מאמינה כי הוא יעשה חסד רב עם הקהילה.

Response to Item 7:

We feel that adequate provisions have been provided by means of the revised procedures described in the response to Item 2.

- a) Using our revised procedures for RCS fill and vent, plant cooldown and heatup, the RCS will no longer be in a water solid condition during any of these operations. During RCS fill and vent, air bubbles are maintained in the steam generators while a pressurizer steam bubble is established. The reactor coolant pumps (RCP's) are not operated prior to PZR steam bubble formation. System pressure is increased for RCP operation by increasing PZR temperature to about 440°F. Pump run and vent cycles are conducted at these conditions. With this procedure the RCP's are not operated in a water solid condition.

The RCS is not placed in a water solid condition at anytime during cooldown. The PZR is cooled down and RCS depressurized using Auxiliary spray and slowly filling the PZR to a maximum level of 85% and recirculating until conditions are met for draining the PZR/RCS.

Either air or N₂ blanket is placed on system at start of drain down. If the RCS is not to be opened during a unit shutdown, a low pressure (i.e. 50-75 psig) bubble will be maintained in the PZR during shutdown precluding a water solid condition.

Using these revised procedures, RCP operation during water solid conditions is no longer a question.

- b) A PZR steam bubble is established for all conditions listed in Item 7(a) prior to the start of the first reactor coolant pump.
- c) Listed below are the limits associated with system temperature before the first RCP can be started. This question is not applicable to the Cook Plant due to the response of (b) above.

[illegible]

1. The first step is to identify the problem or goal. This involves understanding the current situation and what needs to be achieved.

1. The first step is to identify the problem or goal. This involves understanding the current situation and what needs to be achieved.

1. RCS below 150°F without seal water or with RCP seal leakage rate at 5 gpm or less and about 35 gpm of component cooling water at inlet temperature of about 80°F is flowing through thermal barrier.
 2. A pressure differential of at least 275 psi is available across the #1 controlled leakage seal. This is met if reactor coolant pressure is above 375 psig., and temperature of 350°F or less.
- d) RCS temperature profile instruments:
1. Individual hot and cold leg reactor coolant temperature are recorded over the range of 0-700°F.
 2. RHR pump discharge temperature is recorded over a range of 0-400°F.
- e) With steam bubble operation it is not necessary to establish isothermal conditions in the RCS for RCP operation.
- f) Pressure spikes are not a problem on RCP starts when a PZR steam bubble has been established. Several uses of the revised procedures as described in the response to Item 2 have shown this to be the case.

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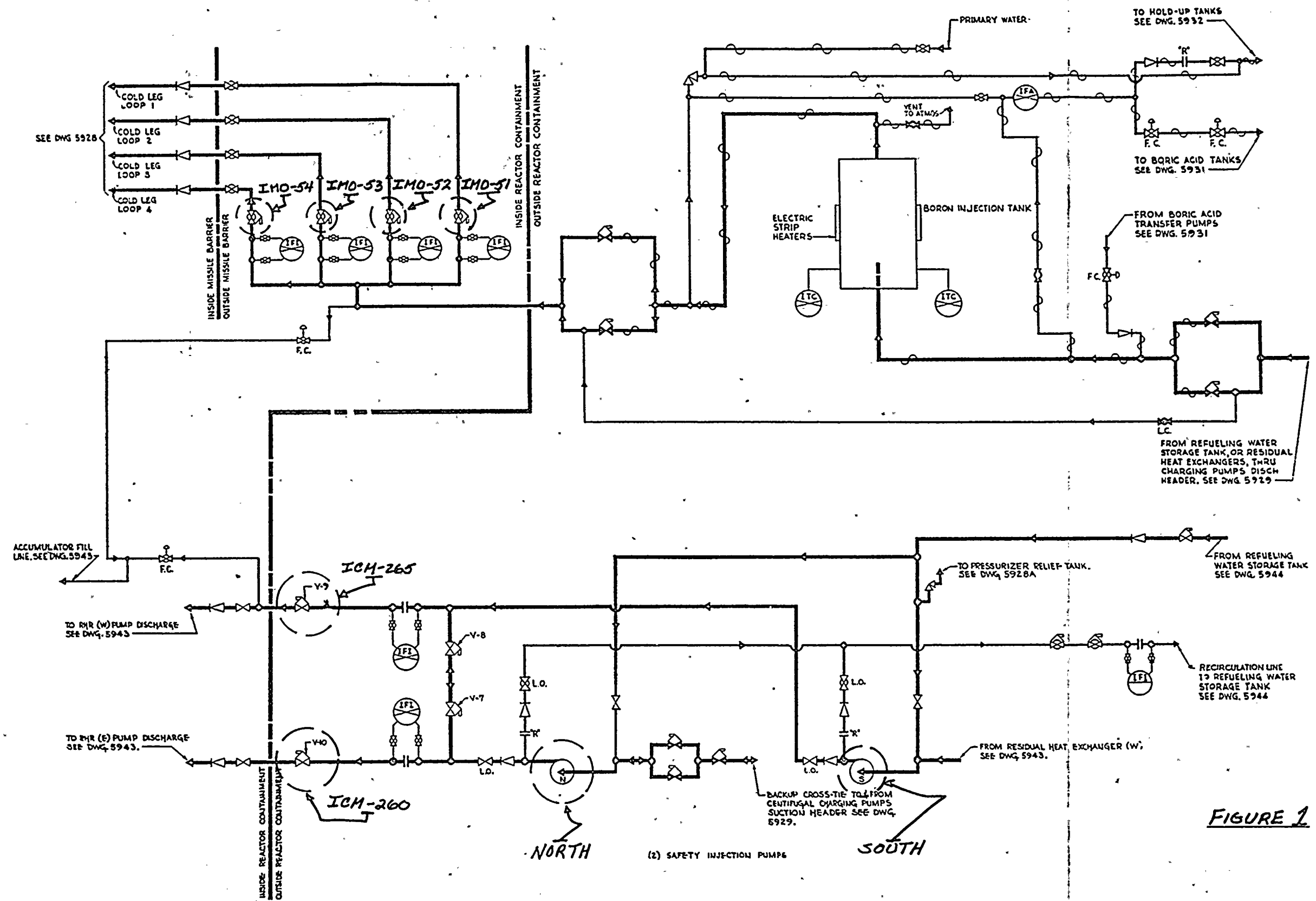
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NOTE:
VALVE TEST LINES
NOT SHOWN

FIGURE 1

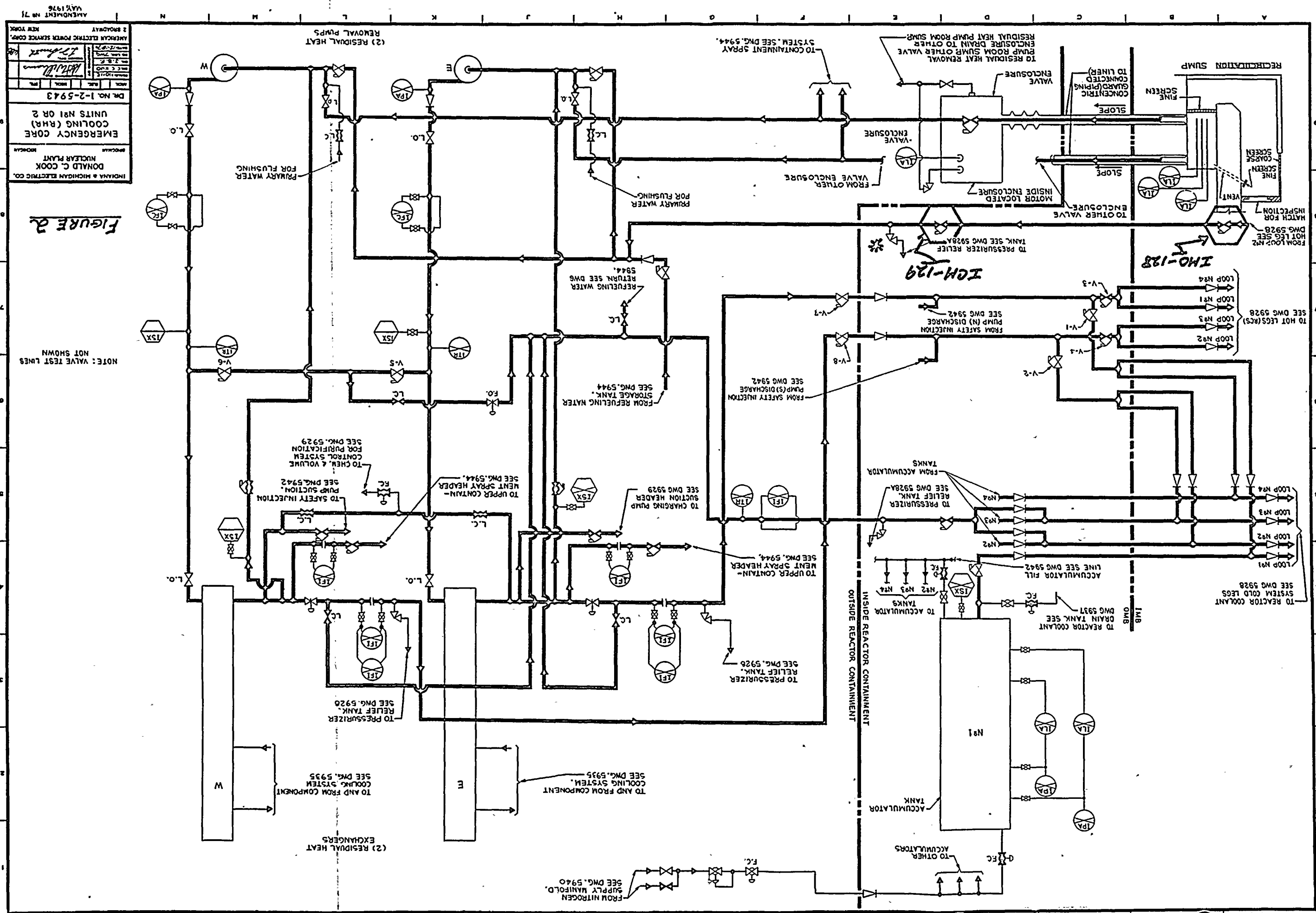


FIGURE 2.

CONTRACTOR _____
 CUSTOMER WESTINGHOUSE APD
 SPIN _____
 NO. APR SIAPS-01 P.O. 54-E-705-03B SUPP
 IMPELLER PATTERN M-6146 M-6147/48
 MAXIMUM DIAMETER 8 5/8 8 5/8 / 8 5/8
 RATED DIAMETER 8 5/8 8 5/8 / 8 5/8
 MINIMUM DIAMETER 8 1/4 8 1/4 / 8 1/4

TEST PERFORMANCE CURVE NO. 345540
 SIZE 2 1/2 TYPE JTCH STAGES 10
 R.P.M. 3570 DATE 2-19-70
 PUMP NUMBER 45491 Unit 1-Mon
 PERFORMANCE ALSO APPLIES TO PUMP
 NUMBER _____

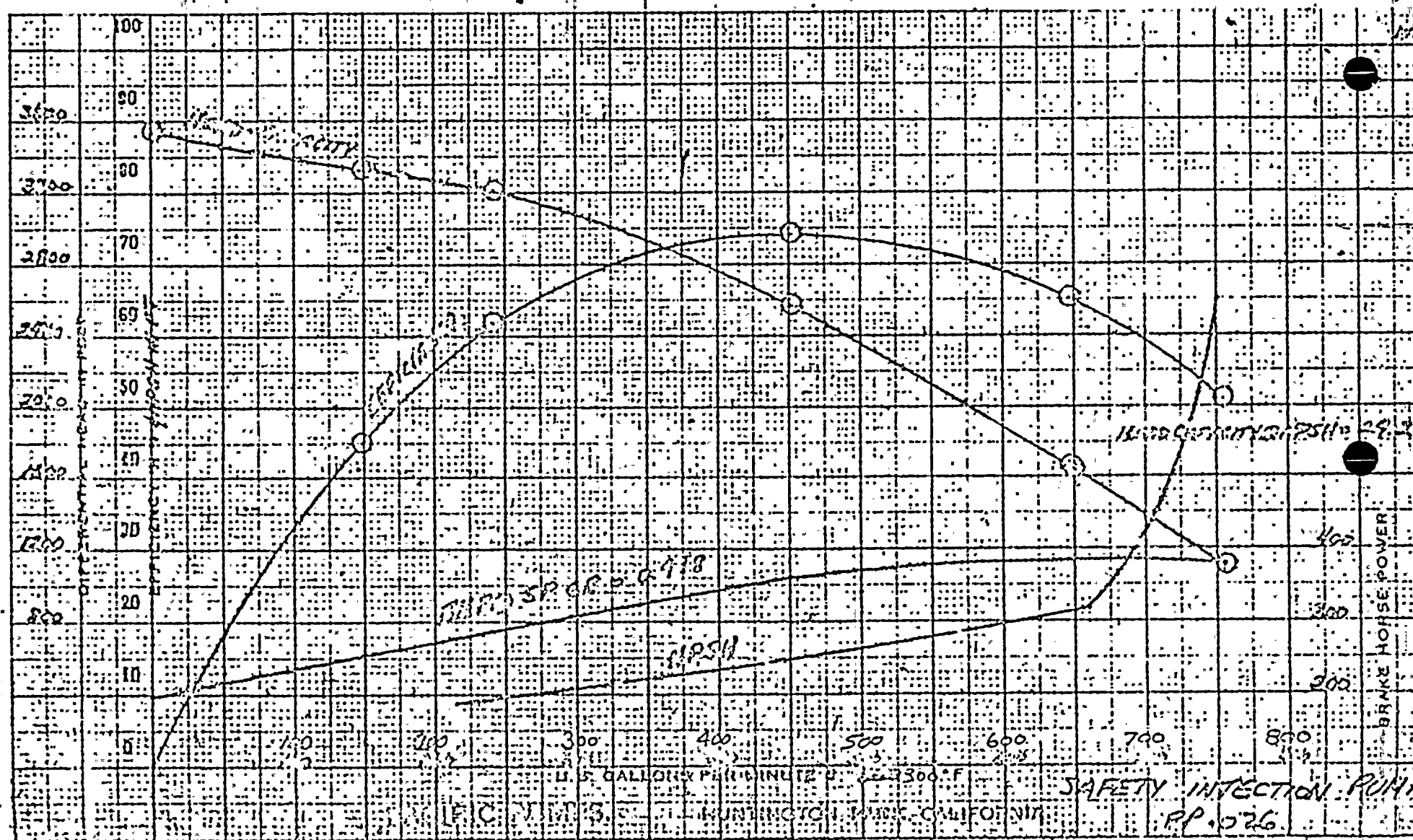


FIGURE 3

CONTRACTOR _____

CUSTOMER WESTINGHOUSE APD

SPIN NO AMPSPST-02P D 54-E-705-03B SUPP

IMPELLER PATTERN M-6146 M-6147/48

MAXIMUM DIAMETER 8 5/8 8 5/8 8 5/8

RATED DIAMETER 8 5/8 8 5/8 8 5/8

MINIMUM DIAMETER 8 1/4 8 1/4 8 1/4

TEST PERFORMANCE CURVE NO. 54534 F

SIZE 2 1/2 TYPE JTCM STAGES 10

R P.M. 3570 DATE 2-16-70

PUMP NUMBER 45474 Plant 1-Scath

PERFORMANCE ALSO APPLIES TO PUMP

NUMBER _____

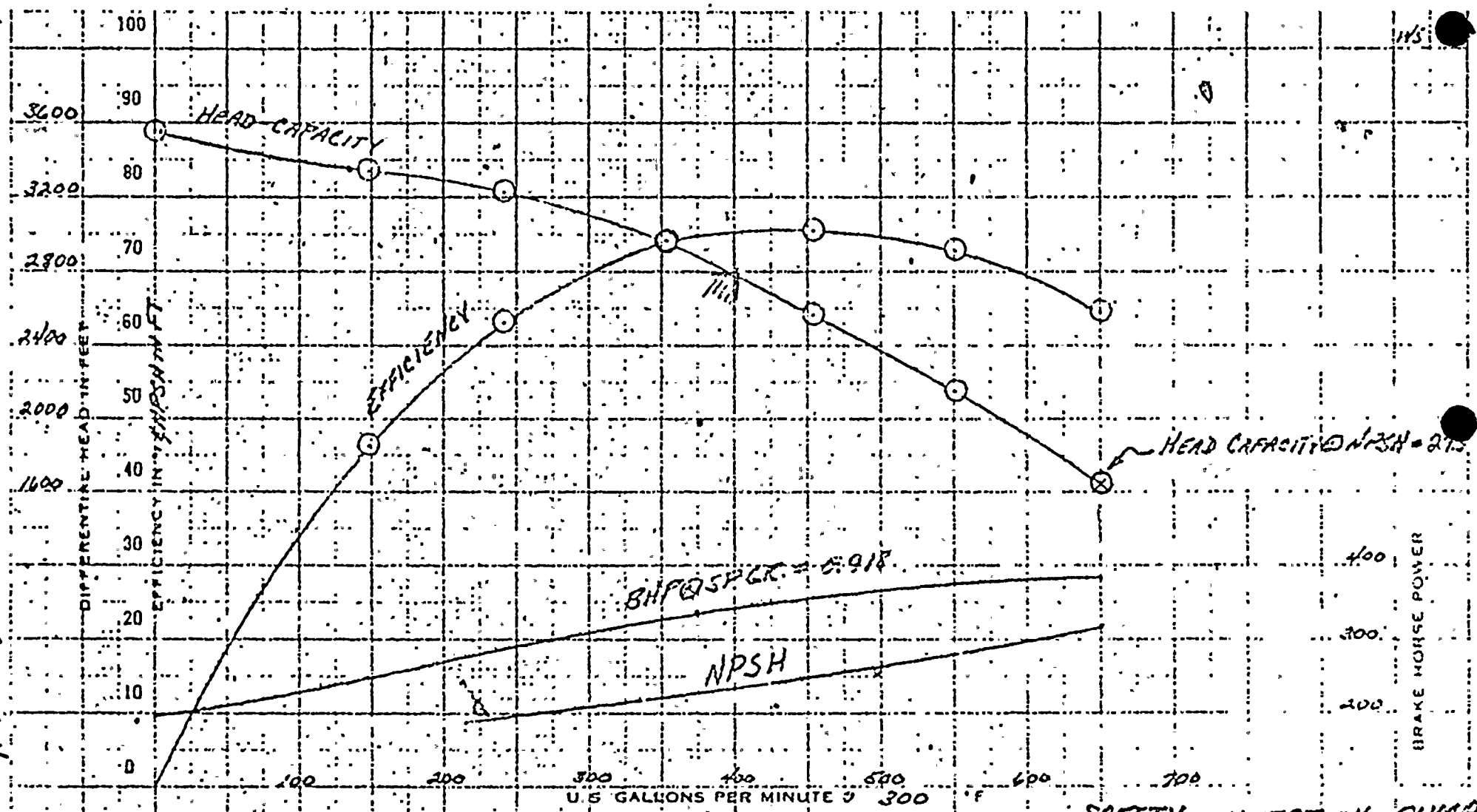
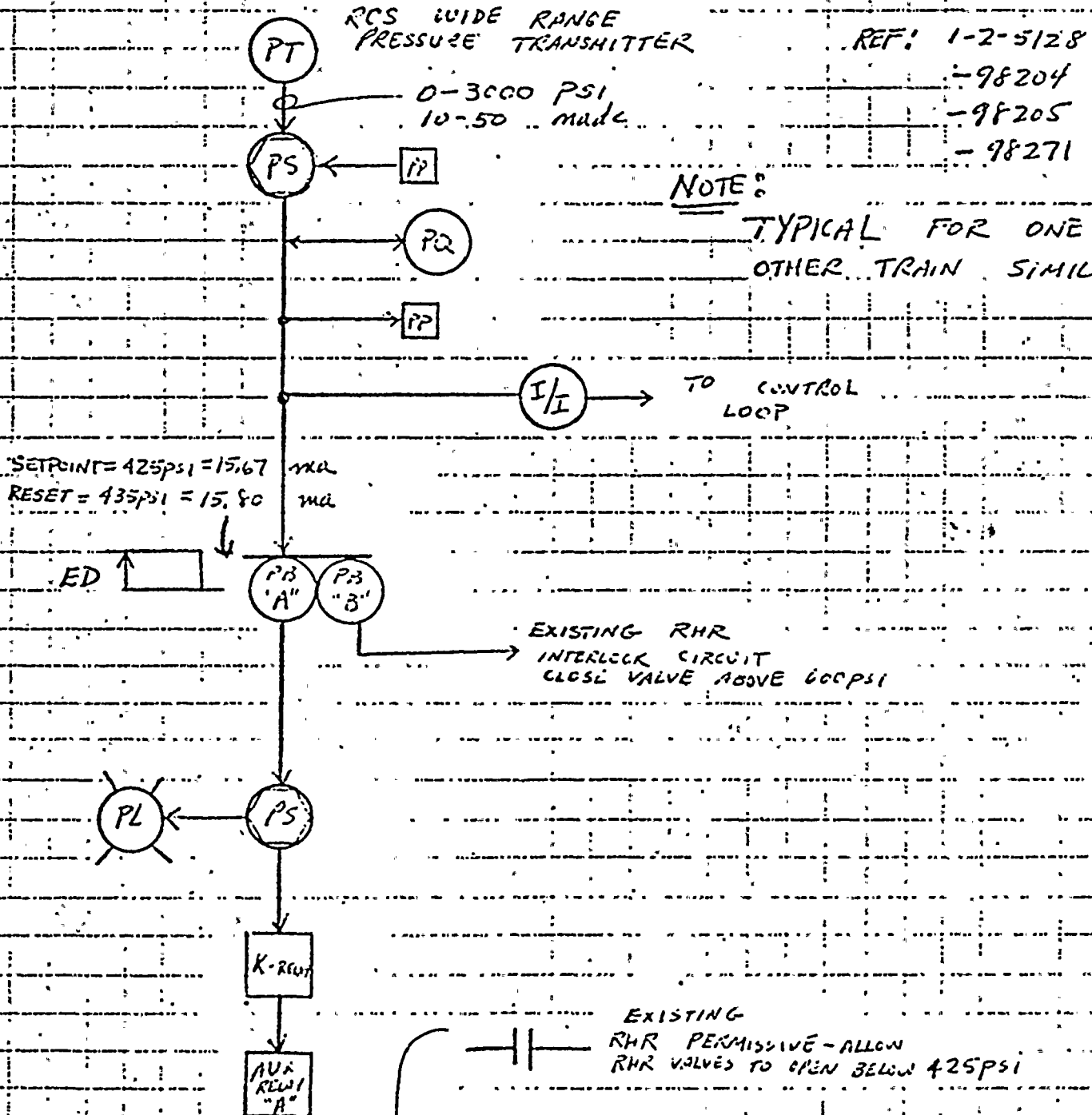


FIGURE 4

SAFETY INJECTION PUMP

SUBJECT RCS OVERPRESSURIZATIONPROPOSAL - SKETCH 1

NOTE:

TYPICAL FOR ONE TRAIN
OTHER TRAIN SIMILARSEE
SKETCH
2
 EXISTING
 RHR PERMISSIVE - ALLOW
 RHR VALVES TO OPEN BELOW 425 PSI

 RCS OVERPRESSURE PROTECTION
 BLOCKED CIRCUIT (OPERATOR WARNING)

 OPEN POWER OPERATED
 RELIEF VALVE CIRCUIT

AUX RELAY "A"

SUBJECT RCS OVERPRESSURIZATION - SKETCH 2

ENERGIZED
BELOW 425 PSI

DEENERGIZED
ABOVE 435 PSI

AUX
RELAY
"A"

BLOCKED
UNBLOCKED

MANUALLY OPERATED BLOCK SWITCH
MOUNTED ON MAIN CONTROL BOARD

NOTE:
TYPICAL FOR ONE
TRAIN. OTHER TRAIN
SIMILAR

ANNUNCIATOR TO ALERT
OPERATOR THAT SHOULD BE
IN THE UNBLOCKED MODE.
(PRESSURE IS BELOW 425 PSI)

PROTECTION
GRADE

CONTROL
GRADE

EXISTING RELIEF VALVE
OPEN CIRCUIT
(VALVE SWITCH IN AUTO)

ANNUNCIATOR ALERTING
OPERATOR THAT THE
RCS PRESSURE IS
ABOVE 435 PSI.
RELIEF VALVE OPENED

THIS SIGNAL
TO OVERRIDE EXISTING
OPEN CIRCUIT

OPEN TRAIN ORIENTED
POWER OPERATED RELIEF VALVE

