PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF: DOCKET NO: --

DAVIS BESSE INCIDENT

(INTERVIEW & MEETING)

(CLOSED)

Discuss Additional Information Request: Serial 517 letter; Flows for AWF, SUFW, Makeup, HPI, HPI/LPI Piggyback; CWD's for MSIV's, 599/608, AFP Turbine Steam Valves.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

- - -

TUESDAY, JULY 9, 1985

- - -

MEETING BETWEEN THE NRC FACT-FINDING TEAM AND TOLEDO EDISON

TO

DISCUSS ADDITIONAL INFORMATION REQUEST:

* Serial 517 Letter
* Flows for AFW, SUFW, Makeup, HPI, HPI/LPI piggyback
* CWD's for MSIV's, 599/608 AFP Turbine Steam Valves

- - -

NRC FACT-FINDING MEMBERS PRESENT:

ERNEST ROSSI
J. T. BEARD
LARRY BELL

TOLEDO EDISON MEMBERS PRESENT:

MR. DONNE
MR. JAIN
MS. MacDONALD

- - -

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P R O C E E D I N G S (11:20 a.m.)

MR. ROSSI: We have had a number of loose end kind of questions that we wanted to discuss with you that we need to know answers to to try to complete our report.

One of the first ones was a June 15th 1979 letter that went to Mr. Denton from Lowell Roe, and it had a statement in it to the effect that the ability of the steam generator to maintain pressure for auxiliary feedwater turbine operation over an extended time has been experienced and we are basically trying to find out what information is there on how long you can run or restart auxiliary feedwater pumps with stored steam in the steam generators after they go dry.

MR. JAIN: We had another letter that was sent to the NRC on June 23, 1979, Serial No. 522. I only have three copies here of that letter.

MR. BEARD: Did you say June 23?

MR. JAIN: June 23, right.

MR. ROSSI. It is a June 23 letter and ---

MR. BEARD: Ernie, may I ask that this be entered as an exhibit, whatever the number is.

MR. ROSSI: Yes. That one should go with the transcript. It is a June 23rd, 1979 letter.

(The document referred to was marked Exhibit No. 1 and submitted for the record.)

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MR. JAIN: That describes a scoping calculation, if you will, as to how much steam will be bottled up in the steam generators after they are isolated and how much steam do you really need to start the aux feed pump turbine.

What it concludes is that after the isolation you would have about 1600 pounds of dry steam and ---

MR. ROSSI: You have about what?

MR. JAIN: Sixteen hundred pounds of dry steam and you need about 275 pounds of steam to start the turbine rolling.

MR. ROSSI: Okay. Does this describe any tests that were done at any time?

MR. JAIN: It also describes on the second page I believe or at the end of the first page the transient that we had on September 24, 1977 where one generator went dry and I think it went down to 650 psi and the aux feed pump turbine was started on that steam generator as it was brought down.

MR. ROSSI: So to the best of your knowledge, this has the best information available on starting auxiliary feedwater pump turbines with dry steam generators?

MR. JAIN: To the best of my knowledge, that is the thing that is on the docket right now to support that kind of operation.

MR. ROSSI: Okay, fine. We will review that. I

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doubt if we will have any questions. We just wanted to be sure that we did indeed have the best information.

Do you guys have any questions on that, JT or Larry?

MR. BEARD: No.

MR. BELL: No.

MR. ROSSI: Now the next thing we wanted to get some clarifications on is pump capacities of various equipment that can be used to mitigate a total loss of feed, and we have some numbers that we have obtained from letters and reports that have been submitted to the NRC.

Maybe the best thing to do is just start with the various sytems and ask some questions. Please understand that what we are interested in are flows and pressures like in the steam generator if we are talking about auxiliary feedwater pumps and startup pumps and not just head flow curves of the pumps themselves. We are really interested in their ability and capability to deliver flow during conditions that might exist during the loss of all feed. So that is the kind of thing that we want.

Do you have a comment, JT?

MR. BEARD: No. You made the point I wanted to bring up.

MR. ROSSI: The first one is on the steam driven auxiliary feedwater pumps. The number we have is that the

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pumps will pump 1050 gpm at 1050 psig in the steam generator, but out of that 1050 gpm it is my understanding that 250 of it goes for recirculation flow.

Now are those numbers correct so that you get 800 gpm to the steam generators from each pump at 1050?

MR. DONNE: That is correct.

MR. BEARD: That is from which pump, the startup pump?

MR. ROSSI: No. The steam driven auxiliary feedwater pump.

MR. DONNE: At 3600 rpm.

MR. ROSSI: And that is at 1050 psig in the steam generators?

MR. DONNE: Yes.

MR. ROSSI: Could you tell us, what is the code safety valve set point of the lowest on the steam generators?

MR. DONNE: 1050.

MR. ROSSI: The code safety valve set point is 1050?

MR. DONNE: Right. The lowest two open at 1050 and then they stagger up to 1100.

MR. BEARD: Now do you have any information other than just the number or graphical form that you keep?

MR. DONNE: We have a resistance curve that was generated for us by Bechtel.

MR. BEARD: On aux feedwater?

MR. DONNE: On aux feedwater. This is the curve. This is the total flow to both steam generators. So the flow to each steam generator would be half this.

MR. BEARD: This is actual measured information here?

MR. DONNE: No. This is calcualted based upon frictional effects in the piping and stuff like that.

MR. BEARD: So it is calculated based on tests?

MR. DONNE: Based upon the pipe layout ---

MR. JAIN: And the friction losses.

MR. DONNE: Right.

MR. ROSSI: Now, JT, you have that in front of you. That should go with the transcript.

MR. BEARD: Yes, and let me just identify that there are two curves here.

MR. DONNE: One is the pump curve and the other one is the system resistance curve calculated based upon the pump curve.

MR. BEARD: We will put this in as an exhibit, whatever the next number is.

(The documents refered to were marked Exhibit No. 2 and submitted for the record.)

MR. BEARD: Now do you have any extra copies that

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we could just look at during the meeting or is that the only copy?

MR. DONNE: We have a copy here.

MR. BEARD: I mean just so we can glance at it.

MR. DONNE: I believe that is the only copy.

MR. ROSSI: Well, I am more interested in getting the information. I don't know that there is any point in talking about it unless somebody has a very specific question.

In any event, you are saying that at the safety valve set point at 1050 psig that the aux feed pumps will pump 800 gpm, each one will put in 800 gpm into the steam generator and that the other 250 gpm is recirc?

MR. DONNE: Right, and that curve should be flowed to the steam generator. So that curve does not have recirc flow in it.

MR. BEARD: Apparently this curve is for both steam generators as a composite.

MR. DONNE: Right.

MR. BEARD: Because at 1050 it shows around 1600.

MR. DONNE: Around 1600, yes, and that is what I think the "X" axis label says, flow to both steam generators. So it is assuming both pumps. So to get the flow for each steam generator you would just have to have the air flow and keep the same steam generator pressure.

MR. ROSSI: Now the next question that we had was a similar one on the startup feedwater pump. What is its capacity at 1050 psig, which is the steam generator safety valve set point?

MR. DONNE: The only information I was able to find in our files, and I haven't had real time to go in and do a detailed look, was that B&W did a report for us, this report on the startup feed pump and the PORV and the makeup pumps as to what we would need for a complete loss of feedwater, of aux feedwater.

MR. ROSSI: Now is that the document that you gave us earlier that was a graph?

MR. DONNE: It is a June 22nd 1981 document?

MR. ROSSI: Yes, June 22nd, 1981 entitled "Engineering Summary Report Of A Complete Loss Of Feedwater Transient Analysis For Davis-Besse."

MR. DONNE: Right. There are three tables in there, Table 32, 33 and 34, and they give flow versus back pressure curves for a one-makeup pump operational and two makeup pumps operational and a startup feed pump operational.

MR. ROSSI: Okay. So that has the information for the makeup pumps ---

MR. DONNE: And the startup feed pump. We are in the process of basically going through to try and reconfirm

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those numbers since they were generated back in '81 and no one downtown is very familiar to all the input that went into those calculations. But there was some transmittal of information from us to the B&W about fractional losses in the system. And I believe B&W then probably calculated the system curve. So we are going to try and check these to make sure that these are reasonable.

MR. BEARD: Could I ask you a question about the report you referred to?

MR. DONNE: Yes.

MR. BEARD: Maybe this is not the right forum.

MR. DONNE: I may not be able to answer it.

MR. BEARD: When we were given that report, it was marked draft, et cetera, et cetera, and I guess I am unclear as to what its status is as far as for within your company goes.

MR. JAIN: Let me comment on that, JT. That report per se was never submitted to the NRC on our docket. However, parts of the results of that report were submitted to the NRC sometime in June or July of 1979 after TMI. We had asked B&W to summarize whatever they had in their files for a complete loss of feedwater analysis. So the 1981 report was just a summary, an engineering summary of all the efforts that they had done.

At the time that that was given to Wayne Schiffer,

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two or three weeks ago, there was some confusion in people's minds here as well as B&W as to whether all the things in there were kosher or not. Because of that, we put a note in there is it preliminary.

We are doing several other analyses right now, B&W is doing it, which might further validate some or more of those things in there.

MR. ROSSI: Okay. But the information that we have right now on the consequences of a total loss of feed with various systems in operation are basically that B&W report, which is apparently the most complete.

There is the EBS report that was done in December of 1981.

MR. JAIN: That doesn't relate to a complete loss of feedwater analysis.

MR. ROSSI: Well, it has got some information in there on the fact that availability of the main feedwater startup pump flow combined with a primary coolant makeup flow for one makeup pump is sufficient to handle. It does have those statements in there and that is formally on the docket or the dockets.

MR. JAIN: Also you have the June 15, 1979 letter.

MR. ROSSI: Yes. We have the June 15, 1979 letter which basically just gives two of the pieces of information that were later summarized in the B&W report, and that is

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basically everything that we think we have got from you on the consequeces of the loss of main feedwater.

Is there something else that we ought to know about or be given now?

MR. JAIN: Yes. I think there is also a Volume 3 or the Blue Book, as you call it. I am pretty sure that was submitted on the docket sometime in May or June of '79, and that essentially talked about -- it didn't talk about startup makeup PORV, but it talked about how long did you have before you could start aux feed pumps.

MR. BEARD: What do you mean when you refer to the Blue Book? Can you give me a better title?

MR. JAIN: We call it the Blue Book because it was blue, but there was an analysis.

MR. BELL: That book is referred to in this letter of June the 23rd, right?

MR. JAIN: Correct. That is exactly right.

MR. BEARD: Could you just read the title then?

MR. JAIN: Okay. It says Volume 3 of the Evaluation of Transient Behavior and Small Reactor Coolant System Breaks in the 177 Fuel Assembly Plant.

MR. ROSSI: I believe we have that, too. But my recollection of that is that it didn't have as much information in it as the other three reports.

MR. JAIN: Correct.

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MR. ROSSI: I mean it didn't have anything really more that added to the other reports.

MR. JAIN: That is true.

MR. ROSSI: Okay. So we have got the best information on the makeup pumps, and this is the primary coolant makeup pumps, for one pump and for two pumps.

We have got your best information on the startup pump, and those come out of the B&W report. We have that.

MR. DONNE: We have that.

MR. ROSSI: And we have now verified what we understood about the aux feed pump flow and pressure. Now the high pressure injection pumps, the safety related high pressure injection pumps, we have for those that they have a shutoff head without being piggybacked of 1630 psig, that that is basically the shutoff head when they are not piggybacked, and when they are piggybacked, they are 1830 psig.

MR. DONNE: That is about correct. Bechtel went back and did a system resistance curve for the HPI back in May of 1979, and they did it for both lines using the tested pump curves for both pumps. There is some slight difference in the tested characteristics of the head curve for the two HPI pumps that were tested. The 1630 is the one with the lowest head, which is high pressure injection pump No. 1.

MR. ROSSI: How much higher is the other one?

MR. DONNE: It looks like it is about 50 to 60 psi

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system. For 1000 gpm using the decay heat system, which is I think 8 or 10-inch piping, the frictional effects were probably very minimal.

MR. BELL: But that suction piping from the LPI pump discharge to the HPI sunction would have to -- you would have to take into account the frictional effect of air.

MR. DONNE: We basically said that would be a wash between the suction piping where the HPI normally takes off to the pump suction, and those would be comparable.

MR. BELL: Of equal value.

MR. DONNE: Yes.

MR. BEARD: So what you are saying is, if I understand you correctly, and let me make sure that I do, this is your company's best estimate to date.

MR. DONNE: Yes.

MR. BEARD: Can you just read the numbers of the shutoff heads?

MR. DONNE: Okay. For pump No. 1, for HPI injection it shows around 16 ---

MR. BEARD: No. I mean for piggyback.

MR. DONNE: Okay. 1830.

MR. ROSSI: That is for the lowest head pump?

MR. DONNE: The lowest head pump, yes. The second pump where we have a slightly higher HPI shutoff head, the piggyback goes up to around 1890. The shutoff head in

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piggyback would be around 1890.

MR. ROSSI: Are you people fairly familiar with the feed and bleed mode of operation?

MR. BEARD: Wait just a second, Ernie. Can we get this entered as an exhibit.

(The Pump Flow Charts referred to were marked Exhibit No. 3 and submitted for the record.)

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higher. So it is a combination of probably the frictional effects of those differences in the pump curves.

MR. BEARD: So what did your curve indicate the shutoff point for the other curve was?

MR. JAIN: 1708.

MR. DONNE: It was 1700.

MR. BEARD: 1708?

MR. DONNE: Right.

MR. ROSSI: I gather that you have curves that we can put in our transcript?

MR. DONNE: Yes.

MR. ROSSI: How about for piggyback operation, do they have similar information for piggyback operation?

MR. DONNE: They didn't have it, but yesterday we went in and basically superinposed upon the HPI pump the head developed by the decay heat pumps. And over the 0 to 1000 gpm programs, the head developed at the decay heat pumps is pretty flat. So it is basically a constant Delta P, and we superimposed that Delta P on the HPI curves that Bechtel generated.

MR. ROSSI: And those are all with system frictional losses and so forth also?

MR. DONNE: For the decay heat we didn't go in and include any decay heat in the LPI portion of the piping. So the fractional effects would be whatever was in the HPI

MR. ROSSI: Let's see. Do you have anything else that we ought to have. We are going to probably try to do calculations within the NRC.

I don't know how quickly they are going to get done, but there are a number of efforts underway to calculate feed and bleed and that kind of thing within the NRC to see what the consequences are.

Is there any other information that you have that would be useful in that effort that we haven't thought of?

MR. DONNE: Well, the only -- we have B&W basically going through and doing similar type calculations now. Right now they are analyzing the 6/9 event.

Eventually they may be made -- tell them to go ahead and just do a hundred percent power case. They haven't started that yet, but they are basically prepared to do that.

We don't have any of the results back from the 6/9 event yet, but we expect them some time this week. Preliminary results from B&W.

The only thing that we discovered in talking to them that may affect the analysis, and B&W has talked to Bob Jones at the NRC about this, and he is aware of it, is that the PORV capacity is actually graded on the old graded capacity based upon the EPRI test results.

EPRI tested the PORV -- they tested the North Anna PORV, just a small bore diameter, and it ran for around 2500 psia. They were measuring steam blow down around 150 to 160 thousand pounds.

With our larger bore diameter, our estimate is at around 2,500 psia we should be able to pass around 200,000 pounds, and that number is being used by B&W in their analysis and it has been passed to Bob Jones at NRC.

That's only other thing that I am aware of that may affect any feed and bleed analysis upon them.

MR. ROSSI: What is the code safety valve set point on the parameter side?

MR. DONNE: It is 2,500 psig --

MR. ROSSI: 2,500 psig.

MR. DONNE: That is right.

MR. BEARD: The PORV set point I believe is 2425.

MR. DONNE: 2,400.

MR. JAIN: We could verify that.

MR. BEARD: The numbers we were given earlier, if I remember them correctly, was 2425 to open, 2375 to close.

MR. DONNE: Sounds good.

MR. BEARD: So that the discharge would be a little bit greater than that number.

MR. DONNE: The discharge would be a little bit lower. What they were doing is they were using that to calculate the flow area.

MR. BELL : These other documents that you have showed us concerning a loss of feed water event address the startup pump and the makeup pump.

However, your procedure directs the operators to enter the PORV cooling mode using makeup pumps and the high pressure injection pumps, and we asked for analyses that showed the flows, and whether or not that mode of cooling would be adequate.

Is that the analysis that B&W is working on, or do you have --

MR. DONNE: The B&W analysis has the -- is assuming that the HPI would be put in piggyback at 30 minutes into the event.

Now, depending upon what the system pressure is, it would depend upon whether we can get any benefit out of it.

MR. ROSSI: I would think that that would do you no good if you got it at 30 minutes. I mean even from --

MR. DONNE: That was our feeling that it doesn't really matter because we are not going to get down to that pressure fast enough really to get any benefit out of it.

MR. BELL: Until and if the high pressure injection pumps -- excuse me, the makeup pumps -- turn temps.

MR. DONNE: Right. Turn the pressure down when they catch up to decay heat and start depressuring and eventually on the way down we would pick up the piggy-back -- HPI in pippyback.

The analysis they are doing, we don't really expect to see piggyback come into play until, for all practical purposes, the transient is over.

MR. ROSSI: Okay. We had a question of what was done with the makeup flow, flow control valve, during the event.

Do you people know the answer to that, or is that going to be somebody else?

MR. JAIN: I would rather defer that.

MR. ROSSI: You want to defer that.

MR. HELLE: Can I ask a question about the procedures? Do the procedures address the makeup flow control valve? If I go to Section 6 on overheating --

MR. JAIN: I know what you are talking about. I am not too sure what exactly it tells him to do.

MR. BEARD: The reason I am curious is that that and piggyback are both some place in the procedures. But I didn't find anything, if I remember correctly, that in

Section 6 itself brings that up.

And so it would be somewhat contingent upon the operator tying this all together, so to speak. If you follow what I am trying to say.

MR. JAIN: Yes, I exactly follow you.

MR. BELL: You are saying that he has to tie together specific rules 1 and 2 in Section 6, which directs him to initiate those modes of cooling for those specific coolants?

MR. BEARD: I know that specific Rule 2 deals with piggyback. It basically says except for one exception he is allowed to piggyback whenever he wants to, and specific rule -- I don't know which one it is, talks about the makeup valve as one of the four or five subparts. And I am trying to understand whether the operator really could be expected to tie that little facet with this, and come up with exactly the best combination for a particular event.

And it is not obvious that he would.

MR. JAIN: May I suggest that we have the person who wrote the procedure here who could answer that.

MR. BEARD: That is fine.

MR. ROSSI: Okay. I am looking -- I think we have covered -- the serial 517 letter, I guess, is this question on turbine driven auxiliary feedwater. We have covered that. We have covered the flows. Let me ask you a

question.

The flows that you are giving us, does Bob Jones have those, do you know?

MR. JAIN: He has been talking to Bert Dunn , who is the ECCS person .

MR. DONNE: I believe he has makeup flows and the startup feed pump flows.

MR. ROSSI: Okay, fine. So, those will be going into the calculations.

MR. DONNE: He has been, like Sushil said, been talking to Bert Dunn at B&W, and I believe Bert has passed that information on.

MR. ROSSI: Okay. Then the next item on the agenda was the drawings for the MSIVs, 599 608 and the auxiliary feed pump turbine steam valves.

MR. BEARD: Could I ask an administrative question? On the agenda that you folks prepared here, it says CWDs. What does that stand for?

MR. JAIN: Control wiring diagrams.

MR. BEARD: Are those the drawings that you gave me earlier?

MR. JAIN: Yes.

MR. BEARD: Okay. So, I think we ought to just acknowledge that we received them, and obviously have not reviewed them yet, and we will discuss them later.

MR. ROSSI: Okay. Then, are we to a point now where we want to close this meeting, and we will reconvene when you two fellows have reviewed each others things?

Did you have anything else that you wanted to bring up?

MR. DONNE: No.

MR. JAIN: I thought you were suggesting to me this afternoon on the action plans for the SFRCS?

MR. ROSSI: Right. We can discuss it at that time.

MR. BEARD: And I think we were going to do both of them jointly.

MR. ROSSI: Okay. Then why don't we adjourn for now, and we will reconvene at 1:00 for the afternoon session.

(Off the record discussion ensues.)

MR. ROSSI: We are back on the record because there has been some questions raised about the trouble shooting action plan on steam and feedwater rupture control system trip/MSIV closure, and we would just like to clarify that yesterday the NRC had -- we received this plan over the weekend, and we did review it and felt that there was no need to hold any further meetings on it.

So, we want to clarify that that plan is, as far as we are concerned, they are ready to proceed with it. They can proceed with it, and the meeting this afternoon is only

going to cover the operation of the steam and feedwater rupture control system.

The remaining questions that we want to talk about after people have looked at drawings and sketches that have been interchanged this morning.

Okay. We will reconvene at 1:00 p.m.

(Whereupon, the meeting concluded at 12:02 p.m., this same day.)

* * * * * * * * * * *

7/9/85 EXHIBIT #1

TOLEDO EDISON

LOWELL E. ROE
Vice President
Facilities Development
(419) 259-5242

Files: 0017; 0028

Docket No. 50-346
License No. NPF-3
Serial No. 522
June 23, 1979

Director of Nuclear Reactor Regulation
Attention: Mr. Robert N. Reid, Chief
Operating Reactors Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Reid:

This letter transmits the following information requested by G. R. Mazetis:

1) An analysis on the capability of a dry and isolated steam generator to start an auxiliary feedwater pump 30 minutes after the loss of all main and auxiliary feedwater.

2) The test results for anticipatory reactor trip system.

Yours very truly,

Lowell E. Roe

w/Attach. 1

LER:FRM

Attachment

BCC:
P. M. Smart, Esq. ,w/o
G. Charnoff, Esq., w/Attach. 1
D. H. Hauser, Esq., w/o
W. A. Johnson, w/o
T. D. Murray, w/Attach.1
J. G. Evans, w/Attach. 1
J. S. Grant/R. P. Crouse, w/o
J. D. Lenardson, w/o
C. T. Daft, w/o
T. J. Myers, w/Attach. 1
E. C. Novak, w/Attach. 1
C. R. Domeck, w/o
W. C. Rowles, w/o
R. Rosenthal, w/o
M. Malcom, w/o
A. H. Lazar, w/o
R. E. Lapp, w/o
C. M. Rice, w/o
W. E. Nyer, w/o

J. R. Dyer, w/o
A. Smart, Det. Edison,w/o
B&W Owners Group, w/o
CNRB Members, w/o

Docket No. 50-346
License No. NPF-3
Serial No. 522
June 23, 1979

Attachment 1

Question 1

Discuss the ability of the secondary system to support AFW steam turbine operation at 20 minutes after loss of feedwater to the generator.

Response

Davis-Besse Nuclear Power Station Unit 1 (DB-1) is designed to redundantly isolate each steam generator (SG) upon initiation of SFRCS. The steam generators are not cross-connected on either the feed or steam system side when isolated. In any loss of feedwater condition, SFRCS isolates the steam generators and starts the auxiliary feedwater (AFW) steam turbines to provide auxiliary feedwater flow to the generators within 40 seconds. If for some reason one or both redundant safety grade AFW trains do not initiate for thirty minutes there will be adequate pressure to start the pumps.

This is illustrated by both calculation and experience at DB-1. The sequence of events would be as follows:

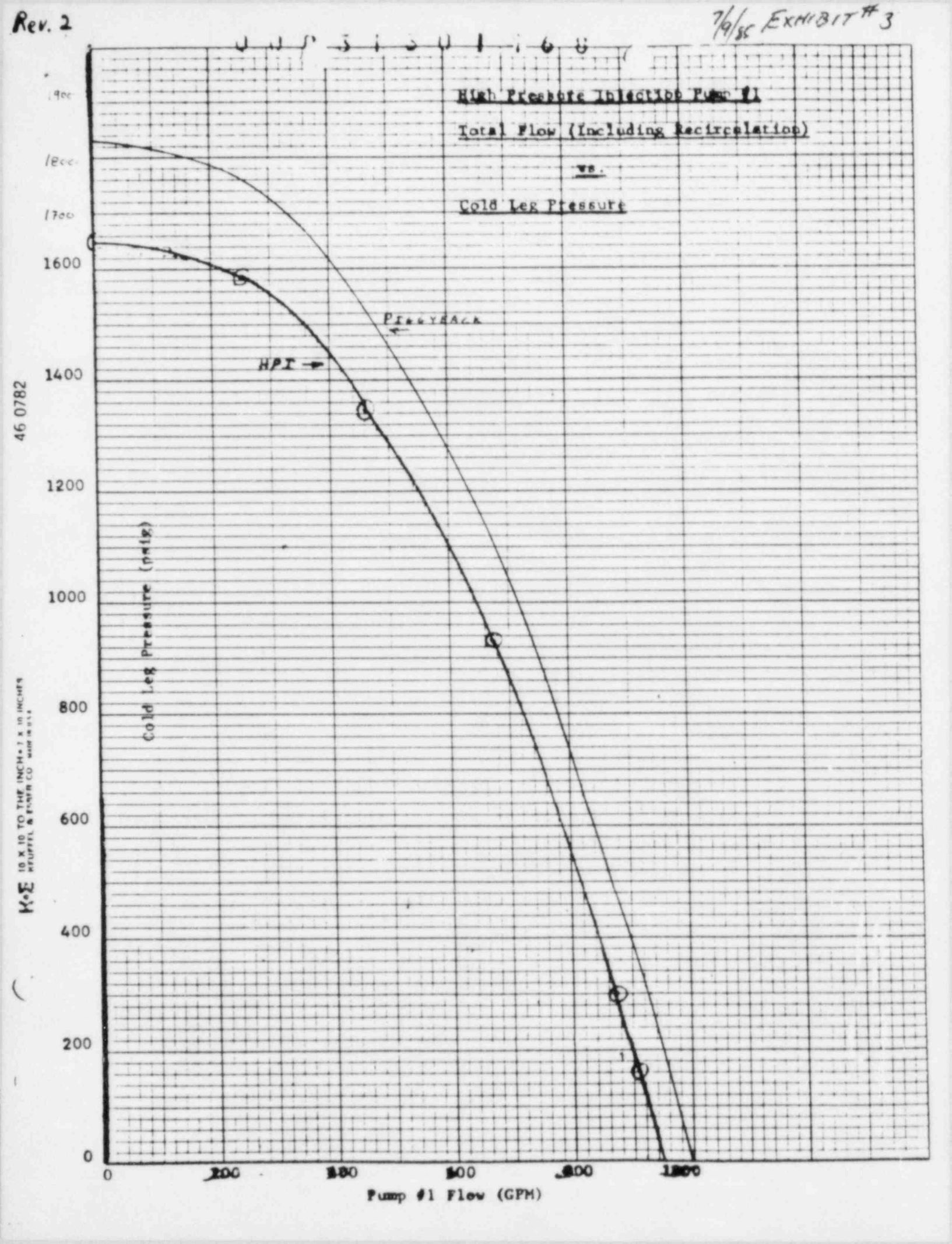
a) LOFW
b) Reactor trip
c) SFRCS - isolated steam generators (assume no AFW initiation)
d) Decay heat removal due to primary to secondary heat transfer to steam generator inventory, boiling off the inventory to atmosphere via main steam safety valves. Secondary system pressure 1050 psig $\approx 550^{\circ}$F.
e) As soon as the generator inventory boils off from a reactor trip at any previous power level, decay heat removal to that generator is lost. If both generators are dry, all decay heat is removed via the boil-off of the primary system through the PORV, pressurizer code safety valves and/or break. This has been analyzed in Volume III of the "Evaluation of Transient Behavior and Small Reactor Coolant System Breaks in the 177 Fuel Assembly Plant", dated May 16, 1979. This will let pressure fall to main steam safety reseat setpoint and isolate all dry steam loss from the steam generator. With this total SG isolation the steam generator should be at approximately 1000 psig and will remain pressurized indefinitely. During this time, the dry superheated steam in the steam generators will be at primary system temperature and there will be no heat transfer through the steam generator. There will be 3412 Cu.Ft. ($\approx$1600 lb.) of dry superheated steam in the SG at 1000 psig available to start the AFW pumps. At a full rated flow, the AFW turbine conservatively requires 33,000 lb./hr. steam flow. The turbine starts in 30 seconds after steam inlet valves start to open which means that it will require about 275 lbs. of steam to start and bring the AFW pump up to full speed at full rated flow against full steam generator pressure.

   As a bounding argument to this case, DB-1 has had one event in which a steam generator did not receive AFW when actuated on September 24, 1977.

During this event one AFW pump was running at 2600 rpm while the SG was dry. During this condition the SG pressure reduced to about 650 psig in 16 minutes. At that time the operator manually increased the AFW pump speed and the SG pressure immediately increased, due to the introduction of AFW to the SG. Additional details are found in the Supplement to the September 24, 1977 Licensee Event Report dated November 14, 1977.

Rev. 2

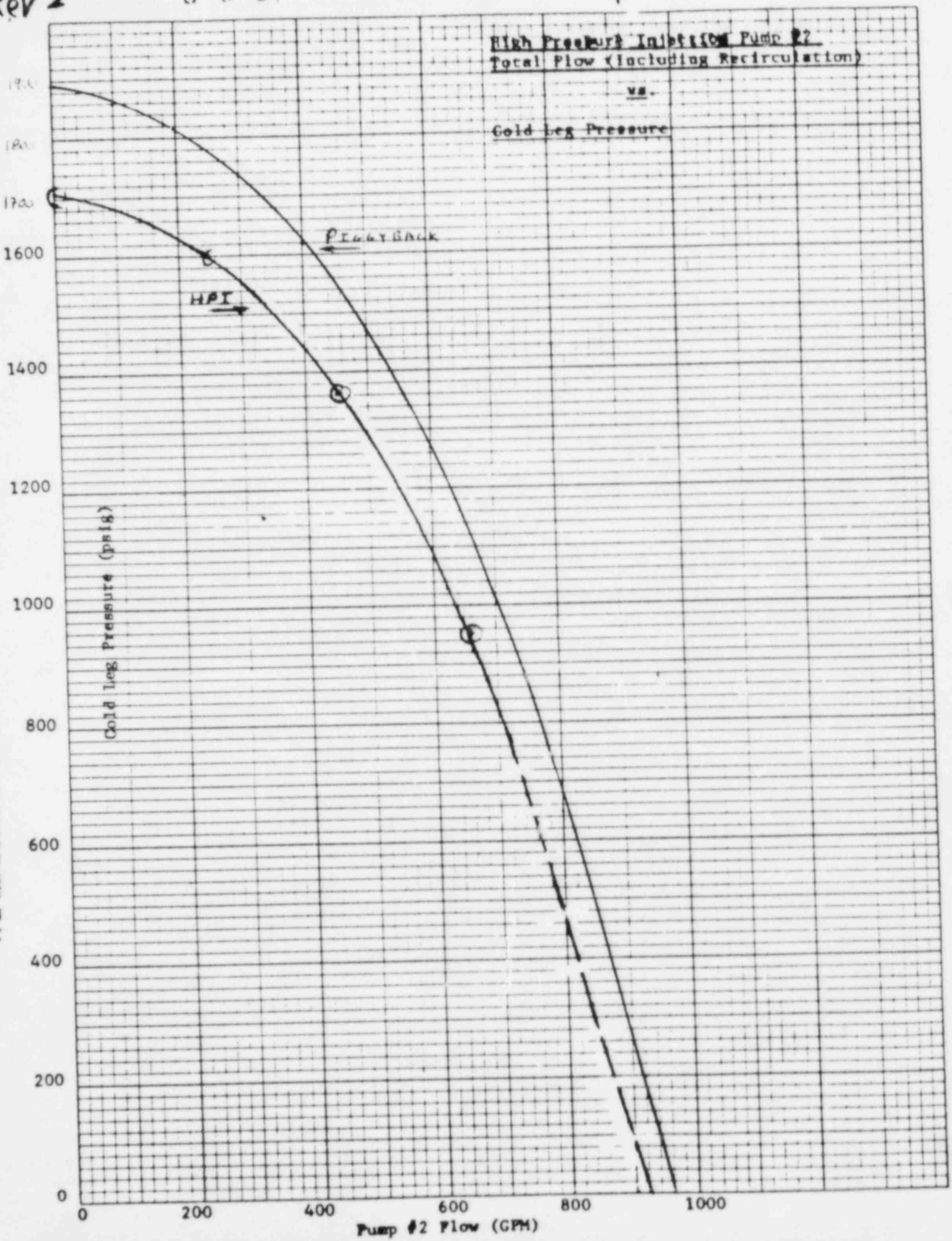
7/9/85 EXHIBIT # 3



46 0782

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Rev 2



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K•E 10 X 10 TO THE INCH 5 X 10 INCHES KEUFFEL & ESSER CO MADE IN U.S.A.

File

0 0 0 3 1 5 0 3 8 9 8

B&W LYNCHBURG FOR TOLEDO EDISON, U.S.A.

HPI PUMP

B&W pumps

Babcock & Wilcox Canada Ltd.

PUMP PERFORMANCE CHART

CURVE 7134.5003
SPEED 3570 RPM
DATE 12/19/1972
SERIAL 86920
TRIM 9.250 IN.
TEST NO. 12-30

CURVES SHOW APPROXIMATE CHARACTERISTICS WHEN PUMPING CLEAR COLD WATER UNLESS OTHERWISE SPECIFIED

PUMP BMDS 4x6x9 - 11 STG. IMPELLER 304205

CERTIFIED TEST CURVE

TEST ENGINEER

TEST WITNESSED BY Mr. J. Decker B&W Lynchburg

RECEIVED
JAN 9 1973
MECH. ENG. DIV.

EXHIBIT H

BHP

HEAD - FEET

EFF %

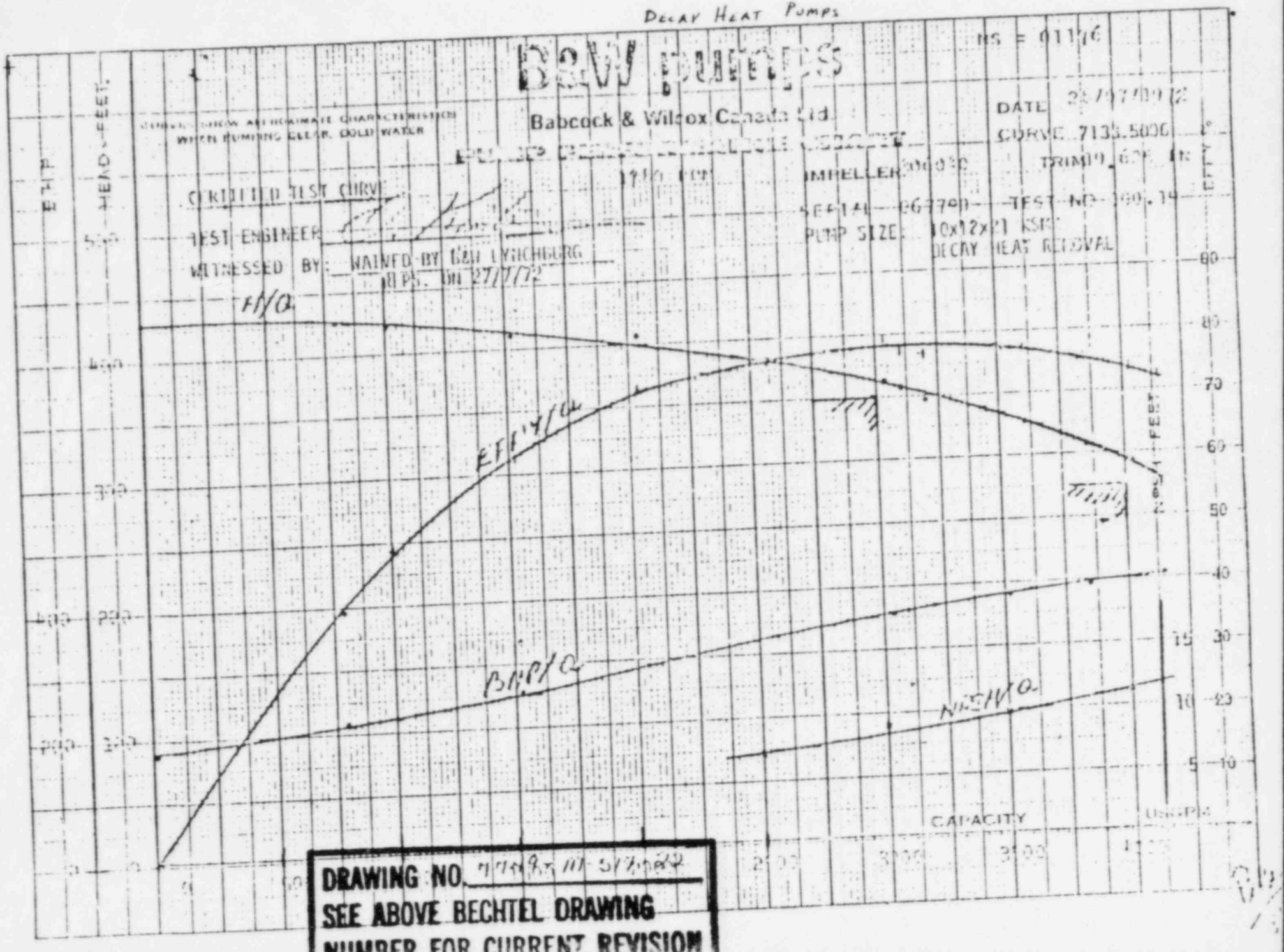
NPSH

CAPACITY USGPM

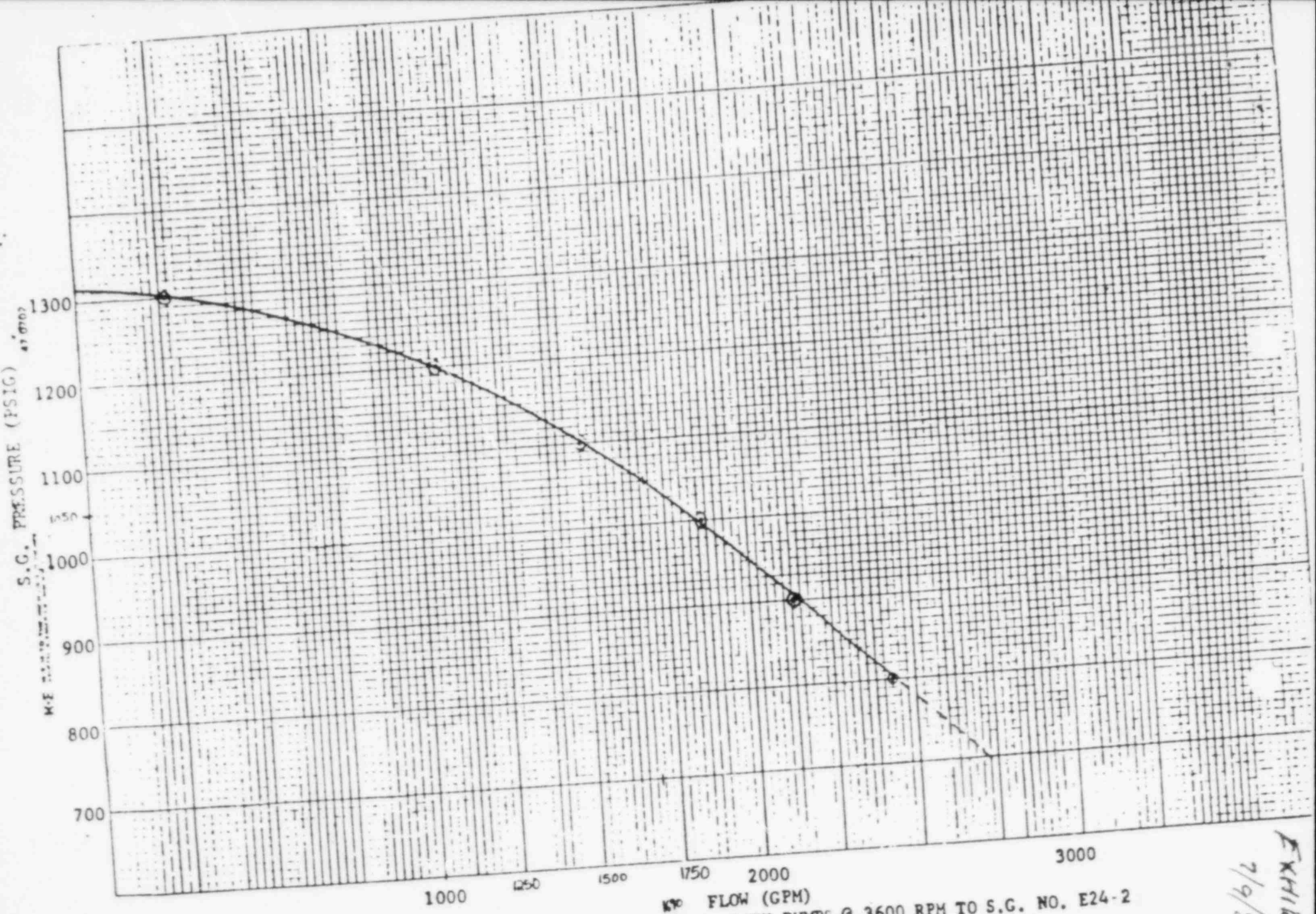
0 100 200 300 400 500 600 700 800

10 20 30 40 50 60 70 80 90

DECAY HEAT PUMPS



DRAWING NO. 7135.5000-111-51-0002
SEE ABOVE BECHTEL DRAWING
NUMBER FOR CURRENT REVISION

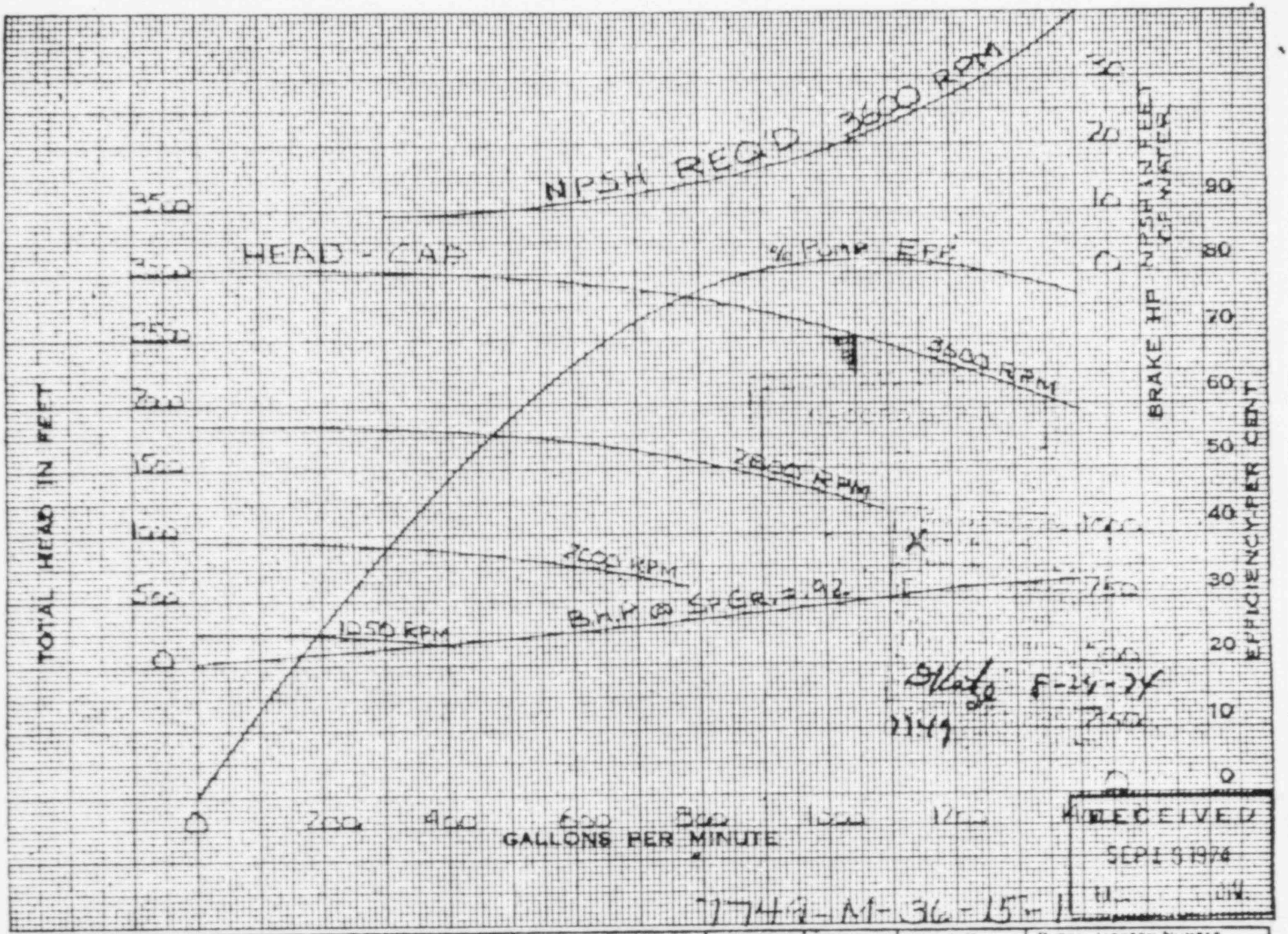


AFW FLOW TO S.G. VS S.G. PRESSURE--BOTH PUMPS @ 3600 RPM TO S.G. NO. E24-2

EXHIBIT 2
2/9/95

Attachment to Letter BT-13091

BYRON JACKSON



7736-X-22

PUMP SIZE AND TYPE	RPM NOTED ABOVE	CUSTOMER NO.	IMPELLER NO.	BASED ON	DATE	BYRON JACKSON NUMBER
4x6x9D 7 STG DVMX		RICHTO 7749	AV-5V	T-32593	1-26-73	PC 31791
		G.S.	BRANCH NO. CLEVELAND	DATA BY L.H	DRAWN BY K.K	

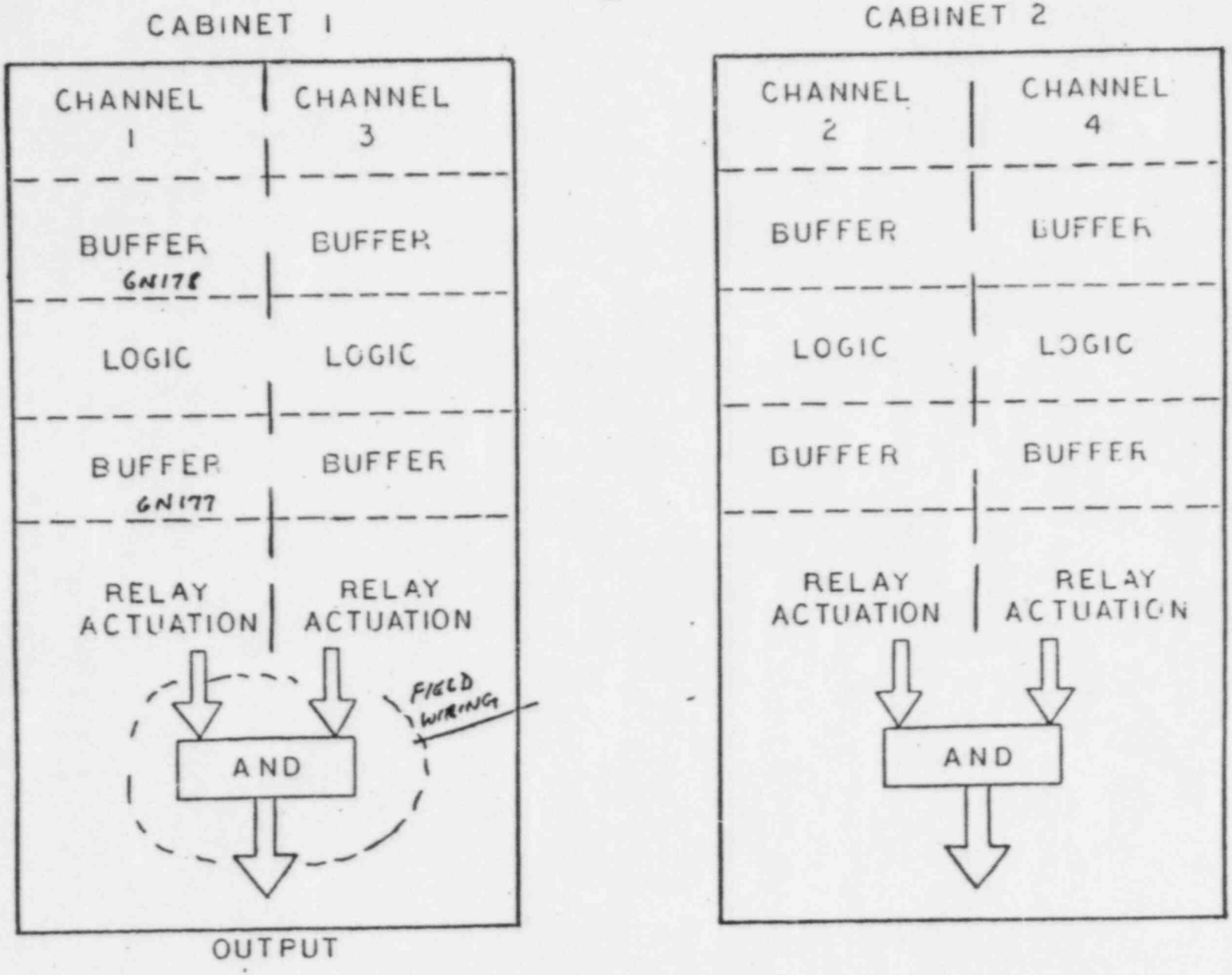


FIGURE I.

ANNUNCIATION CIRCUITRY

GN41 = S/G LEVEL INSTRUMENTS

4 trains

Table 1: SFRCS EQUIPMENT ACTUATION
(SHEET 1 OF 2)
ACTUATION CHANNEL 1 } similar to p. 2
FULL TRIPS

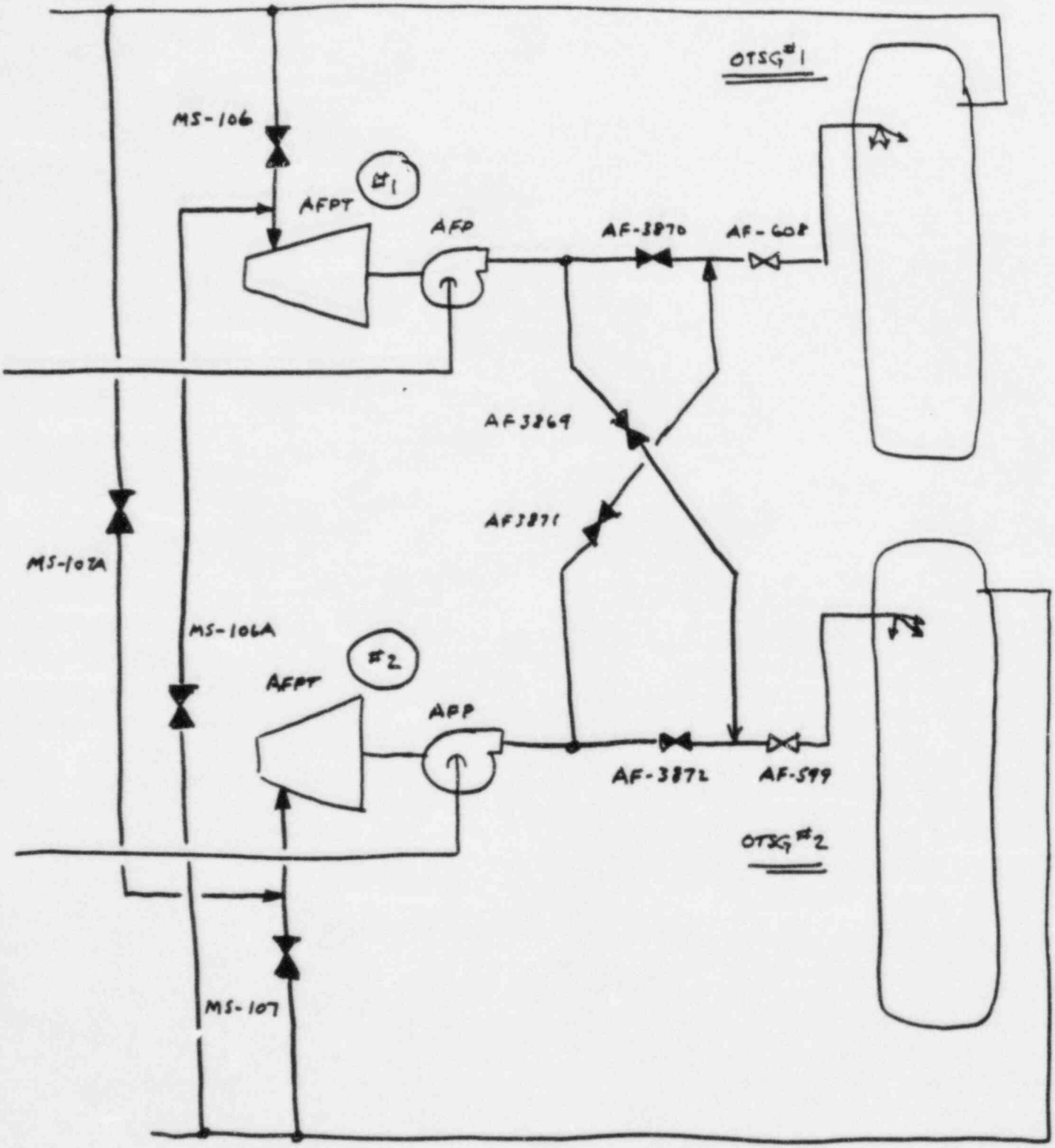
Steam Line 1 Low Pressure (Over-Riding Action)	SG Low/High Level Reverse FW to SG dP Steam Line 2 Low Press	Loss of Four RCPs Only
Check Closed:	Check Closed:	Check Closed:
ICS-11B AVV #1	ICS-11B AVV #1	AG-3869 AFP #1 Disch to SG #2
MS-101-1 MSIV BYPASS #1	MS-101-1 MSIV BYPASS #1	*MS-106A #2 MS to AFPT #1
MS-394 MS DRAIN #1	MS-394 MS DRAIN #1	Check Open:
	MS-611 SG DRAIN #1	
SP-7B SU FW CONT VLV #1	SP-7B SU FW CONT VLV #1	MS-106 #1 MS to AFPT #1
MS-106 #1 MS to AFPT #1		AF-3870 AFP #1 DISCH to SG #1
	MS-101 MSIV #1	
	MS-100 MSIV #2	
AF-3870 AFP #1 DISCH to SG #1	AF-3869 AFP #1 DISCH to SG #2	Steam Line Low Pressure SG Low/High Level Reverse FW to SG dP
FW-780 NFW BLK VLV #1	FW-780 MFW BLK VLV #1	
SP-6A MFW BLK VLV #2	SP-6A MFW CONT VLV #2	Check Closed:
AF-608 AFW #1 DISCH to SG #1		ICS-11B AVV #1 MS-101-1 MSIV BYPASS #1 MS-394 MS DRAIN #1 MS-611 SG DRAIN #1
AF-3869 AFP #1 DISCH to SG #2		
Check Open:	Check Open:	
MS-106A #2 MS to AFPT #1	MS-106 #1 MS to AFPT #1	
AF-3869 AFP #1 DISCH to SG #2		
	AF-3870 AFP #1 DISCH to SG #1 AF-608 AFW #1 DISCH to SG #1	
CHECK TRIPPED:	CHECK TRIPPED:	
Main Turbine	Main Turbine	
Reactor (via ARTS)	Reactor (via ARTS)	

Table 1: AFRCS EQUIPMENT ACTUATION
(SHEET 2 OF 2)

ACTUATION CHANNEL 2

FULL TRIPS

Steam Line 1 Low Pressure (Over-Riding Action)	SG Low/High Level Reverse FW to SG dP Steam Line 2 Low Press	Loss of Four RCPs Only
Check Closed:	Checlk Closed:	Check Closed:
ICS-11A AVV #2	ICS-11A AVV #2	AF-3871 AFP #2 DISCH TO SG #1
MS-100-1 MSIV BYPASS #2	MS-100-1 MSIV BYPASS #2	*MS-107A #1 MS to AFPT #2
MS-375 MS DRAIN #2	MS-375 MS DRAIN #2	Check Open:
	MS-603 SG Drain #2	
P-7A SU FW CONT VLV #2	SP-7a SU FW CONT VLV #2	AF-599 AFP #2 DISCH to SG #2
FW-601 MFW STOP VLV #2	FW-601 MFW STOP VLV #2	MS-107 #2 MS to AFPT #2
	*MS-107A #1 MS to AFPT #2	
MS-107 #2 MS to AFPT #2		AF-3872 AFP #2 DISCH to SG #2
MS-101 MSIV #1	MS-101 MSIV #1	
MS-100 MSIV #2	MS-100 MSIV #2	Half Trip
AF-3872 AFP #2 DISCH to SG #2	AF-3871 AFP #2 DISCH to SG #1	Steam Line Low Pressure SG Low/High Level Reverse FW to SG dP
FW-779 MFW BLK VLV #1	FW-779 MFW CONT VLV #2	Check Closed:
SP-6B MFW CONT VLV #1	SP-6B MFW CONT VLV #1	ICS-11A AVV #2 MS-100-1 MSIV BYPASS #2 MS-375 MS DRAIN #2 MS-603 SG DRAIN #2
Check Open:	Check Open:	
MS-107A #1 MS to AFPT #2	MS-107 #2 MS to AFPT #2	
AF-3871 AFP #2 DISCH #1	AF-3872 AFP #2 DISCH to SG #2	
	AF-599 AFW #2 DISCH to SG #2	*If open at the time of the trip, valve must be manually closed.
Check Tripped:	Check Tripped:	
Main Turbine	Main Turbine	
ACTOR (via ARTS)	REACTOR (via ARTS)	


OTSG #1
MS-106
#1
AFPT
AFD
AF-3870
AF-608
AF3869
AF3871
MS-102A
MS-106A
#2
AFPT
AFP
AF-3872
AF-599
OTSG #2
MS-107

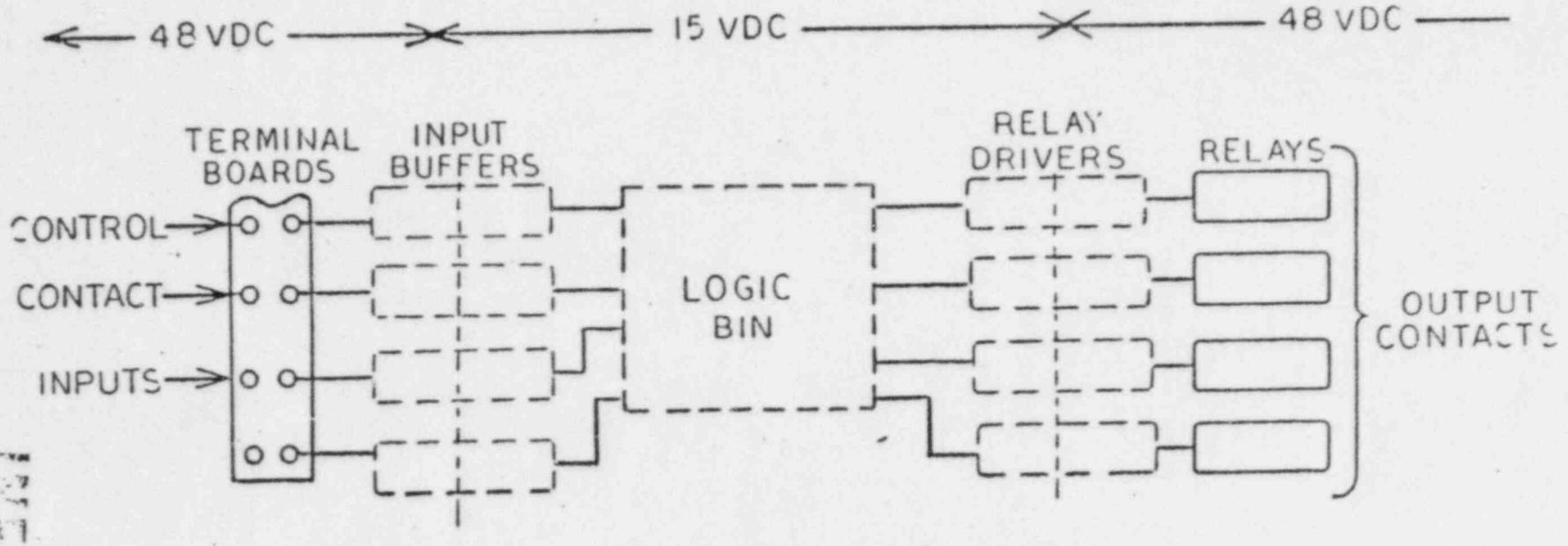
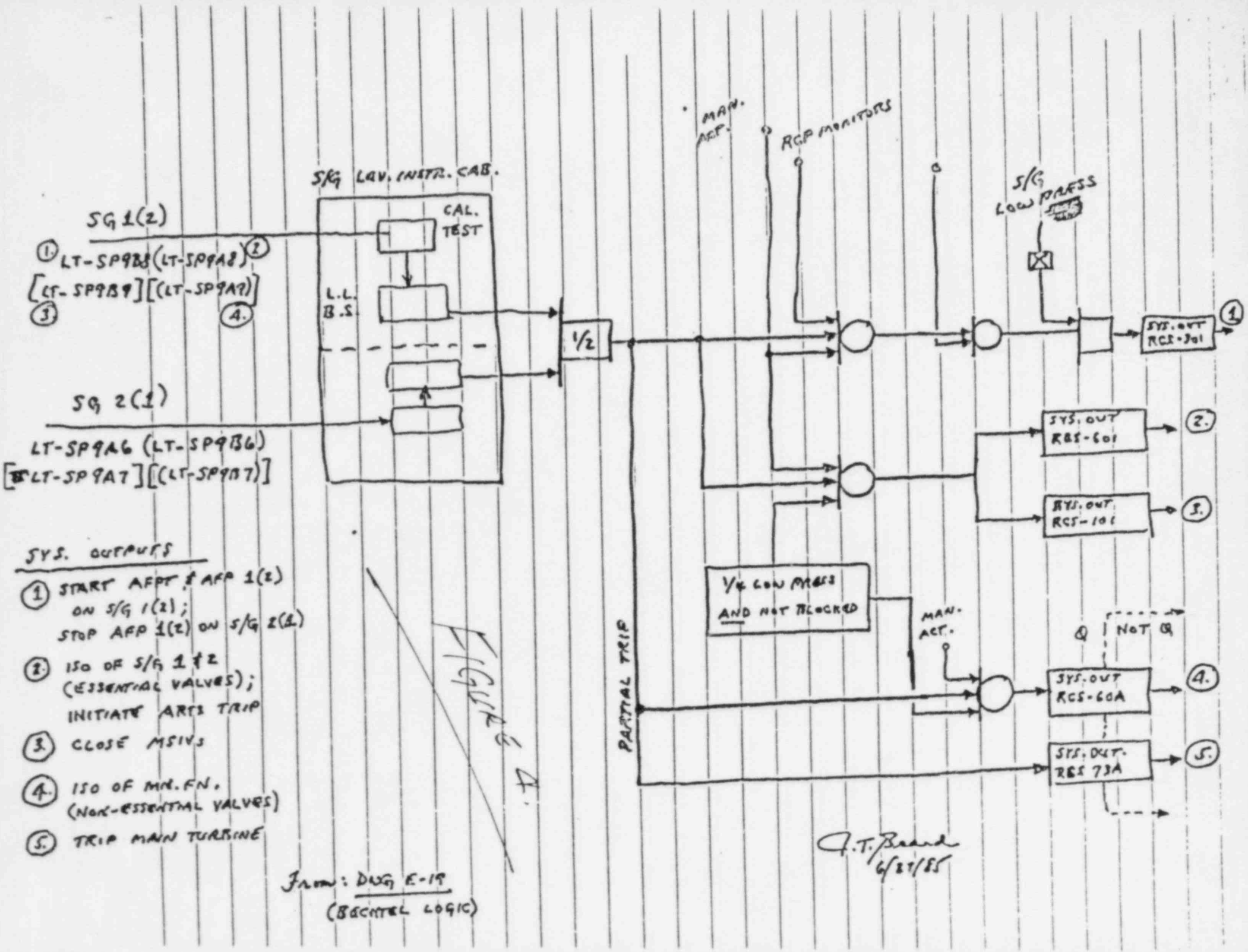
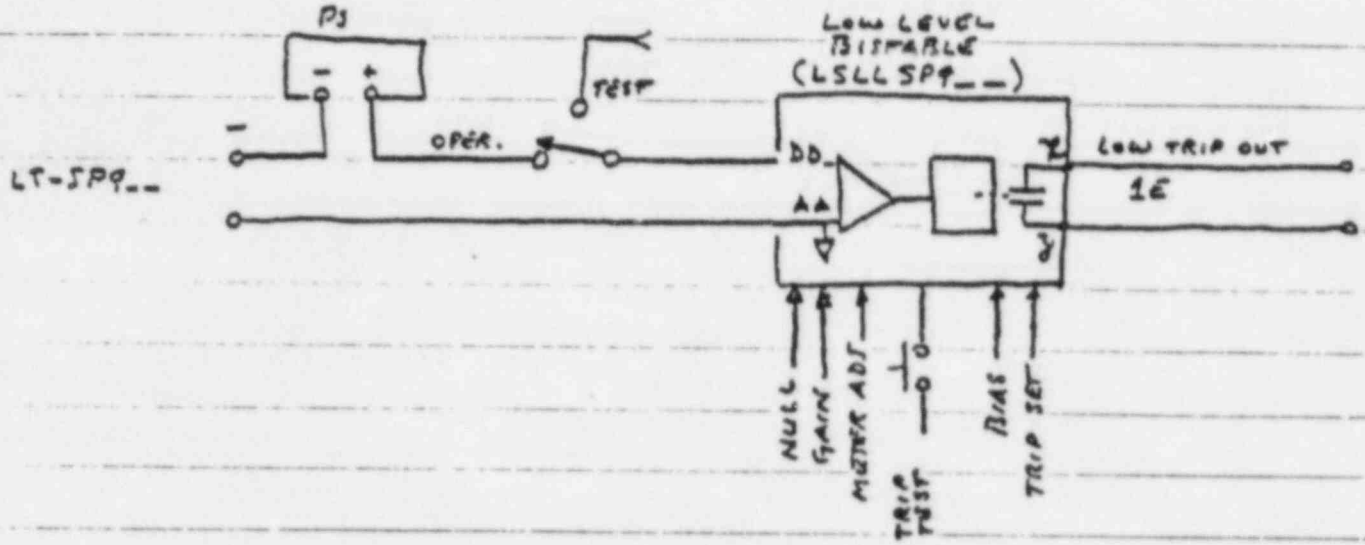


FIGURE II.


S/G LAV. INSTR. CAB.
SG 1(2)
CAL. TEST
1. LT-SP9B8 (LT-SP9A8) 2.
[LT-SP9B9] [(LT-SP9A9)]
3. 4.
L.L. B.S.
SG 2(1)
LT-SP9A6 (LT-SP9B6)
[LT-SP9A7] [(LT-SP9B7)]
1/2
MAN. ACT.
RCP MONITORS
S/G LOW PRESS
SYS. OUT RCS-301
SYS. OUT RES-601
SYS. OUT RCS-101
1/4 LOW PRESS AND NOT BLOCKED
MAN. ACT.
Q
NOT Q
SYS. OUT RCS-60A
SYS. OUT RES 73A
PARTIAL TRIP
SYS. OUTPUTS
1. START AFPT & AFP 1(2) ON S/G 1(2); STOP AFP 1(2) ON S/G 2(1)
2. ISO OF S/G 1 & 2 (ESSENTIAL VALVES); INITIATE ART'S TRIP
3. CLOSE MSIV's
4. ISO OF MN. FW. (NON-ESSENTIAL VALVES)
5. TRIP MAIN TURBINE
FIGURE 4.
From: DWG E-19 (BECHTEL LOGIC)
A.T. Beard 6/21/85



1/2 of 1	SG LIC

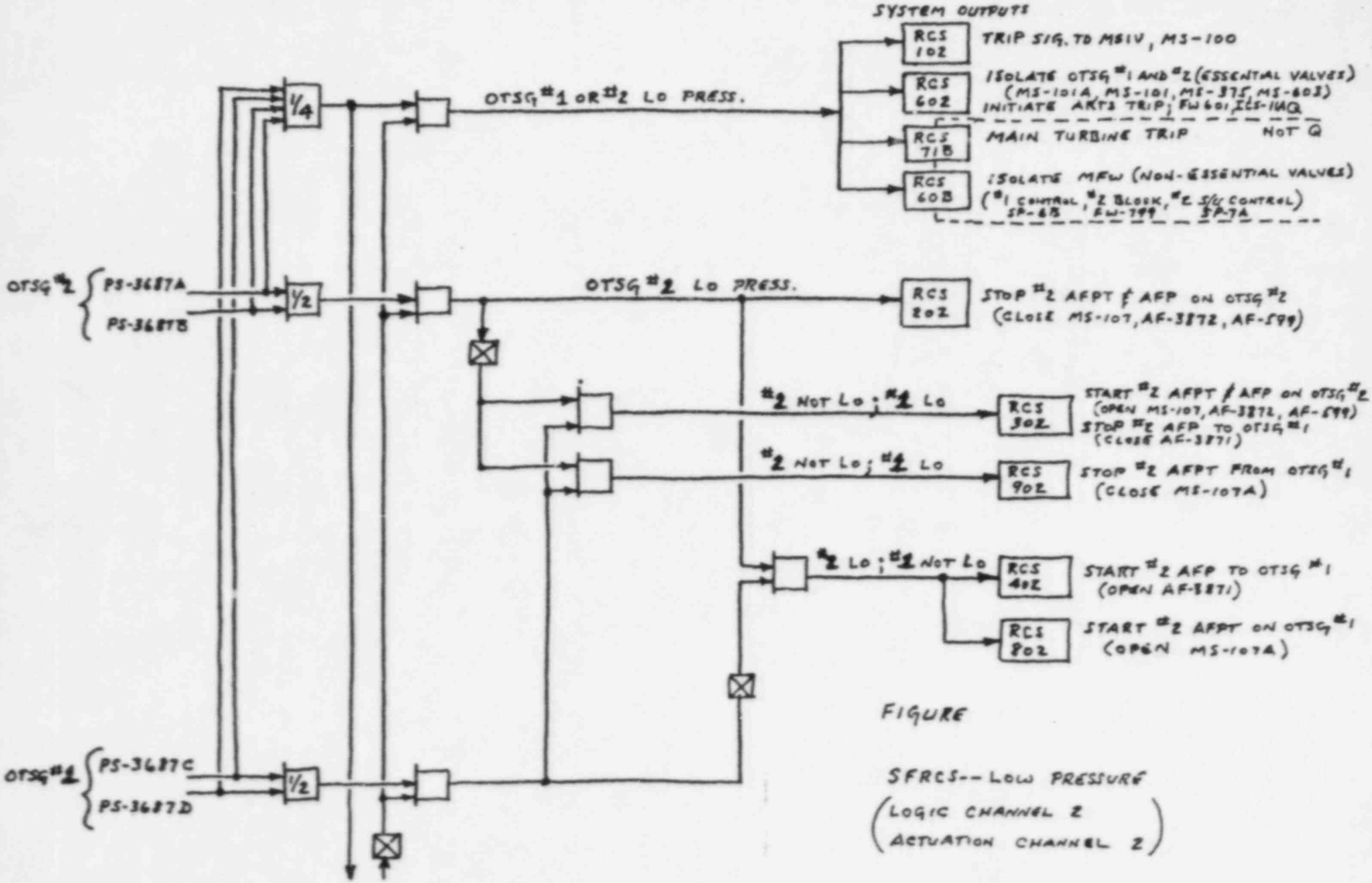
FROM : BECHTEL E18 REV 14

CCC KAD 7316

CONDEC/CCC 6N88-3

A.T. Bard

7/4/85

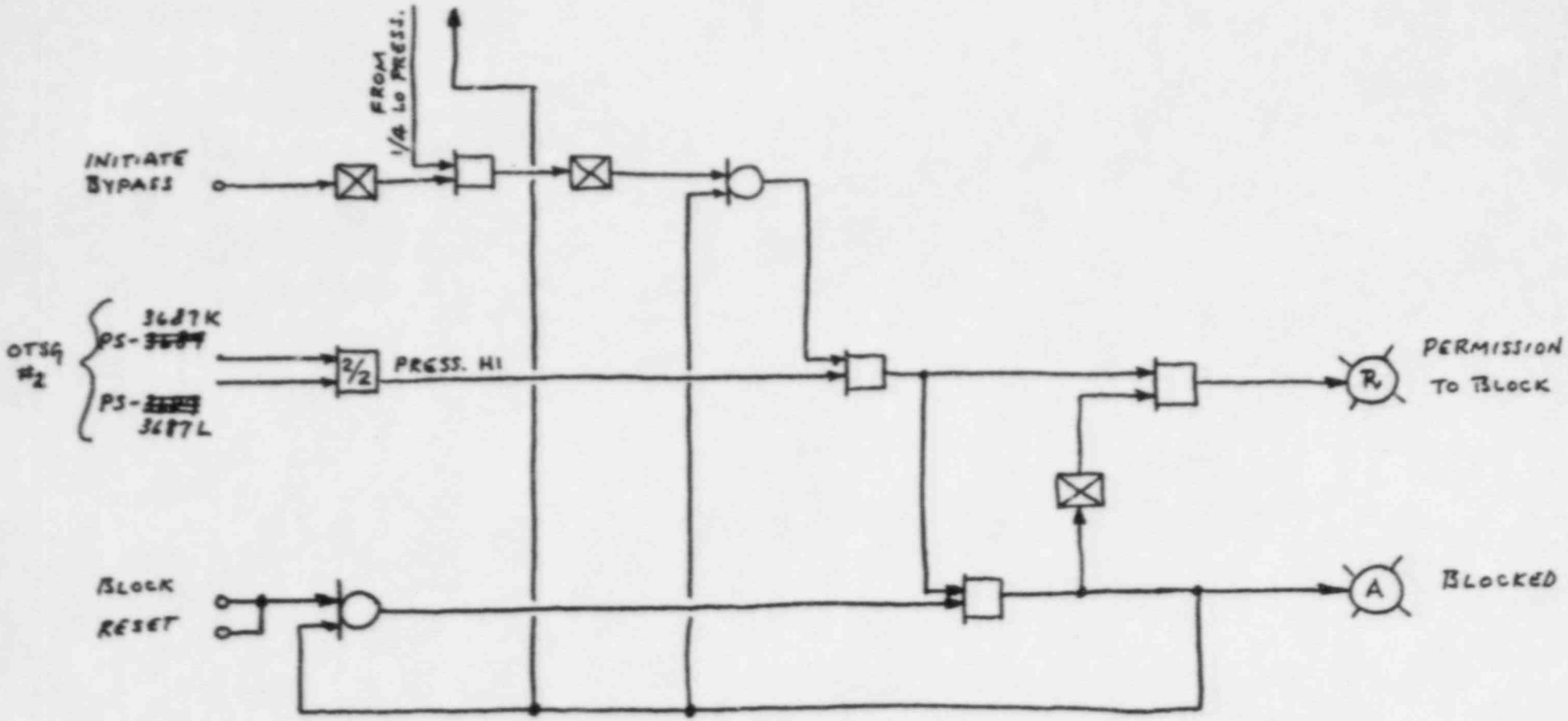


FIGURE

SFRCS -- LOW PRESSURE

(LOGIC CHANNEL 2
ACTUATION CHANNEL 2)

J.T. Beard
7/04/85



FIGURE

SFRCS -- LO PRESSURE

INITIATE BYPASS AND BLOCK LOGIC

T.T. Brandt
7/04/85

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: DAVIS BESSE INCIDENT
(Interview & Meeting)

(CLOSED)

DOCKET NO.: --

PLACE: OAK HARBOR, OH

DATE: TUESDAY, JULY 9, 1985

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sigt) Myrtle H. Walsh

(Typed) MYRTLE H. WALSH
Official Reporter
ACE Federal Reporters

(sigt) Garrett J. Walsh, Jr.

(TYPED) GARRETT J. WALSH, JR.

Official Reporter

Reporter's Affiliation
ACE Federal Reporters

(sigt) Mary C. Simons

(Typed) MARY SIMONS
Official Reporter
ACE Federal Reporter