UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

July 20, 1977

Docket No. 50-29

Secretary
The Alternative Energy Coalition
31 Federal Street
Greenfield, Massachusetts 01301

Dear Secretary:

Thank you for the draft copy of a press release in which the Alternative Energy Coalition (AEC) of Greenfield states its demand for a Franklin County investigation of concerns relating to the current refueling operations and conditions leading up to the recent strike of guards at the Yankee-Rowe nuclear power station.

We have noted the AEC's concerns in these matters and offer the following clarifying comments without prejudice to the investigation demanded by the AEC as indicated in the draft press release.

In accordance with the Nuclear Regulatory Commission (NRC) requirements, Yankee Atomic Electric Company (the licensee) promptly notified the NRC's regional Office of Inspection and Enforcement on June 9, 1977, that shutdown of the Yankee-Rowe reactor had been initiated that date and indicated the reasons for the earlier than anticipated shutdown. On June 22, 1977, the licensee submitted to the NRC the required written follow-up report on this occurrence in the prescribed format of a Licensee Event Report (LER). A copy of this LER is enclosed. The specific conditions resulting in the earlier shutdown of Yankee-Rowe, and the actions required of the licensee to obtain NRC approval to return the reactor to operation with the new core loading are summarized in our June 22, 1977 minutes of meeting with the licensee's staff. A copy of the minutes are also enclosed.

We would like to point out that the enclosed documents are part of the public record and are on file under Docket No. 50-29 at the local public document room at the Greenfield Public Library.

During the recent strike of guards at Yankee-Rowe an NRC inspector was dispatched to the site to assess the impact of the strike on plant security. The inspector confirmed that regulatory requirements for maintaining plant security had been maintained. The matters relating to the guards demands which apparently caused the strike, as indicated in your press release, are outside NRC's jurisdiction. We therefore cannot comment on these aspects of your concerns.

I trust that our comments are responsive to the concerns expressed in the AEC's draft press release.

Sincerely,

Victor Stello, Jr., Director
Division of Operating Reactors
Office of Nuclear Reactor Regulation

Enclosures:
1. Licensee Event Report dated June 22, 1977
2. Meeting Minutes dated June 22, 1977

Rec'd 7.6.77

A.E.C. Press release

The Alternative Energy Coalition OF GREENFIELD (AEC) ~~is~~ demanding an Franklin County investigation of conditions at the Yankee Rowe Nuclear Power Station. ~~Specifically~~, The AEC demands to know why the Rowe YANKEE operators lied about the conditions surrounding their current refueling operations, and also wants to get a more complete story of the conditions ~~xx~~ leading up to the strike ~~o~~f guards there. The AEC also expressed its support for that strike, demands for higher wages, double x & increase health benefits.

Specifically,....

According to three articles printed in the Recorder 6/11, 15, 20, there was much confusion as to the reality of the situation. Having checked with the Recorder, the plant P.R. man and heard Recorder statements from the Union, the NRC and the utility-New Eng Power-still all ?'s are not answered & the AEC feels there is but one choice.

The investigation is essential to explain why :

1. Utility spokesmen lied 6/11 as to why the nuke was shut down early. PR can always explain lies once they have passed, but truthful accounts are the only acceptable method. Utility PR man Herb Autio said on 6/23, 6/4 was the date they were using for shutdown for a long time but the NRC said " the Rowe plant was shut down for refueling at least 4 weeks early because of calculation errors"... of misinformation fed into the computers. Co. officials acknowledged refueling was scheduled for July.

2. What is this "abnormal occurrance" with the computer? The Recorder refers 6/15 to "Clculation errors" discovered by Yankee employees

~~Dupe~~ ~~[illegible]~~

who had " made an incorrect assumption in preparing an accident analysis". Are we to rely on assumptions? What EXACTLY was fed incorrectly to the computer?

3. Why would Yankee shut down early and lose even 50% capacity just because a computer was fed misinformation? This information was needed later to submit to the NRC prior to start up once refueling is complete. By the way, refueling process takes apx 7 wks and costs $2-3 million.

4. A strike is currently on at Rowe but when first interviewed, the New Eng Power Co could not explain this clearly to reporters.

5. We demand honest and complete explanations from all nuclear ~~faciel~~ facilities at each event- normal or abnormal. If it were within our jurisdiction, these mysteries would already have been investigated. The public can act wisely if treated with respect. Nuclear technology can be explained, unless the utility is fearful of the truth and of events they consider bad publicity.

We have sent copies of this critique and our demands to New Eng Power and NRC.

The Alternative Energy Coalition

31 Federal St
Greenfield Mass 01301

YANKEE ATOMIC ELECTRIC COMPANY

YANKEE

Rowe, Massachusetts 01367

June 22, 1977

Mr. J. P. O'Reilly, Director
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Subject: Reportable Occurrence 50-29/77-30/01T
Errors in Accident Analysis

Dear Mr. O'Reilly:

In accordance with Technical Specifications, Section 6.9.4.a, the attached Licensee Event Report is hereby submitted.

Very truly yours,

H. A. Autio

H. A. Autio
Plant Superintendent

MWE/mid

Enclosure:

cc: [40] Director, Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

[1] Director, Office of Management Information & Program Control
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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8011140 227

(LER 77-30/1T)

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1–6)

(PLEASE PRINT ALL REQUIRED INFORMATION)

	LICENSEE NAME	LICENSE NUMBER	LICENSE TYPE	EVENT TYPE
01	M A Y K R 1	0 0 - 0 0 0 0 0 - 0 0	4 1 1 1 1	0 1

	CATEGORY	REPORT TYPE	REPORT SOURCE	DOCKET NUMBER	EVENT DATE	REPORT DATE
01 CON'T		T	L	0 5 0 - 0 0 2 9	0 6 0 8 7 7	0 6 2 2 7 7

EVENT DESCRIPTION

02 Apparent errors in the accident analysis required the plant first to reduce power to

03 50% on June 8, 1977 then to order a plant shutdown on June 10, 1977. Errors in the

04 accident analysis have previously occurred. The analysis will be corrected for

05 Core XIII submittal. (LER 77-30)

06

	SYSTEM CODE	CAUSE CODE	COMPONENT CODE	PRIME COMPONENT SUPPLIER	COMPONENT MANUFACTURER	VIOLATION
07	S F	F	Z Z Z Z Z Z	L	Z 9 9 9	N

CAUSE DESCRIPTION

08 See Attached Sheet.

09

10

	FACILITY STATUS	% POWER	OTHER STATUS	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION
11	E	0 8 1	NA	C	NA

	FORM OF ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY	LOCATION OF RELEASE
12	Z	Z	NA	NA

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION
13	0 0 0	Z	NA

PERSONNEL INJURIES

	NUMBER	DESCRIPTION
14	0 0 0	NA

OFFSITE CONSEQUENCES

15 NA

LOSS OR DAMAGE TO FACILITY

	TYPE	DESCRIPTION
16	Z	NA

PUBLICITY

17 NA

Dupe

ADDITIONAL FACTORS

18 NA

8011140233

19

NAME: Martin W. Ebert PHONE: 413-625-5140

CAUSE DESCRIPTION:

In the course of performing the LOCA analysis for the Core XIII reload submittal, a small break scenario was discovered which appeared more limiting than any analyzed for Core XII. In Core XII analyses, it was postulated that the most limiting small break would be one which would cause a very slow blowdown while at the same time allowing direct ECCS spillage into the containment. This break was correctly assumed to be a complete severance of a safety injection line near the Reactor Coolant System (RCS) injection point such that blowdown of the RCS was through a 2.25" I.D. thermal sleeve. In the Core XII analysis, the hydraulic resistance of the thermal sleeve was analytically included in the ECCS piping consistent with the assumption of a postulated break near the injection point. In subsequent Core XIII analysis, a new break was identified in which the resistance of the thermal sleeve would not be present in the injection line. [Specifically, the break would have to occur in a small length of piping (1 to 2 feet) upstream of the location of the previously assumed break.] The absence of the flow resistance produces a higher spill rate and a lower ECCS header pressure than would be calculated with the presence of the flow resistance. Lower ECCS header pressure in turn delays the time of ECC injection.

It was recognized that the "removal" of flow resistance in the broken injection line had potential significance for Core XII which was then in coastdown. An immediate Appendix K blowdown analysis was performed (assuming that the plant was at 67% power) to analyze the consequences of the newly discovered break scenario. The results of that analysis indicated that the removal of the thermal sleeve's resistance reduced the pressure (and, therefore, increased the time) of ECCS injection to an extent that Appendix K PCT criteria appeared not to be met. The plant was derated to 50%. Analysis at that power level indicated that ECCS injection appeared possible, but sufficient uncertainty with the calculations of header pressure existed to warrant performing an orderly plant shutdown. This decision reflected the need for flow tests to verify analytical prediction of pressure drops and pump flow deliverability.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DOCKET NO. 50-29 DATE: JUN 22 1977

LICENSEE: Yankee Atomic Electric Company (YAEC)

FACILITY: Yankee-Rowe

SUMMARY OF MEETING HELD ON JUNE 17, 1977, FOR BRIEFING ON MATTERS RELATING TO ECCS PERFORMANCE EVALUATION FOR YANKEE-ROWE

On June 17, 1977, representatives of YAEC met with the NRC staff to report on matters relating to ECCS performance at Yankee-Rowe.

A list of attendees is attached.

Important highlights of YAEC's presentations and commitments made during the meeting are summarized below. A copy of YAEC's handout which illustrates significant aspects of the presentations are also attached.

On June 9, 1977, YAEC shutdown Yankee-Rowe following its discovery of modeling errors in the ECCS performance analysis being done in preparation for obtaining NRC approval to operate Yankee-Rowe with the next Core XIII. YAEC decided on early shutdown because of difficulties to resolve the analytical uncertainties in the Core XII ECCS performance analysis and to provide more time to accomplish the necessary work in preparation for Core XIII startup.

YAEC described the progressive upgrading of the ECCS which was originally installed at Yankee-Rowe during 1960. Presently, the ECCS includes three 50 percent pumping trains (3 High Pressure Safety Injection and 3 Low Pressure Safety Injection Pumps) capable of being powered from redundant onsite emergency diesel generators. One ECCS accumulator provides rapid response to large ruptures in the reactor coolant pressure boundary. Flow from the accumulator begins when the reactor coolant system (RCS) pressure drops below the pressure in the accumulator with the concurrent opening of several swing check valves in the injection flow path. The injection flow path separates into four safety injection lines (Yankee-Rowe is a 4-loop reactor) each connected to an RCS cold leg by a thermal sleeve. Each safety injection line (nominal 4 inch) has a 4 inch check valve and a 4 inch motor operated valve upstream of the check valve. A 3 inch motor operated valve is downstream of the check valve. Existing instrumentation permits monitoring of flow in each safety injection line. The original functional requirements for the 2 1/2 inch I.D. thermal sleeve no longer exists. Prior to operation with Core XII YAEC intended to use the motor operated valves to isolate a break in a safety injection line downstream of the check valve. A break upstream of the check valve would not result in depressurization of the RCS. Because of single failure implications, YAEC was required to operate Core XII with power removed from the motor operated valves in the safety injection lines and the valves in the open position.

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YAEC has previously determined in its ECCS performance analysis for Core XII that a break in a safety injection line at the location of the 2 1/4 inch I.D. thermal sleeve would be the most limiting small break (resulting in highest clad temperature for the spectrum of small breaks). During the Core XIII ECC performance analysis efforts YAEC discovered that if a break were assumed in the short 4 inch pipe section downstream of the 4 inch check valve in the safety injection line, this would result in a higher peak clad temperature than for the break location at the thermal sleeve. While the RCS blowdown characteristics would remain the same (blowdown would still be through the flow resistance of the thermal sleeve), the spill of accumulator and pumped injection water to the containment floor (previously assumed through the 2 1/4 inch thermal sleeve) would be significantly greater because of the lower flow resistance at the location of the 4 inch break.

To determine the impact of the modeling error on past operations with Core XII, YAEC performed best estimate calculations using non-conservative assumptions. YAEC stated that its calculations indicate that a break at the 4 inch section downstream of the 4 inch check valve in a safety injection line would not have resulted in unacceptable peak clad temperatures.

To correct the analysis error prior to operation with Core XIII, YAEC proposed to restore power to the motor operated valves in the safety injection lines and to assume in the ECCS analysis for Core XIII, isolation of the broken safety injection line (in the 4 inch section downstream of the check valve) within 15 minutes into the accident.

To enhance the performance capability of the ECCS, YAEC had previously proposed modifications involving the addition of an injection delay feature to the ECCS accumulator subsystem. This proposal is presently under staff review in conjunction with its review of YAEC's Core XIII refueling evaluation. A model change for the large break analysis involving an alternate definition of End of Bypass (EOBY) has also been submitted by YAEC. The staff has found this model change to be acceptable for use in the Core XIII ECCS performance analysis. YAEC also intends to propose a model change for the small break analysis involving the use of a heat transfer correlation that more accurately describes heat transfer at low flows.

With regard to YAEC's proposal to reinstate power to the motor operated valves in the safety injection lines to permit valve closure for preserving accumulator inventory, the staff commented that considerable support would have to be provided to justify operator action (to identify and isolate the broken line). The staff suggested that as an alternative to relying on operator action, YAEC should give thorough consideration to flow balancing by changing the flow resistances as necessary so that the system flows would more closely match the ECCS performance that had previously been considered acceptable.

At the conclusion of the meeting YAEC withdrew its initial proposal to reinstate power to the motor operated valves in the safety injection lines and committed to the following actions for obtaining NRC approval for operation of Yankee-Rowe with Core XIII.

- To provide the increased permanent flow resistances in each safety injection line by replacement of the 4 inch check valves with a 2 1/2 inch check valve or by other appropriate means as determined to be suitable and practical. Provide descriptions and bases for the modifications.

- To proceed promptly with the planned ECCS performance verification tests which in part will provide data for determining the added flow resistances needed in the safety injection lines.

- To submit detailed information in support for the planned model change for the small break analysis involving the pool boiling heat transfer coefficient.

- To provide the Core XIII ECCS performance analysis with the approved evaluation models and acceptable model changes. The analysis will include two large breaks and one small break with the safety injection dealy feature and the added flow restrictions in the Core XIII configuration.

YAEC also committed to submit the confirmatory Core XIII ECCS analysis for the entire break spectrum shortly after obtaining NRC approval for Core XIII operation.

YAEC stated that because of the anticipated heavy summer demand for electric power, startup with Core XIII is scheduled for August 1, 1977. Therefore , YAEC asked for prompt staff review of its submittals . We indicated that in order for us to be responsive, YAEC must time its submittals of . remaining items so as to allow at least two weeks for staff review . In this connection, we pointed out that we consider the small break model change to be the critical path item in our Core XIII review. Therefore, it is necessary for YAEC to make this submittal as soon as possible but not later than two weeks from the date of this meeting.

Alfred Burger, Project Manager
Operating Reactors Branch #1
Division of Operating Reactors

Enclosures:
1. List of Attendees
2. YAEC's Handout

cc w/encls:
See next page

MEETING WITH YANKEE ATOMIC ELECTRIC COMPANY
CONCERNING YANKEE-ROWE
LIST OF ATTENDEES

NRC

A. Burger
D. Haverkamp
W. Lazarus
K. Herring
R. Landry
V. Rooney
M. Chiramal
S. Rhow
N. Anderson
K. Parczewski
P. DiBenedetto
K. Jabbour
D. Tondi
F. Nolan
R. Woodruff

YAEC

J. Thayer
J. Consolatti
W. Szymaczak
A. Ladieu
J. Chapman
T. Keenan
J. Turnage
A. Husain
R. Grube
R. Shone
P. Rainey
M. Ebert

JUN 22 1977

Docket
NRC PDR
LOCAL PDR
ORB#1 Reading
NRR Reading
E. G. Case
V. Stello
K. R. Goller
D. Eisenhut
A. Schwencer
D. Davis
G. Lear
R. Reid
L. Shao
B. Grimes
W. Butler
R. Baer
Project Manager
Attorney, OELD
OI&E (3)
Licensing Assistant
Each NRC participant
T. B. Abernathy
J. R. Buchanan

YANKEE ROWE ECCS PERFORMANCE
MEETING AGENDA

Yankee Atomic Electric Company
and
Nuclear Regulatory Commission

June 17, 1977
9:00 AM
Bethesda, Maryland

		NAME	TIME
I.	Introduction	R. M. Grube	9:00 - 9:10
II.	Rowe ECCS Description	R. P. Shone	9:10 - 9:30
	A. History		
	B. Current Configuration		
III.	LOCA Analysis	J. C. Turnage/ A. Husain	9:30 - 10:15
	A. Core XIII		
	1. Large Break		
	2. Small Break		
	B. Core XII Implications		
IV.	ECCS Performance Verification Tests	P. A. Rainey	10:15 - 10:30 Break
V.	Restoration of Power to Safety Injection Valves . .	R. P. Shone/ F. D. Baxter	10:45 - 12:15
	A. System History		
	B. Philosophy of Proposed Change		
	1. Operator Action		
	2. Single Failure-Valve Installation		
	C. Electrical Circuitry Changes		
	1. Spurious Valve Motion		
	2. Keylock Switches		
VI.	Summary	T. D. Keenan	12:15 - 12:30
VII.	Sub-group Discussions (as needed)		
VIII.	NRC and/or YAEC Caucus (as needed)		
IX.	Conclusions		

12C-#125

SUMMARY

I. SEQUENCE OF EVENTS LEADING TO SHUTDOWN

A. LOCA analysis associated with Core XIII revealed certain modeling errors.

B. Reanalysis of present Core XII configuration was done to determine modeling error impact on operation.

C. Conclusion was that shutdown was warranted due to analytical uncertainties and to maximize time available for Core XIII work.

II. PROPOSED MODIFICATIONS FOR POST-CORE XII OPERATION

A. Analytical modifications regarding heat transfer correlations.

B. System Modifications

1. Restore electrical power to eight safety injection valves.
2. Add additional circuitry to effectively preclude spurious valve motion.
3. Add keylock switches to essentially eliminate the possibility of operator error.
4. Install safety injection valves in positions upstream of check valve in each injection line to provide redundant isolation capability remote from postulated break location.

III. BASIS OF POSITION FOR RESTORING POWER TO VALVES AND ALLOWING OPERATOR ACTION

A. The restoration of power to the safety injection valves essentially restores the system to its operational mode prior to Core XII, with the addition of protection for:

1. Spurious valve motion
2. Operator error

B. The time required for operator action - 15 minutes is a reasonable time frame within which one can be expected to act, is outside the "immediate action" category, and, in our judgement, is acceptable for licensing. This is particularly true in view of the fact that:

The need for any operator action exists only for a small break of the size in question at a very specific location.

All breaks of larger size will be adequately responded to by the system independent of operator action.

C. The physical separation of the valves in question from the break location, including the existence of barriers, precludes any direct impact on the valves from the LOCA. The conclusion reached is that the valves, operators and wiring remain operable for the required time interval.

ECCS DESCRIPTION

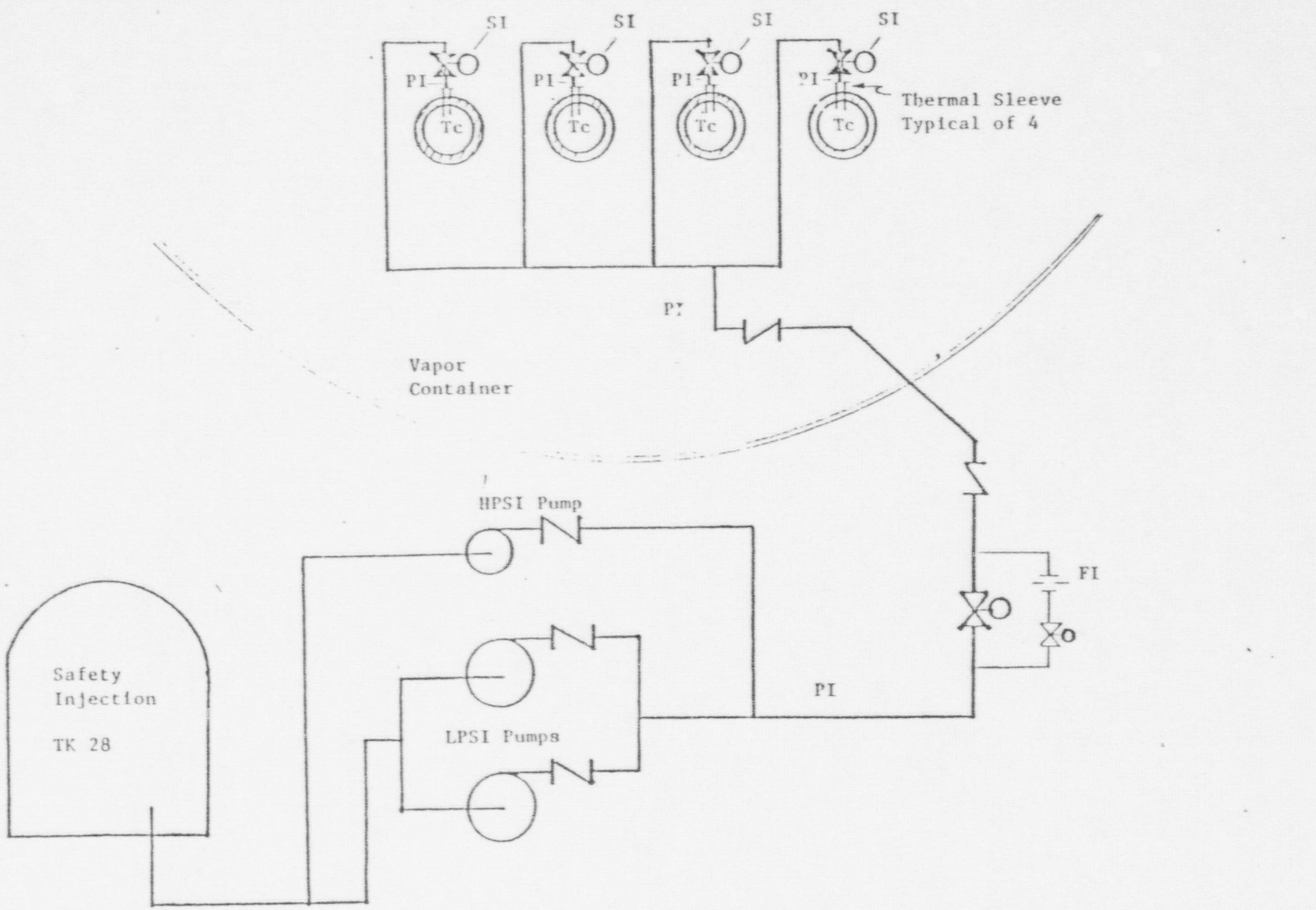
HISTORY

FEATURES OF ORIGINAL SYSTEM (1960)(SEE ATTACHED SKETCH)

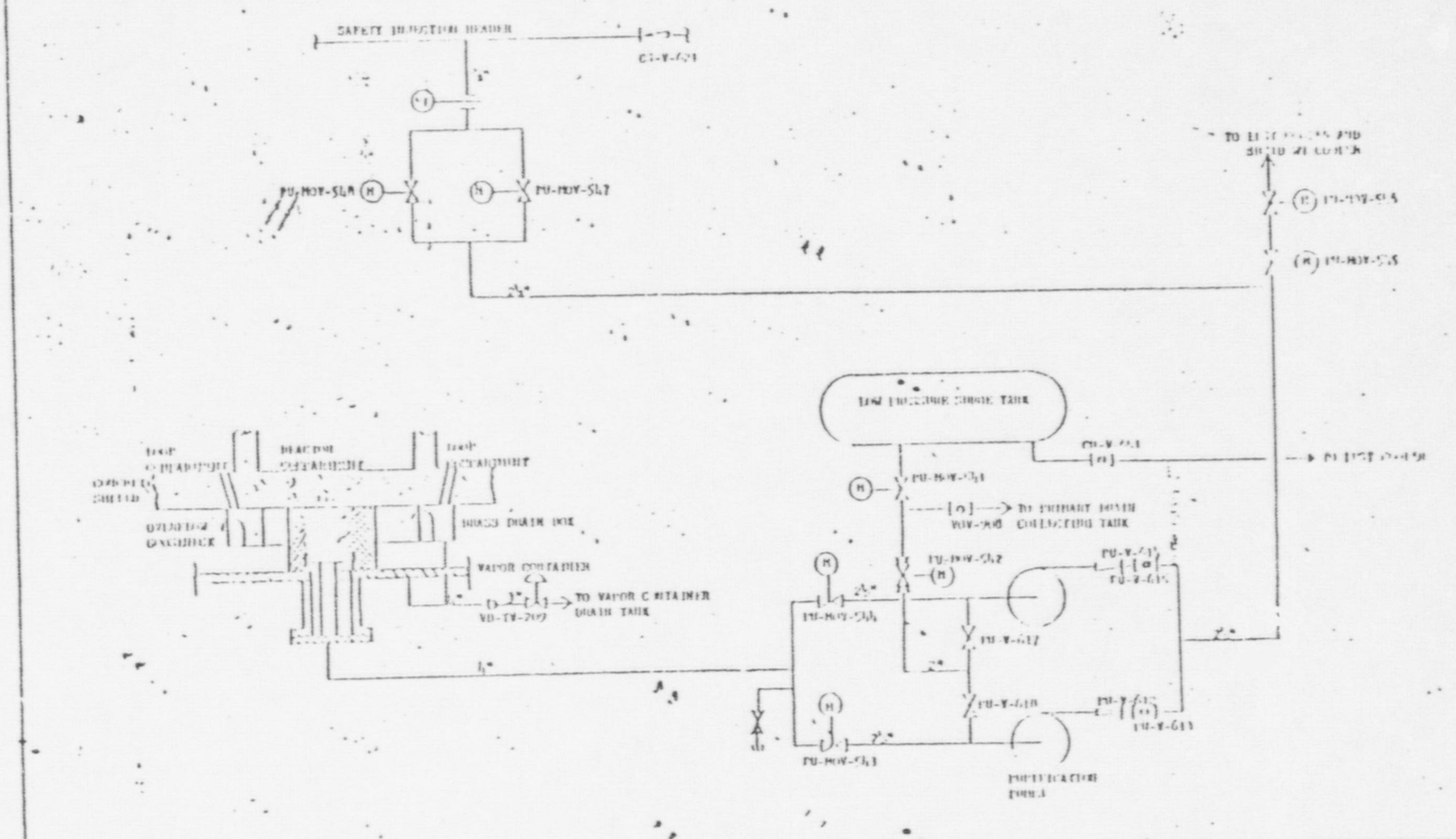
1. TWO LOW PRESSURE, HIGH VOLUME PUMPS.
2. CHARGING SYSTEM CONSISTING OF THREE 33 GPM POSITIVE DISPLACEMENT PUMPS PROVIDED HIGH PRESSURE INJECTION.
3. BACK UP POWER PROVIDED BY TWO OUTSIDE LINES.
4. SI PUMPS AND FILL HEADER ROOT VALVES OPENED AUTOMATICALLY ON SI SIGNAL.
5. OPERATOR ACTION REQUIRED TO CROSS OVER CHARGING FLOW AND TO STRETCH OUT SI WATER INVENTORY.
6. PROCEDURES PROVIDED FOR TERMINATING LOCA WITH LOOP ISOLATION VALVES.

EARLY MODIFICATIONS

1. ADDED ONE INTERMEDIATE PRESSURE PUMP IN PARALLEL WITH THE LOW PRESSURE PUMP IN 1962.
2. IN 1970 THE CAPABILITY TO PROVIDE LONG TERM POST ACCIDENT RECIRCULATION WAS PROVIDED. THIS SYSTEM FEATURED:
   A. THE CAPABILITY TO WITHSTAND A SINGLE FAILURE OF ONE PUMP OR ONE ACTIVE VALVE.
   B. THE CAPABILITY TO INCLUDE THE SHUTDOWN COOLING HEAT EXCHANGER AND CLEAN UP OF THE ECCS WATER.



ORIGINAL SAFETY INJECTION SYSTEM



YANKEE NUCLEAR POWER STATION

RECIRCULATION SYSTEM

C. OPERATOR ACTION WAS REQUIRED TO INITIATE RECIRCULATION.

CURRENT CONFIGURATION

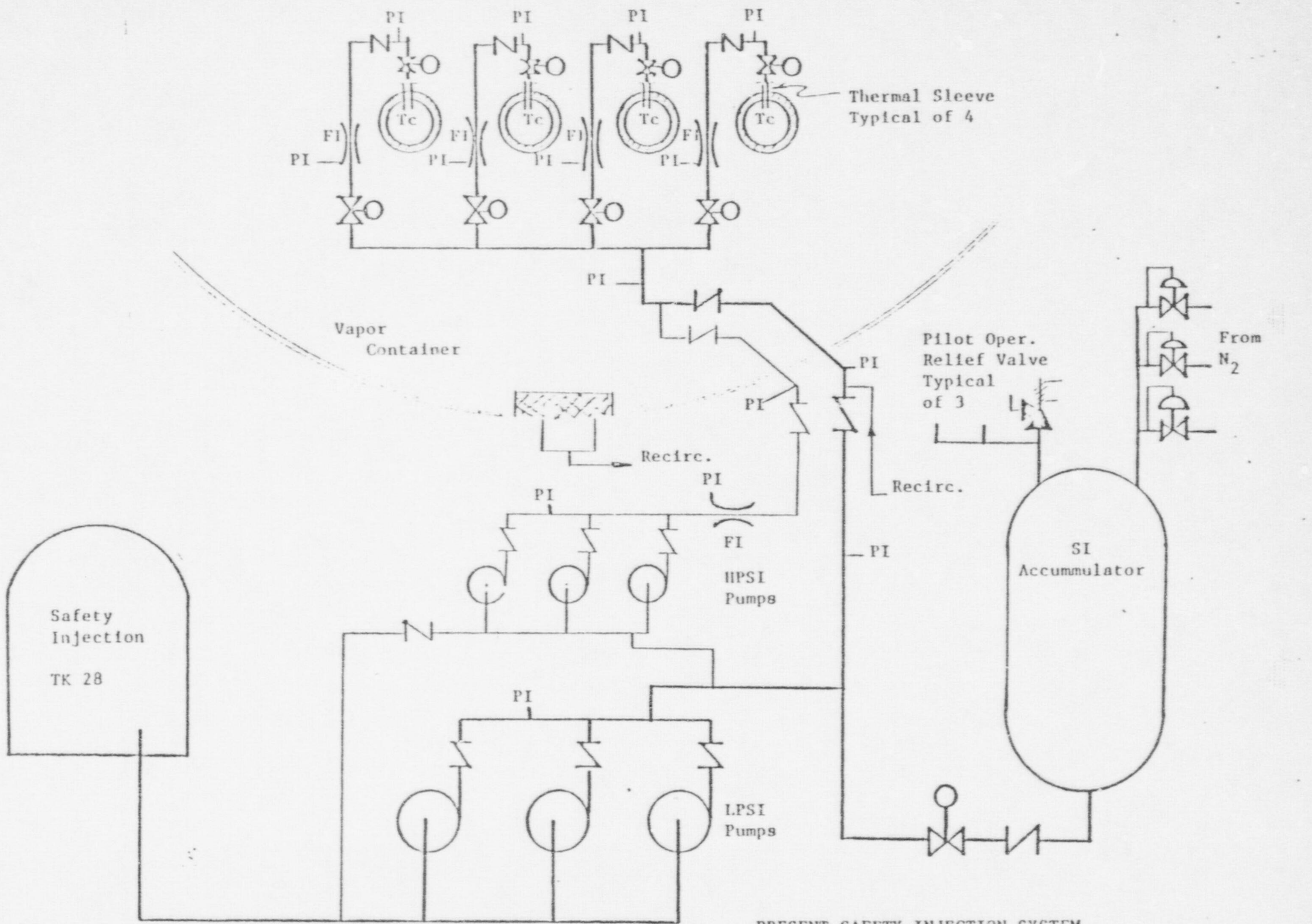
FEATURES

IN 1971 A MAJOR MODIFICATION TO THE ECCS WAS MADE. THIS SYSTEM FEATURES:

1. REDUNDANT ON-SITE EMERGENCY DIESEL GENERATORS.
2. THREE 50 PERCENT PUMPING TRAINS CAPABLE OF FURNISHING ECC WATER FOR THE FULL RANGE OF BREAKS.
3. PROTECTION FOR SINGLE ACTIVE FAILURE.
4. INJECTION FLOW COMMENCES ON RCS DEPRESSURIZATION I.E. MOV'S ARE PASSIVE.
5. PRESSURIZED ACCUMULATOR.
6. OPERATIOR ACTION IS GREATLY SIMPLIFIED AND IS REQUIRED IN EARLY PHASE ONLY FOR THE BREAK OF THE SI LINE ITSELF.

FOR CORE XII THE SYSTEM WAS MODIFIED TO PREVENT SPURIOUS FAILURES AND OPERATOR ERROR. EARLY PHASE OPERATOR ACTION WAS ELIMINATED. IN ADDITION LONG TERM HOT LEG INJECTION WAS PROVIDED TO PREVENT BORON PRECIPITATION.

FOR CORE XIII THE SYSTEM IS BEING MODIFIED TO DELAY INJECTION DURING THE BLOWDOWN PHASE AND INCREASE FLOW RATES DURING ACCUMULATOR INJECTION.



PRESENT SAFETY INJECTION SYSTEM

RESTORATION OF POWER TO SAFETY INJECTION VALVES

HISTORY

THE ECCS SYSTEM IN ITS PRESENT CONFIGURATION WAS ORIGINALLY DESIGNED TO PROVIDE THE CAPABILITY TO ISOLATE FLOW TO AN INDIVIDUAL RC LOOP. THIS WAS REQUIRED ONLY IN THE CASE OF A RUPTURE OF THE SI BRANCH LINE DOWNSTREAM OF THE CHECK VALVE.

THE CORE XII ECCS ANALYSIS DID NOT ASSUME ISOLATION OF FLOW TO THE BREAK. BASED ON THE ASSUMPTION THAT ISOLATION WAS NOT ESSENTIAL, YANKEE PROPOSED TO PROTECT AGAINST OPERATOR ERROR AND SPURIOUS FAILURE BY REMOVING POWER FROM THE BRANCH LINE MOTOR OPERATED VALVES.

PROPOSED CHANGE

YANKEE INTENDS TO ASSUME ISOLATION OF FLOW TO THE BREAK IN THE CORE XIII ANALYSIS IN THE CASE OF THE BRANCH LINE BREAK DOWNSTREAM OF THE CHECK. THEREFORE, RESTORATION OF POWER TO THE BRANCH LINE VALVES AND THE RE-RECOGNITION OF OPERATOR ACTION ARE REQUIRED.

YANKEE PROPOSES TO RESTORE POWER TO CS-MOV-536, 537, 538, 539 AND SI-MOV-22, 23, 24, 25 WHICH WILL PROVIDE REDUNDANT CAPABILITY TO ISOLATE THE BROKEN BRANCH LINE, FROM THE CONTROL ROOM. RESTORATION OF POWER WILL PROVIDE PROTECTION AGAINST

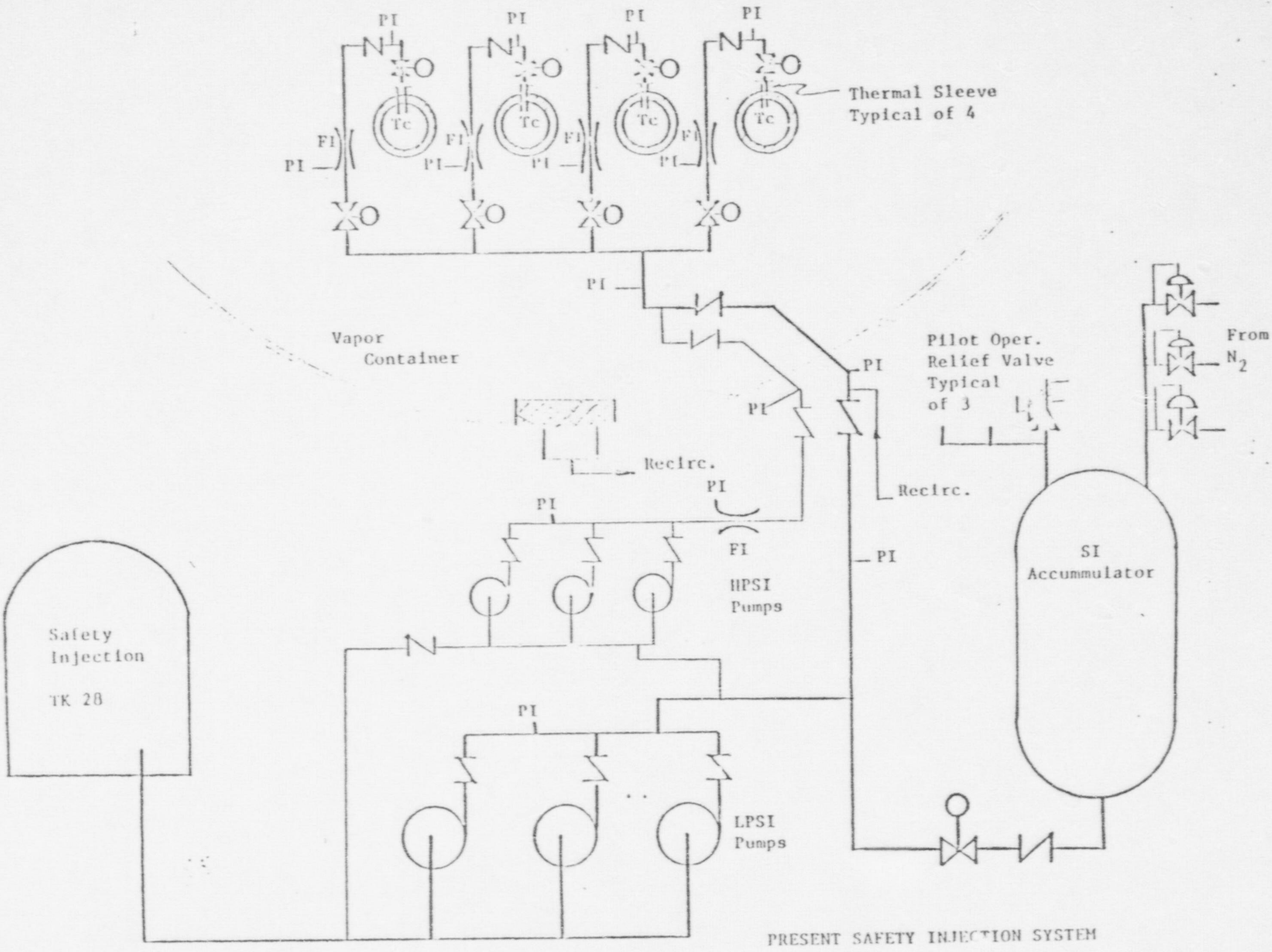
OPERATOR ERROR AND SPURIOUS FAILURE IN ACCORDANCE WITH THE INTENT OF BTP-18.

ANALYSIS INDICATES THAT THE OPERATOR HAS 15 MINUTES TO IDENTIFY AND ISOLATE THE BROKEN BRANCH. YANKEE FEELS THAT OPERATOR ACTION WITHIN THIS TIME FRAME IS JUSTIFIED BECAUSE:

1. OPERATOR ACTION IS REQUIRED ONLY FOR A BREAK OF THE SI LINE DOWNSTREAM OF THE CHECK, AND
2. NO OTHER SHORT TERM OPERATOR ACTION IS REQUIRED.

IN ADDITION YANKEE PROPOSES TO PROVIDE IMPROVED RELIABILITY OF THIS ISOLATION CAPABILITY BY EITHER OF THE FOLLOWING:

1. RELOCATE THE DOWNSTREAM VALVES OUTSIDE THE LOOP, I.E. REMOTE FROM LOCA IMPACT, OR
2. INSTALL NEW REPLACEMENT VALVES OUTSIDE THE LOOP.



PRESENT SAFETY INJECTION SYSTEM

LOCA ANALYSES

CORE 13

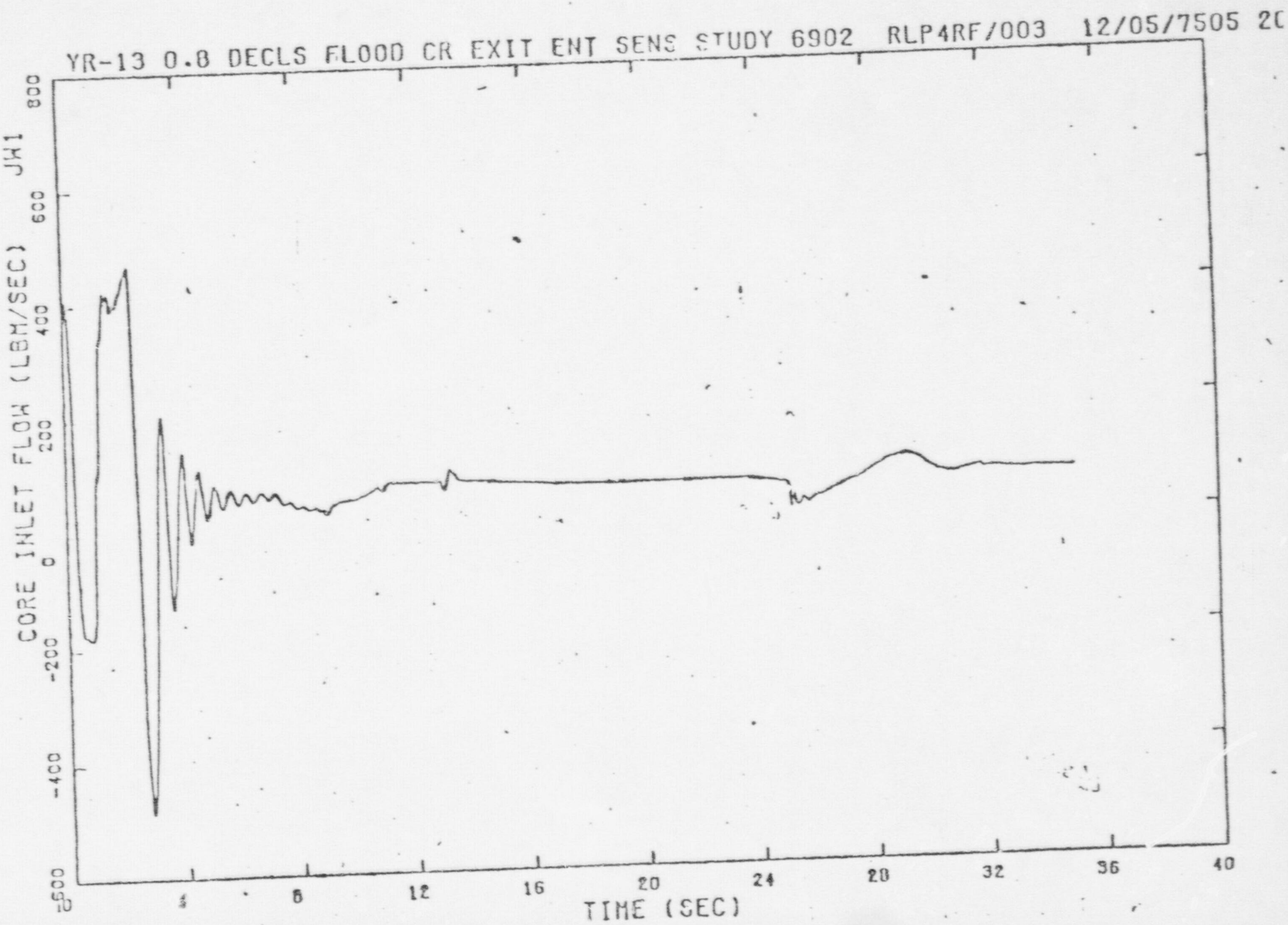
- LARGE BREAK ANALYSIS
  - ECC INJECTION DELAY
  - ALTERNATE DEFINITION FOR EOBY
    - BREAK SPECTRUM STUDY
    - BURN-UP STUDY
      - REFLOOD INSTABILITY FIX
- SMALL BREAK ANALYSIS
  - POOL BOILING HEAT TRANSFER
  - BREAK SPECTRUM STUDY
    - CORE 12 METHOD
    - CORE 13 (WORST BREAK LOCATION)
      - REMOVAL OF THERMAL SLEEVE RESISTANCE

CORE 12

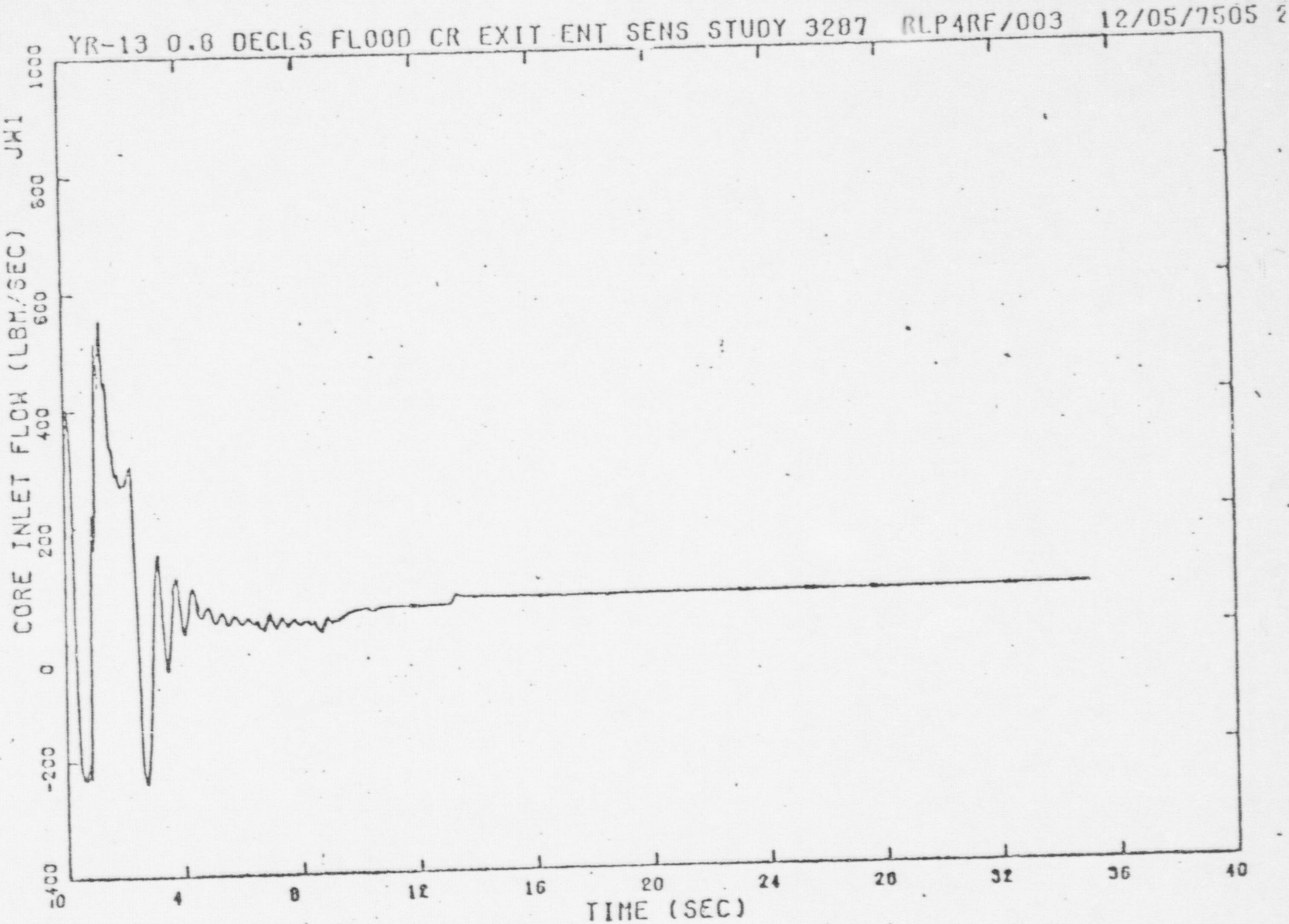
- IMPLICATIONS
  - RESULTS AT 67% AND 50% POWER
  - MIS-MATCH OF CALCULATED AND COMPUTED RESULTS
  - TEST DATA REQUIREMENTS
- BEST ESTIMATE
  - ASSUMPTIONS
  - RESULTS

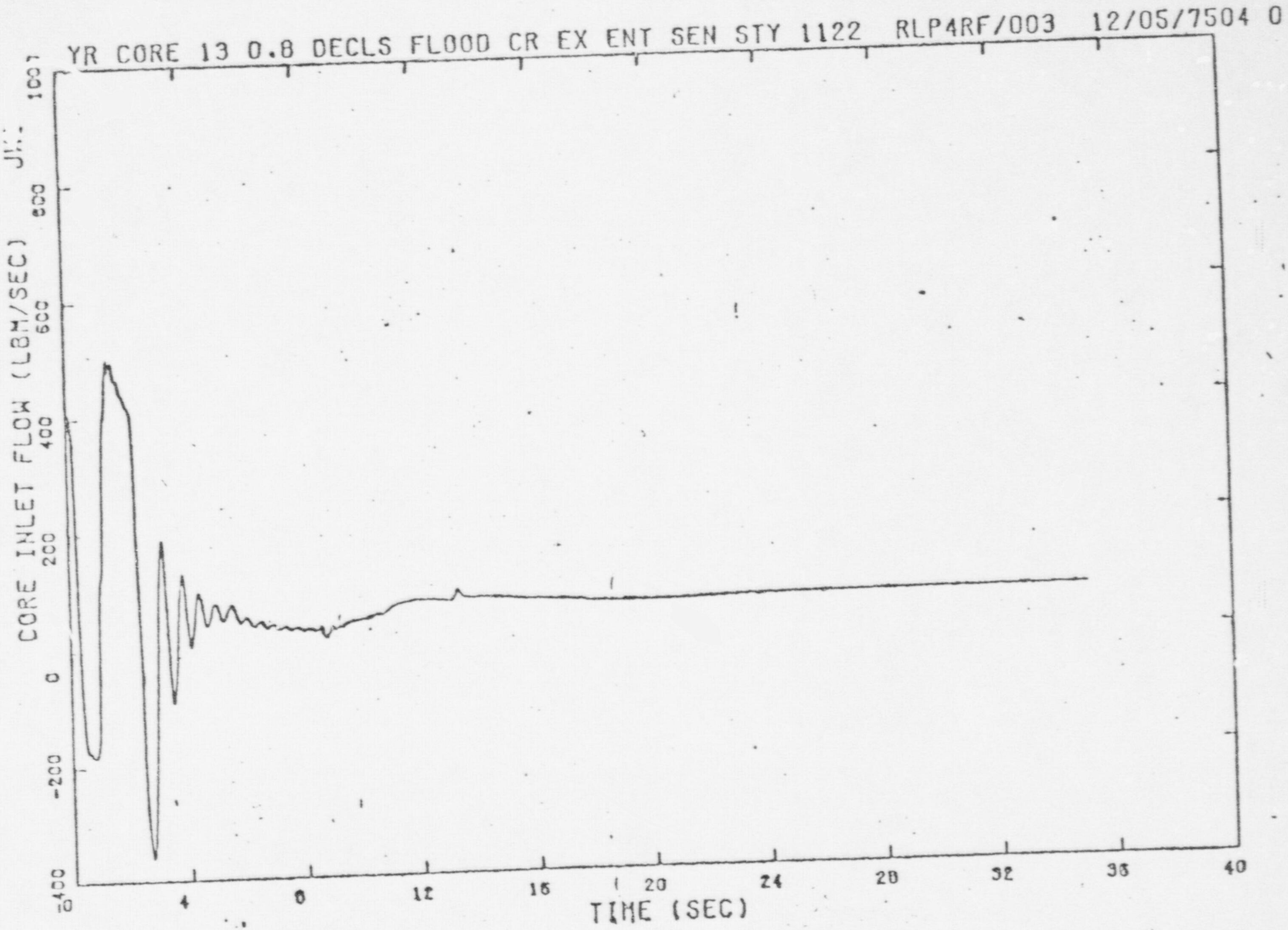
CORE 13

- CORE XIII ENVELOPING STUDY
- EFFECT OF OPERATOR ACTION

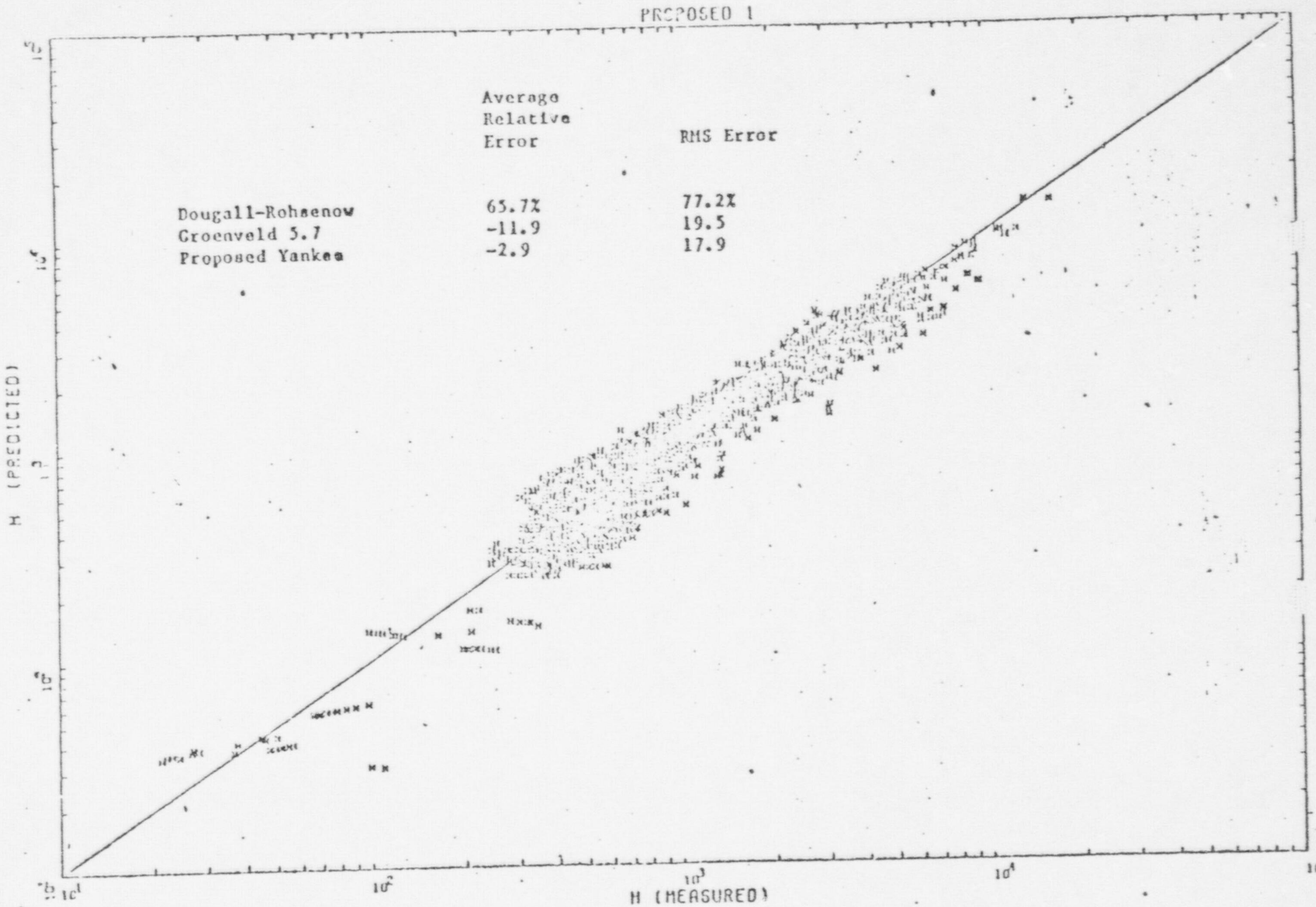


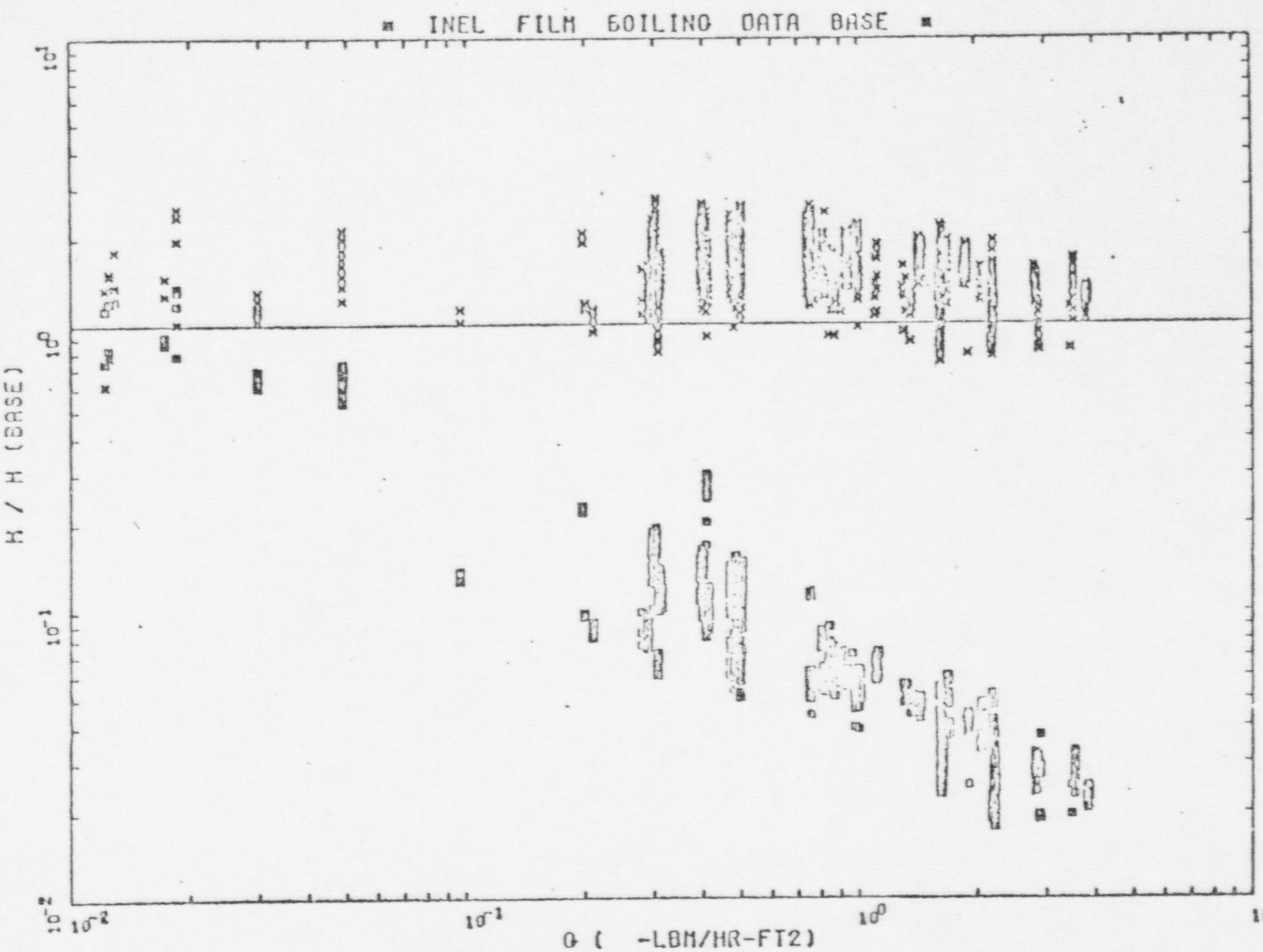
YR-13 0.8 DECLS FLOOD CR EXIT ENT SENS STUDY 6902 RLP4RF/003 12/05/7505 20
CORE INLET FLOW (LBM/SEC) JW1
800
600
400
200
0
-200
-400
-600
0
4
8
12
16
20
24
28
32
36
40
TIME (SEC)


YR-13 0.8 DECLS FLOOD CR EXIT ENT SENS STUDY 3287 RLP4RF/003 12/05/7505 2
CORE INLET FLOW (LBM/SEC) JW1
1000
800
600
400
200
0
-200
-400
0
4
8
12
16
20
24
28
32
36
40
TIME (SEC)

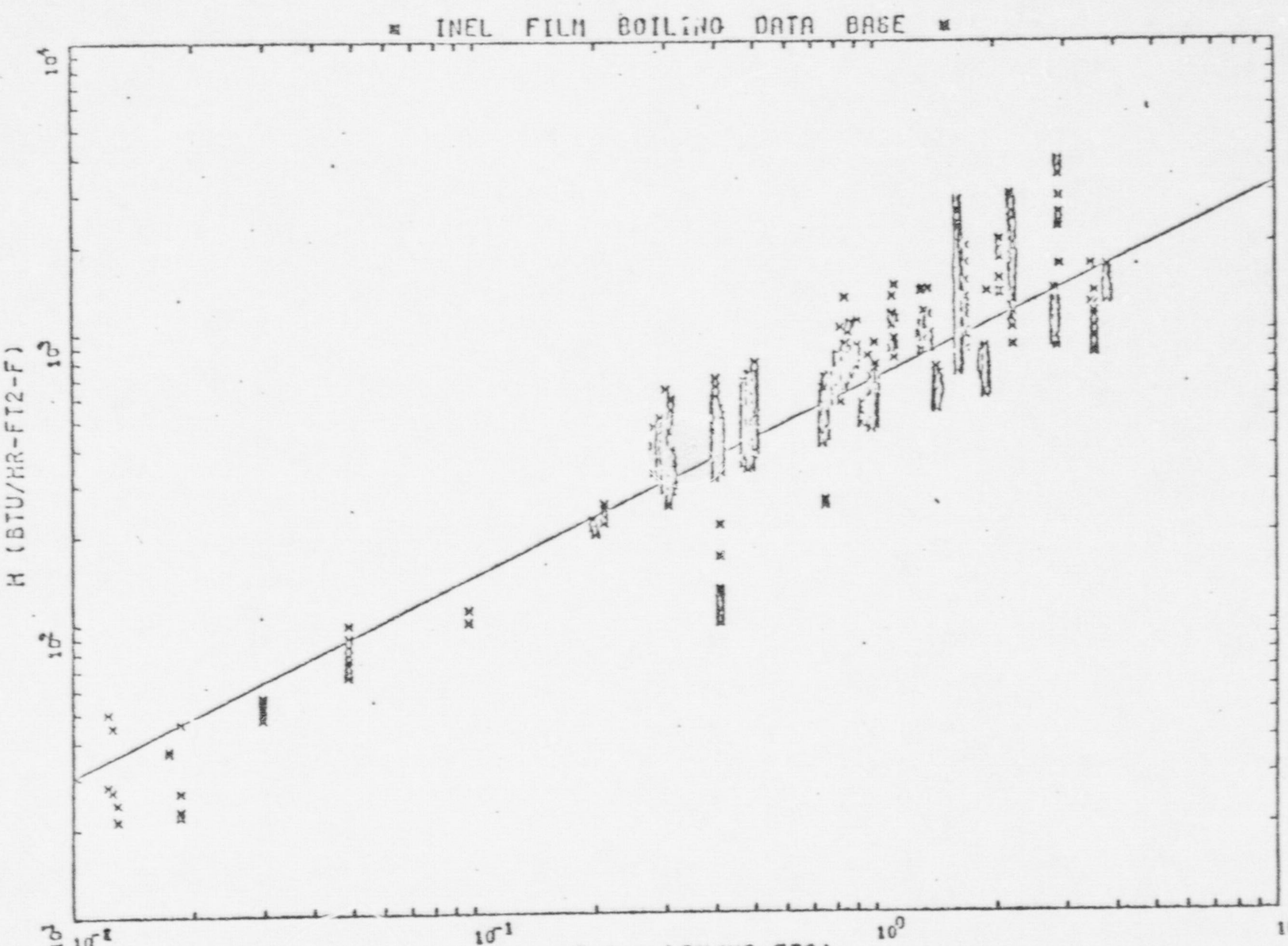


YR CORE 13 0.8 DECLS FLOOD CR EX ENT SEN STY 1122 RLP4RF/003 12/05/7504 0
CORE INLET FLOW (LBM/SEC)
1000
800
600
400
200
0
-200
-400
0
4
8
12
16
20
24
28
32
36
40
TIME (SEC)


PROPOSED 1
Average Relative Error
RMS Error
Dougall-Rohsenow 65.7% 77.2%
Groenveld 5.7 -11.9 19.5
Proposed Yankee -2.9 17.9
H (PREDICTED)
H (MEASURED)

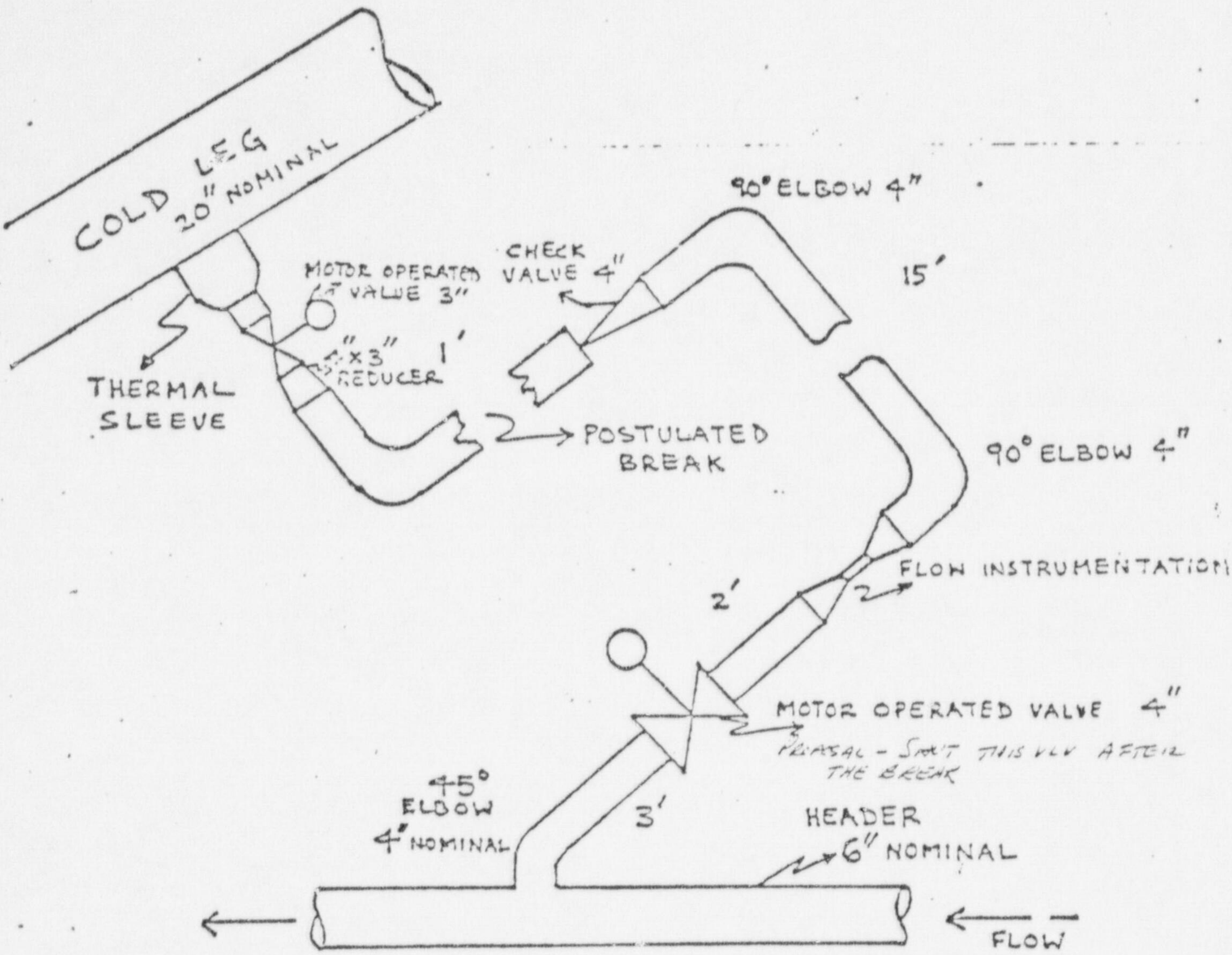


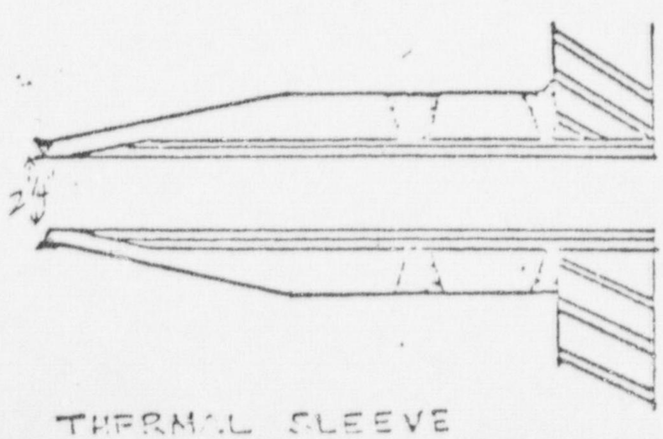
INEL FILM BOILING DATA BASE
H / H (BASE)
G (-LBM/HR-FT2)
10^1
10^0
10^-1
10^-2


* INEL FILM BOILING DATA BASE *
H (BTU/HR-FT2-F)
G (-LBM/HR-FT2)
10^1
10^2
10^3
10^4
10^-2
10^-1
10^0
10^1

YANKEE ROWE

ECCS INJECTION LOOP GEOMETRY

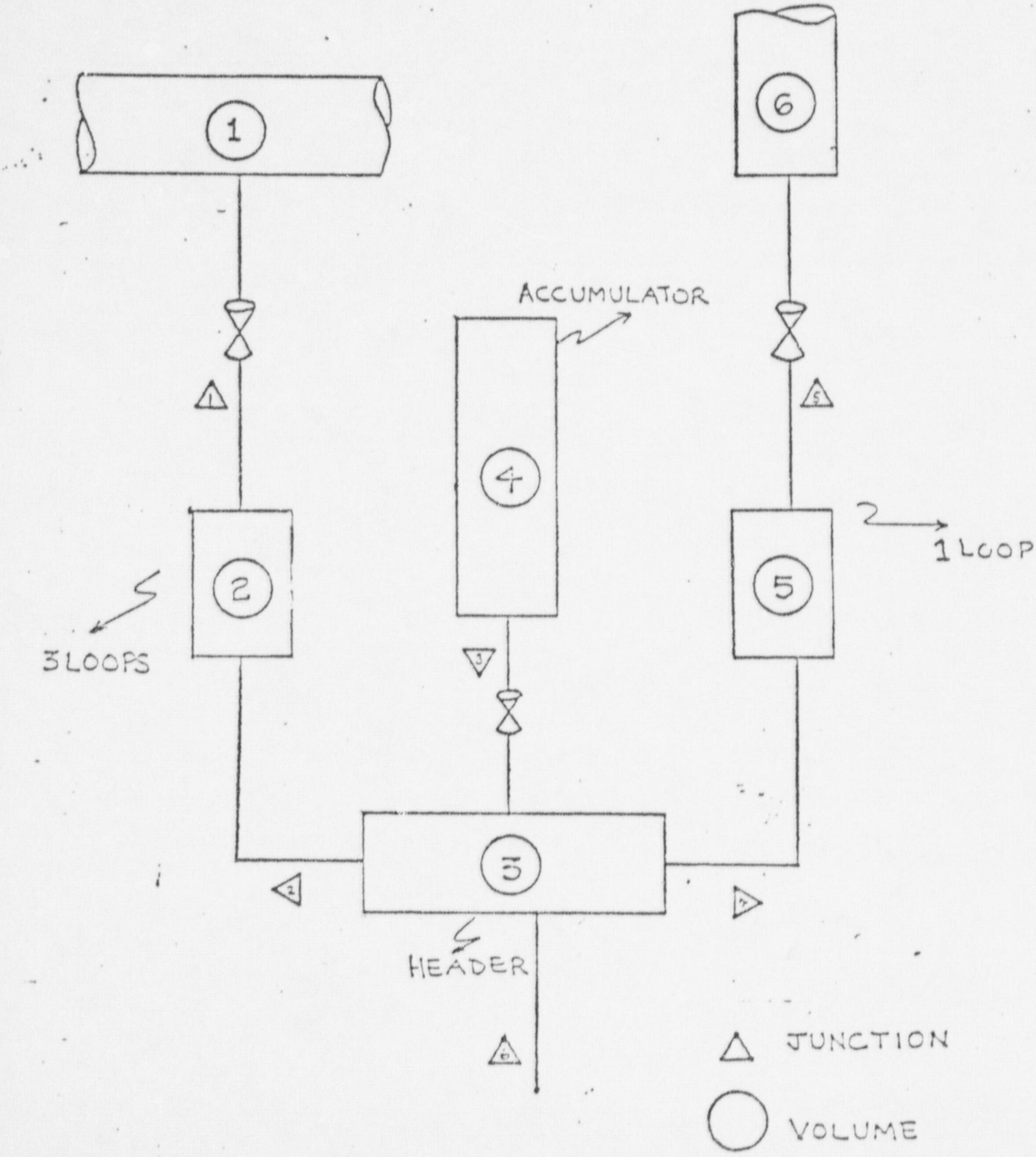




THERMAL SLEEVE

YANKEE ROWE

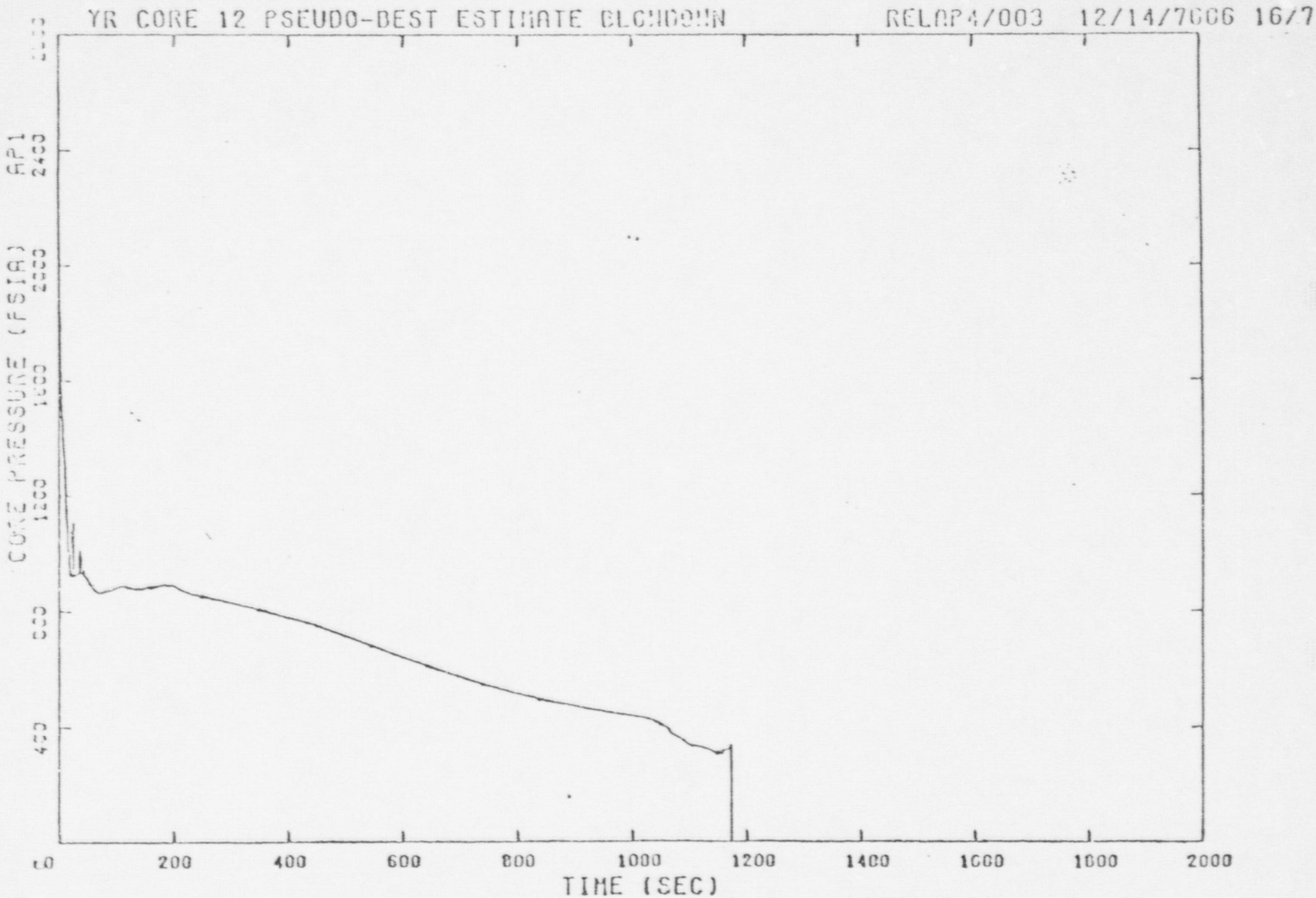
ECCS SUB-MODEL



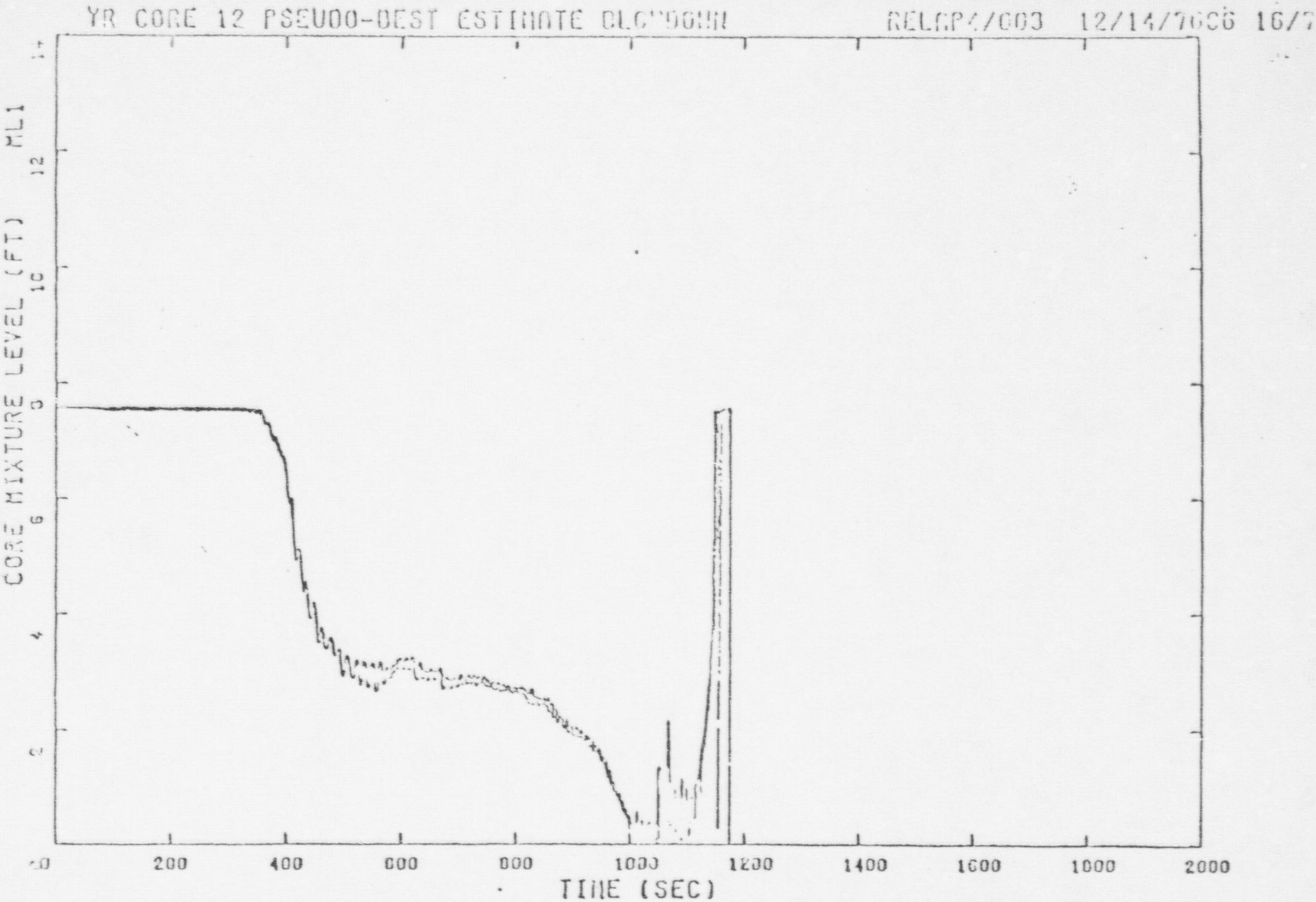
LOCA ANALYSES

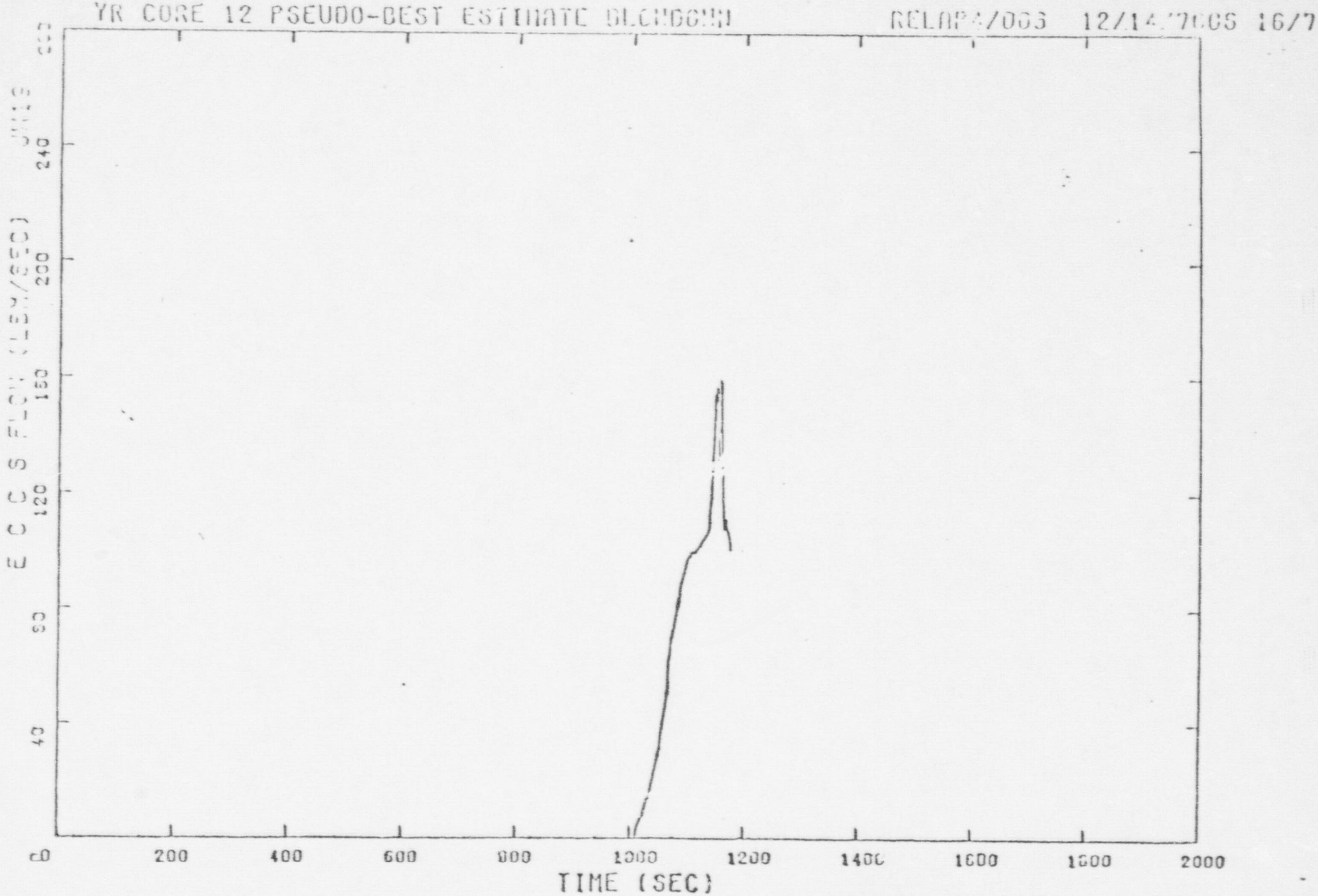
CORE 12 BEST ESTIMATE Assumptions

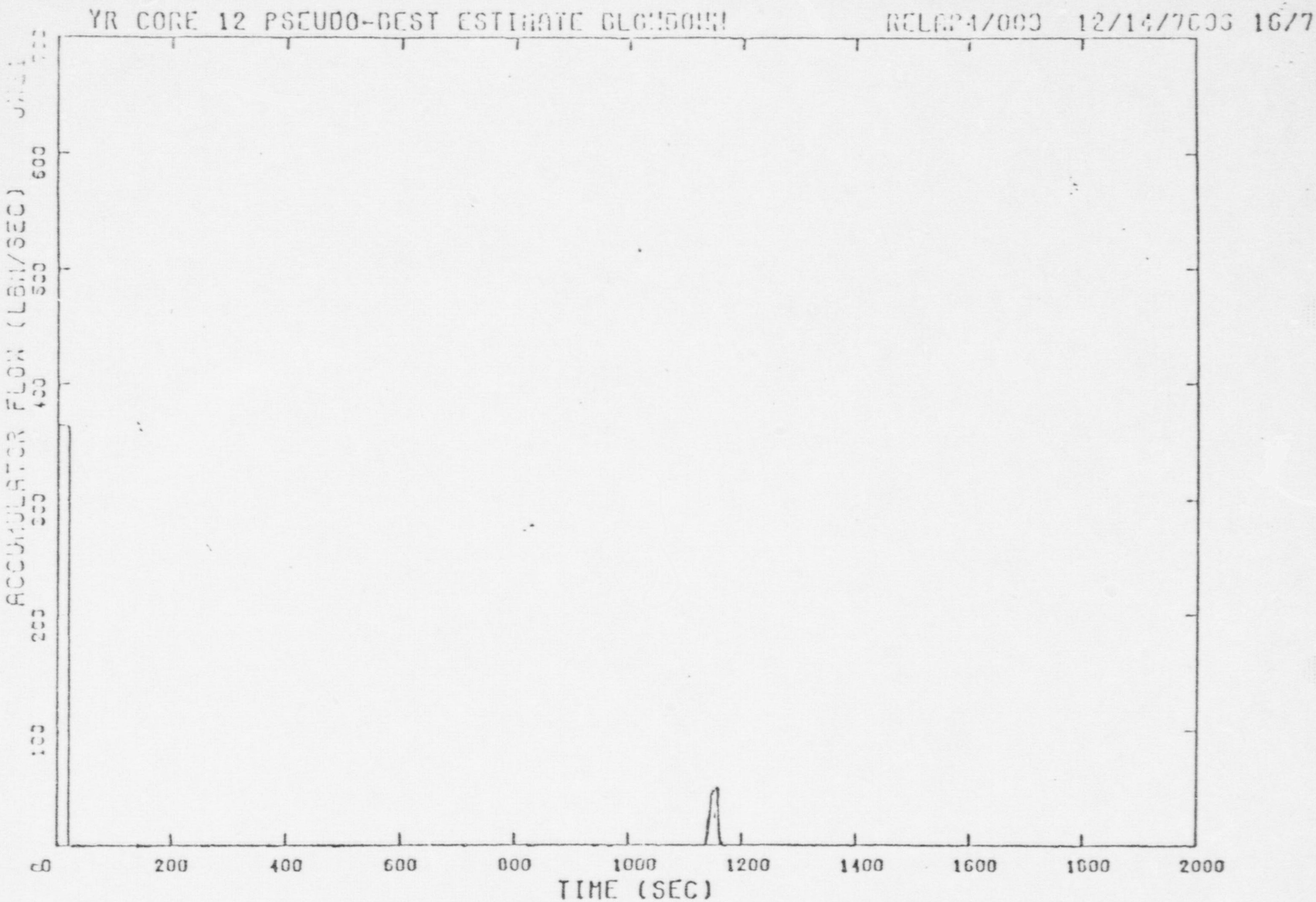
- Availability of off-site power
  - o 3 LPSI & 3 HPSI available
  - o Charging pumps available
  - o Main coolant pumps running until cavitation
  - o Steam dump on high secondary pressure until containment isolated
- No uncertainty on ANS decay curve
- Non-EM heat transfer logic
- Modified heat transfer floor
- Enveloping pin condition



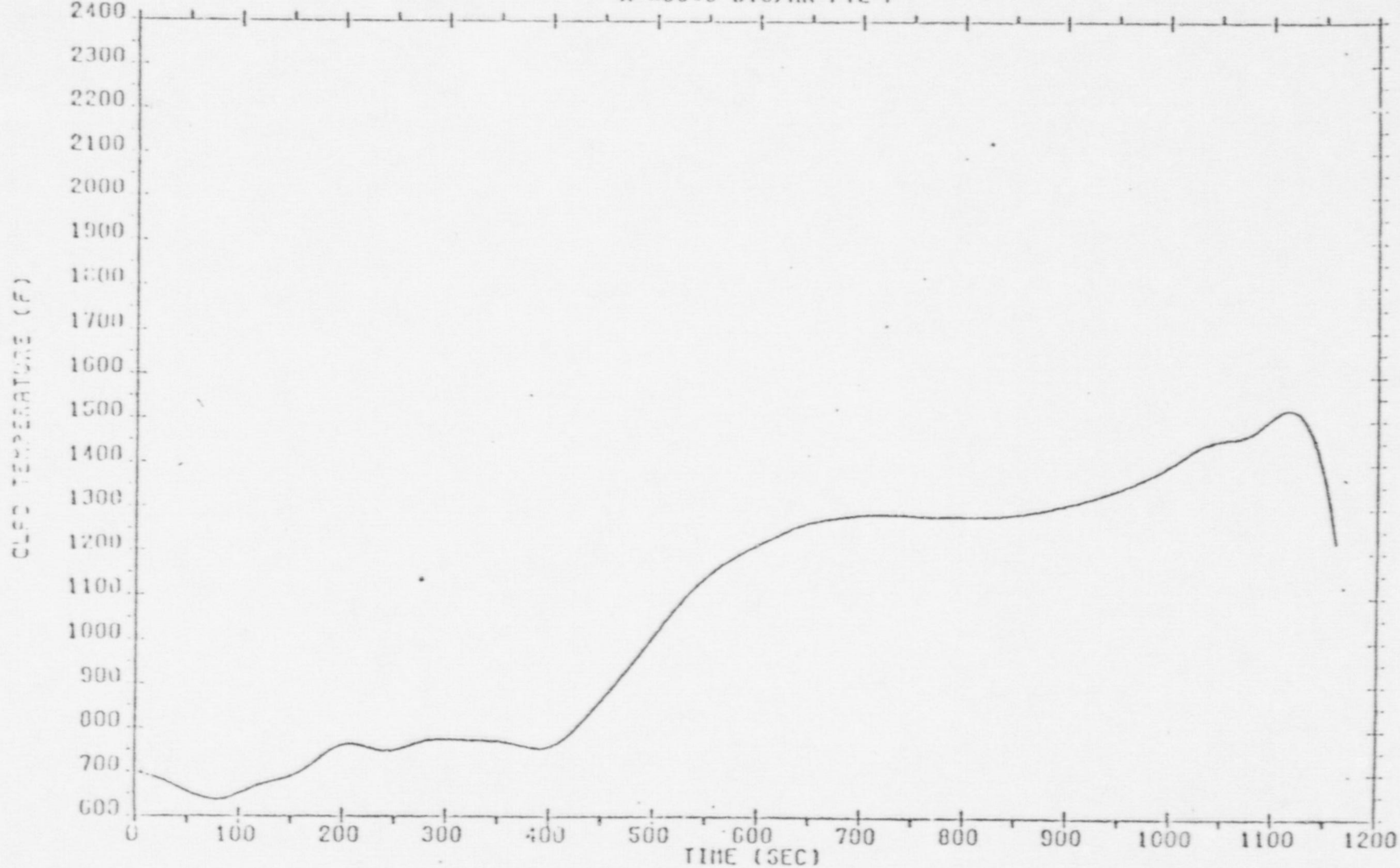
YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/003 12/14/76 16/7
RP1
CORE PRESSURE (PSIA)
2400
2000
1600
1200
800
400
0
200
400
600
800
1000
1200
1400
1600
1800
2000
TIME (SEC)


YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/003 12/14/76

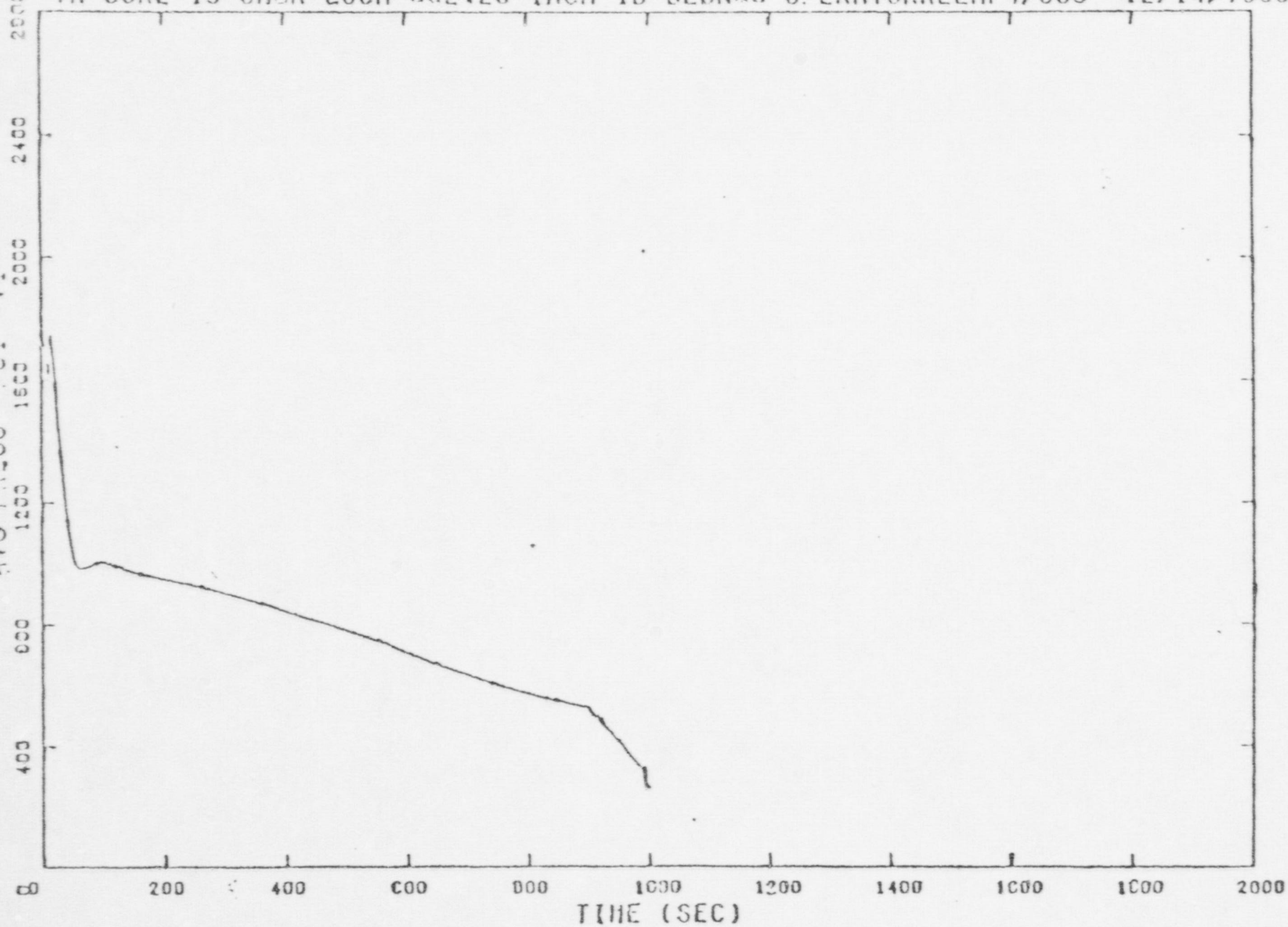

YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/006 12/14/78
E C C S FLOW (LBM/SEC)
TIME (SEC)
0
40
80
120
160
200
240
200
400
600
800
1000
1200
1400
1600
1800
2000

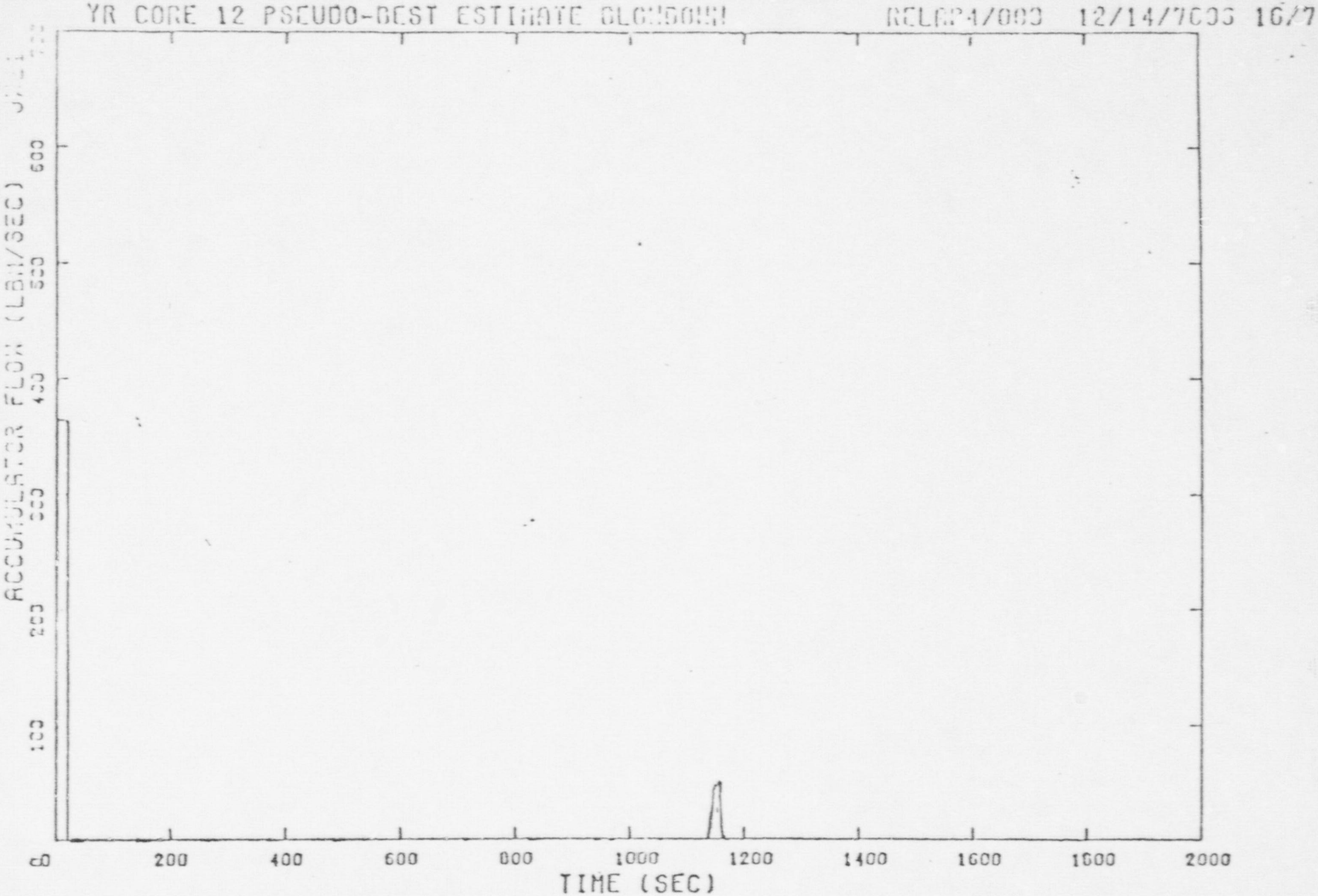

YR CORE 12 PSEUDO-BEST ESTIMATE
ACCUMULATOR FLOW (LBM/SEC)
600
500
400
300
200
100
0
200
400
600
1000
1200
1400
1600
2000
TIME (SEC)

YANKEE ROWE CORE 12 PSEUDO-BEST ESTIMATE 2.25 ID SMBK
H =50.0 BTU/HR-FT2-F



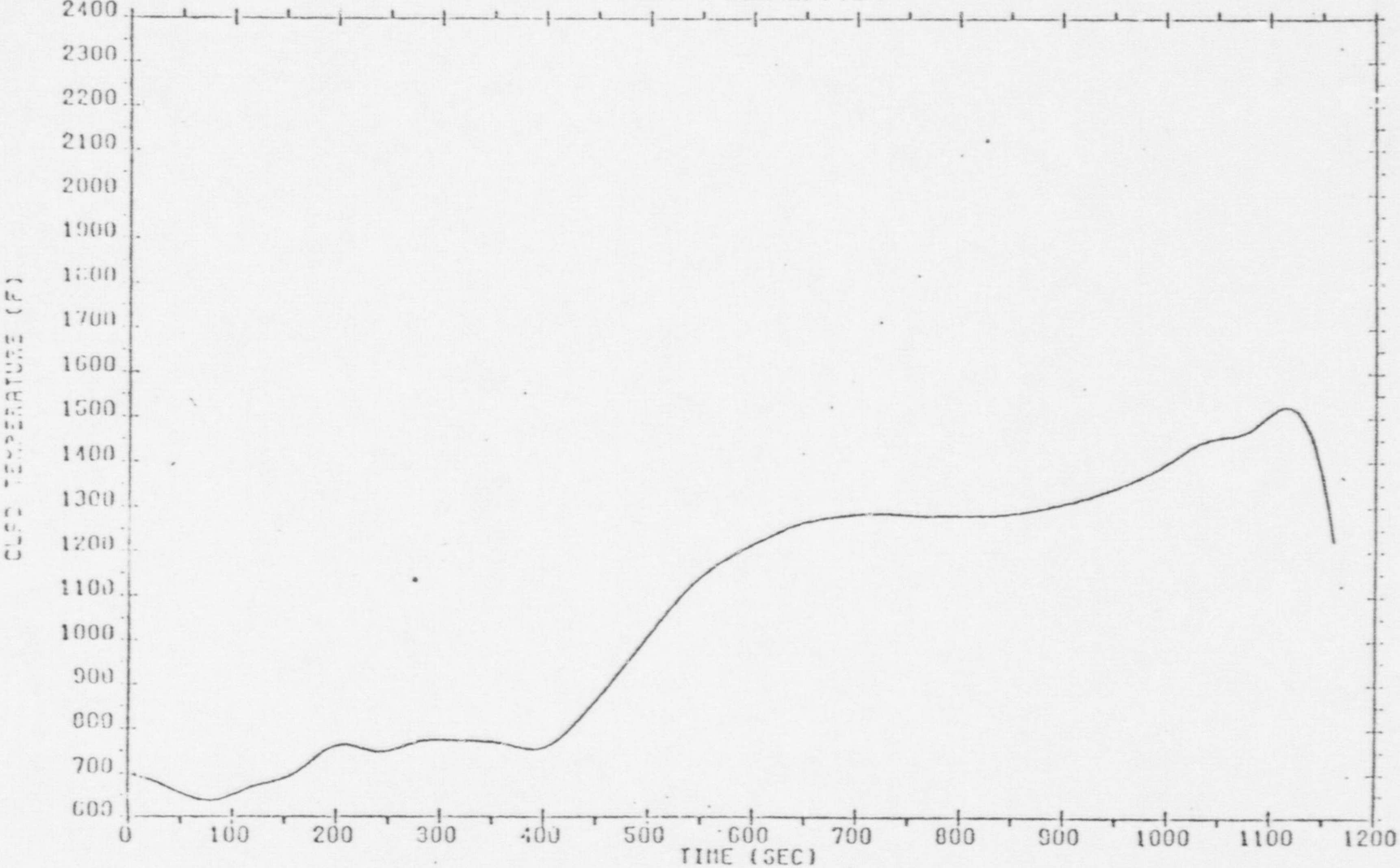
YR CORE 13 SBGK LOCA ==2.25 INCH ID CLOW== 0. ERATOGRELAP4/003 12/14/7606 15/7

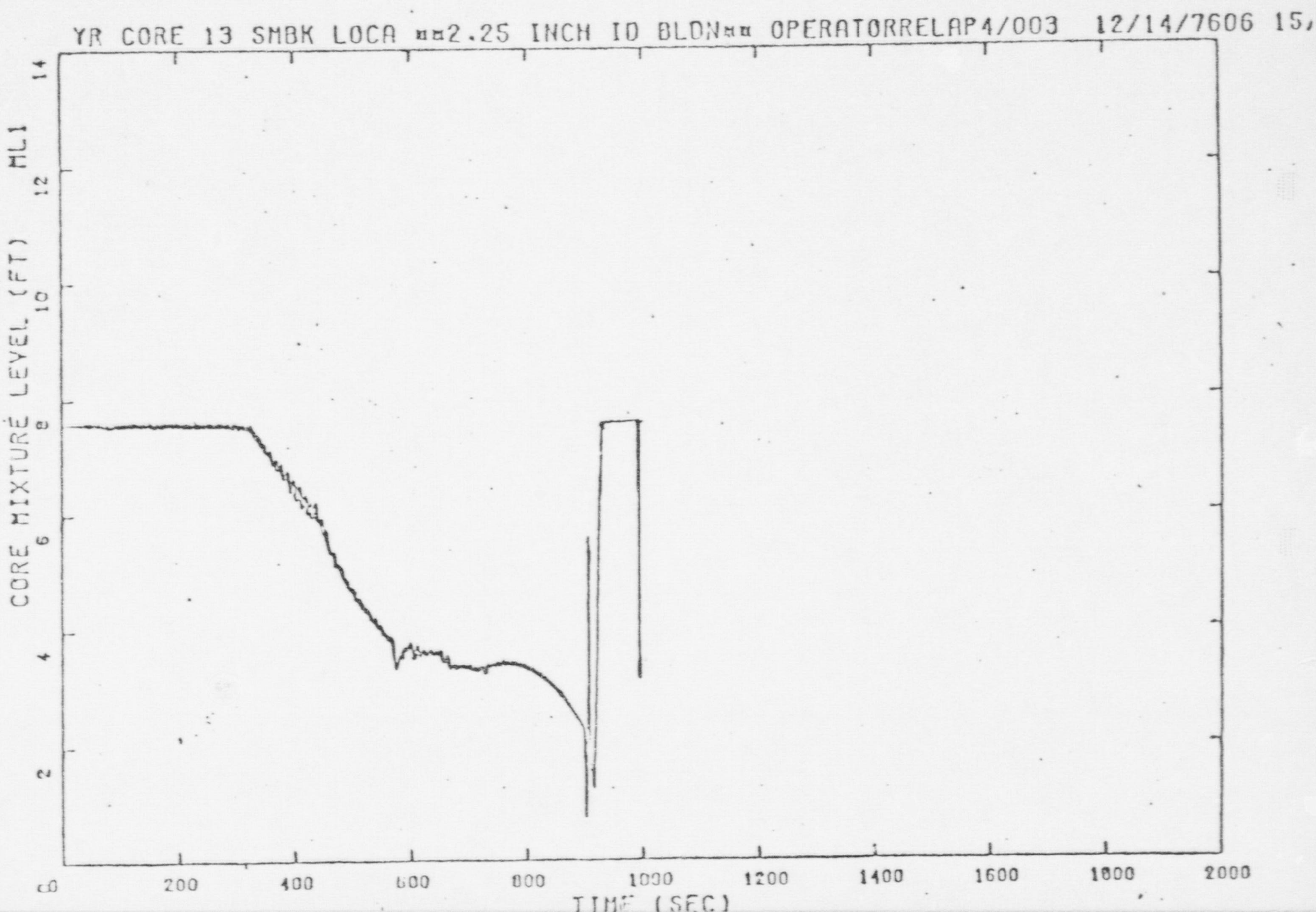


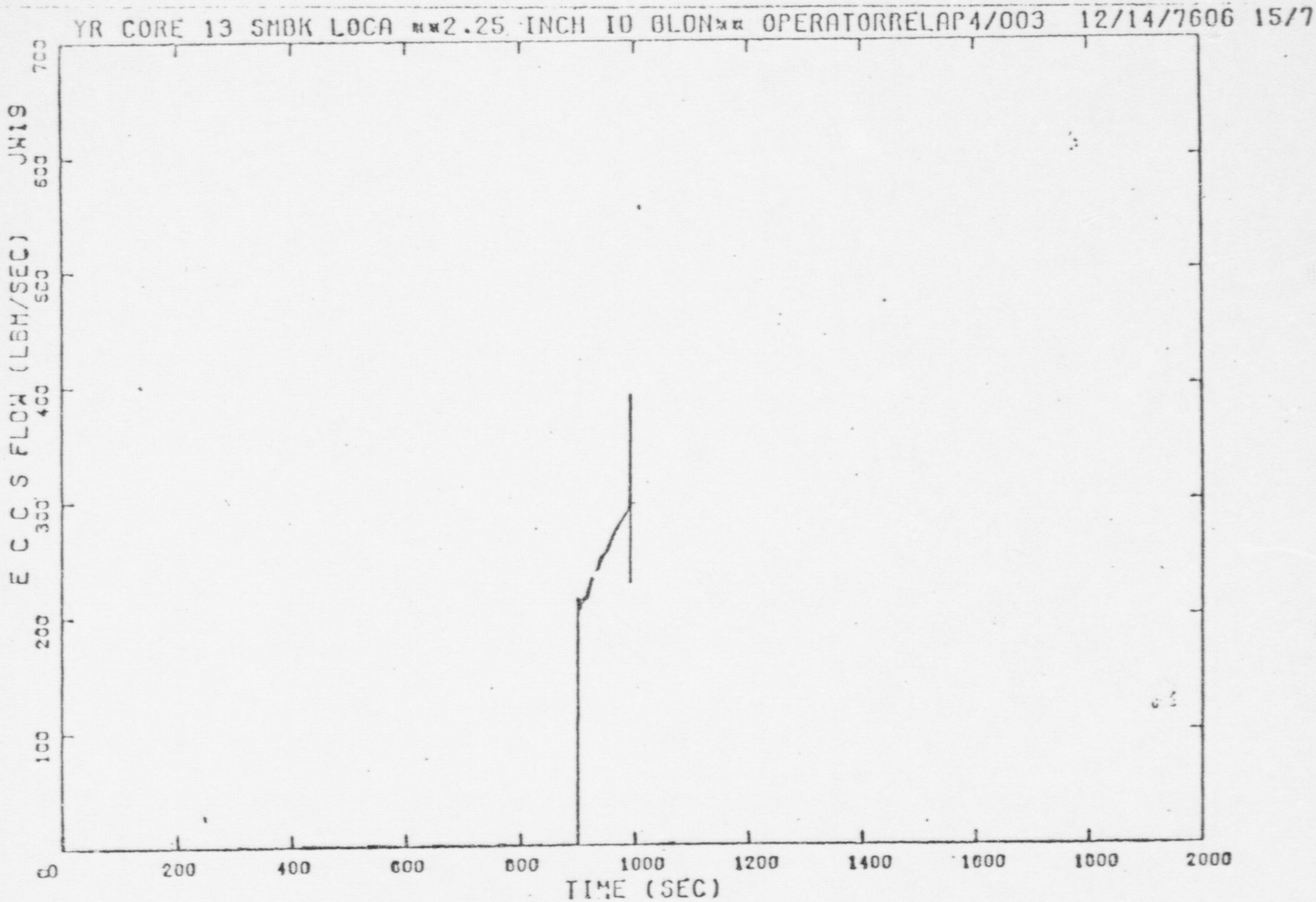


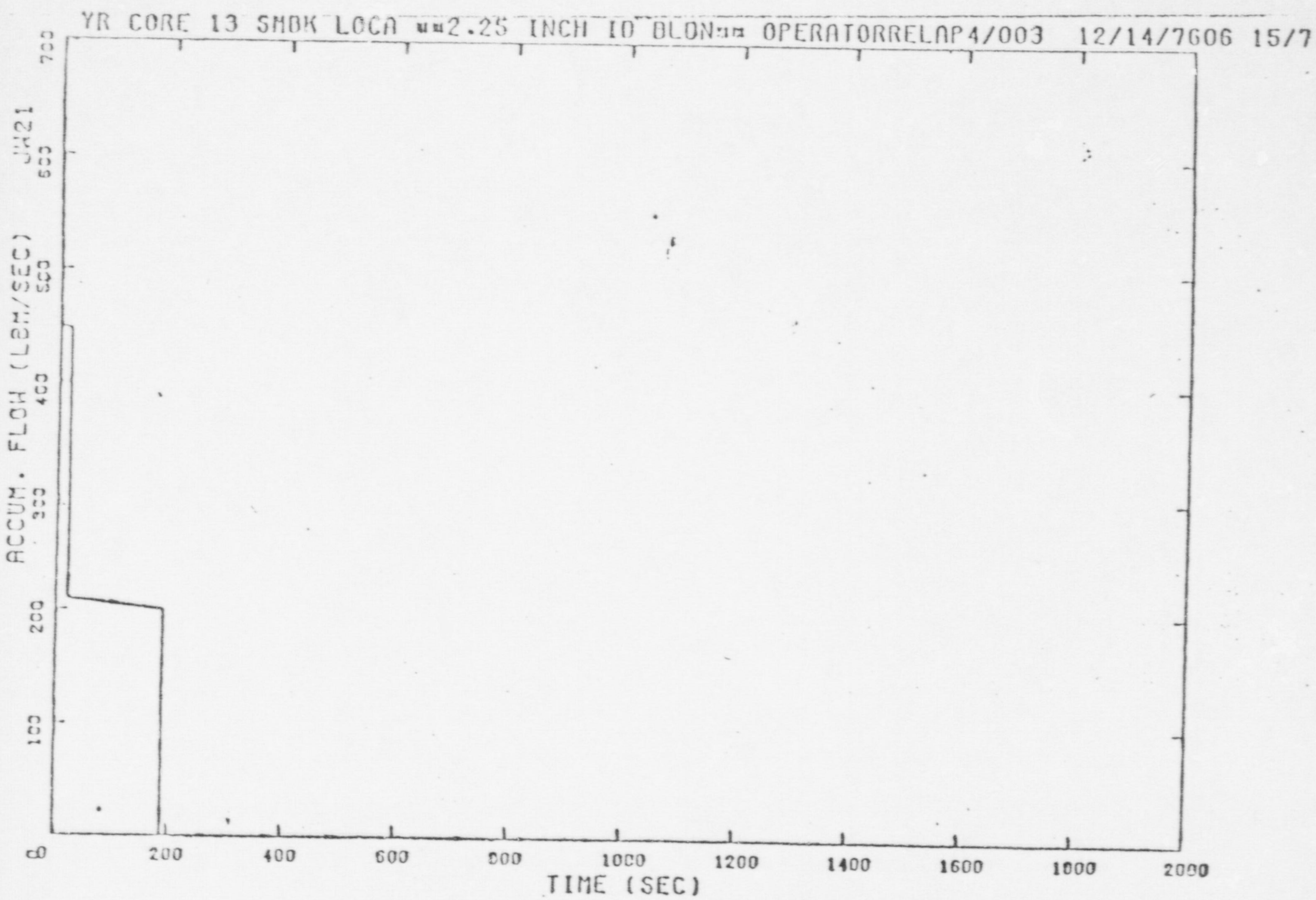
YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/003 12/14/7C05 16/7
ACCUMULATOR FLOW (LBM/SEC)
100
200
300
400
500
600
TIME (SEC)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

YANKEE ROWE CORE 12 PSEUDO-BEST ESTIMATE 2.25 ID SNBK
H =50.0 BTU/HR-FT2-F

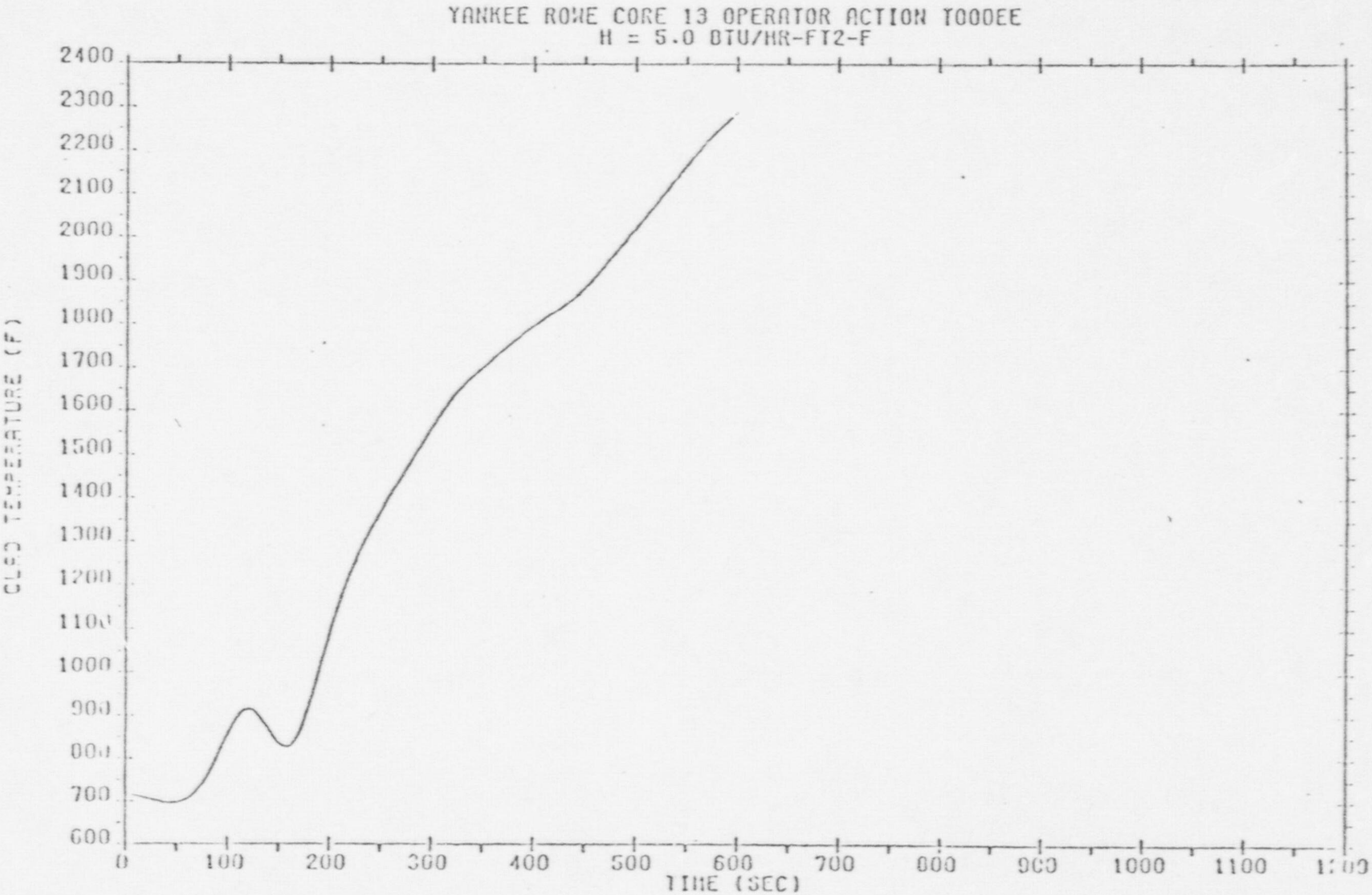



YR CORE 13 SMBK LOCA ¤¤2.25 INCH ID BLDN¤¤ OPERATORRELAP4/003 12/14/7606 15,
CORE MIXTURE LEVEL (FT) ML1
14
12
10
8
6
4
2
0
200
400
600
800
1000
1200
1400
1600
1800
2000
TIME (SEC)

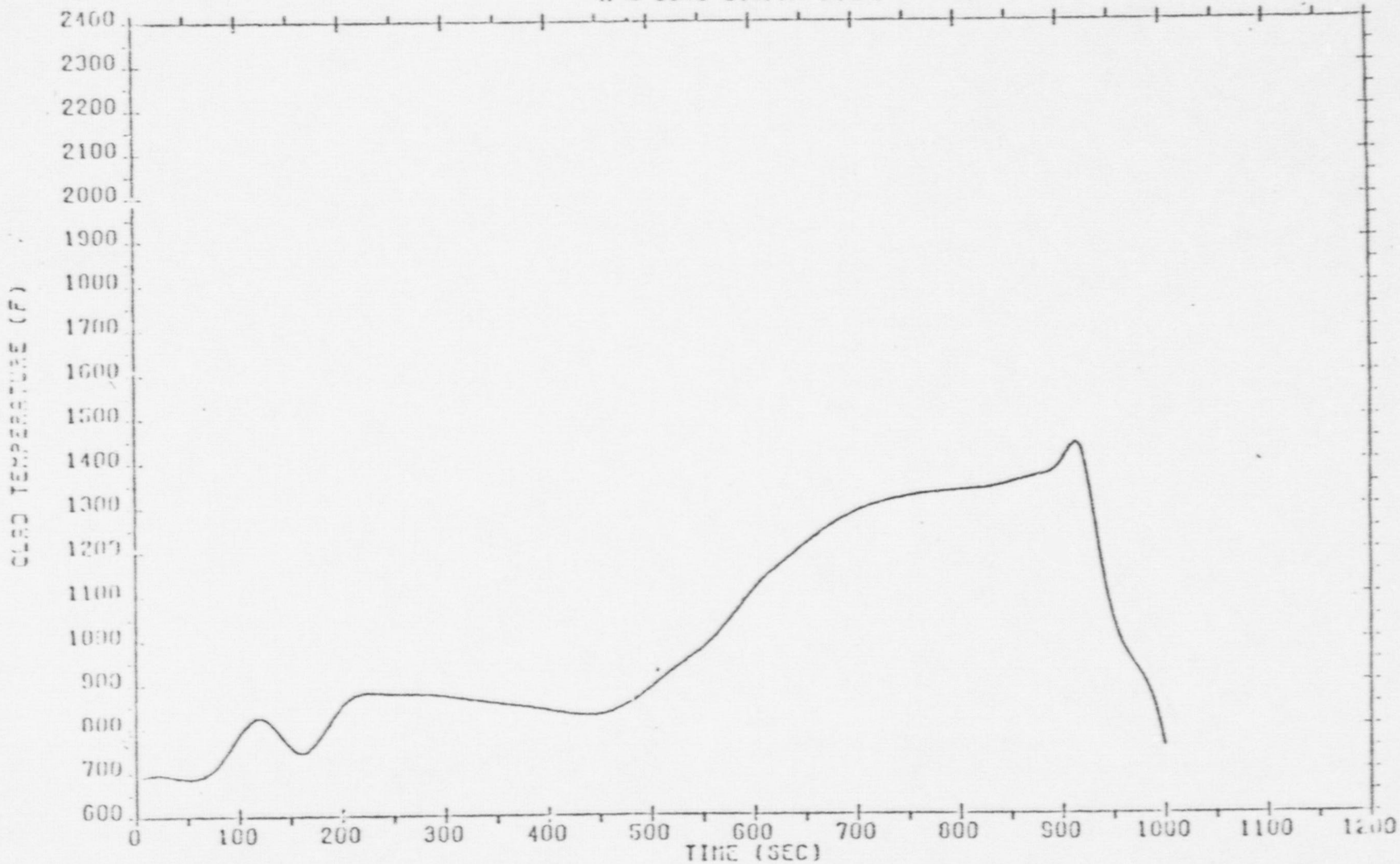

YR CORE 13 SMBK LOCA **2.25 INCH ID BLON** OPERATORRELAP4/003 12/14/7606 15/7
JW19
E C C S FLOW (LBM/SEC)
0
100
200
300
400
500
600
700
200
400
600
800
1000
1200
1400
1600
1800
2000
TIME (SEC)



YR CORE 13 SMDK LOCA **2.25 INCH ID BLON** OPERATORRELAP4/003 12/14/7606 15/7
ACCUM. FLOW (LBM/SEC)
JW21
TIME (SEC)
0
100
200
300
400
500
600
700
800
1000
1200
1400
1600
1800
2000


YANKEE ROWE CORE 13 OPERATOR ACTION T000EE
H = 5.0 BTU/HR-FT2-F
CLAD TEMPERATURE (F)
TIME (SEC)
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1000
900
700
600
0
100
200
300
400
500
600
700
800
900
1000
1100

YANKEE ROWE CORE 13 OPERATOR ACTION TOODEE
H = 30.0 BTU/HR-FT2-F



ECCS PERFORMANCE VERIFICATION TESTS

OJBECT:

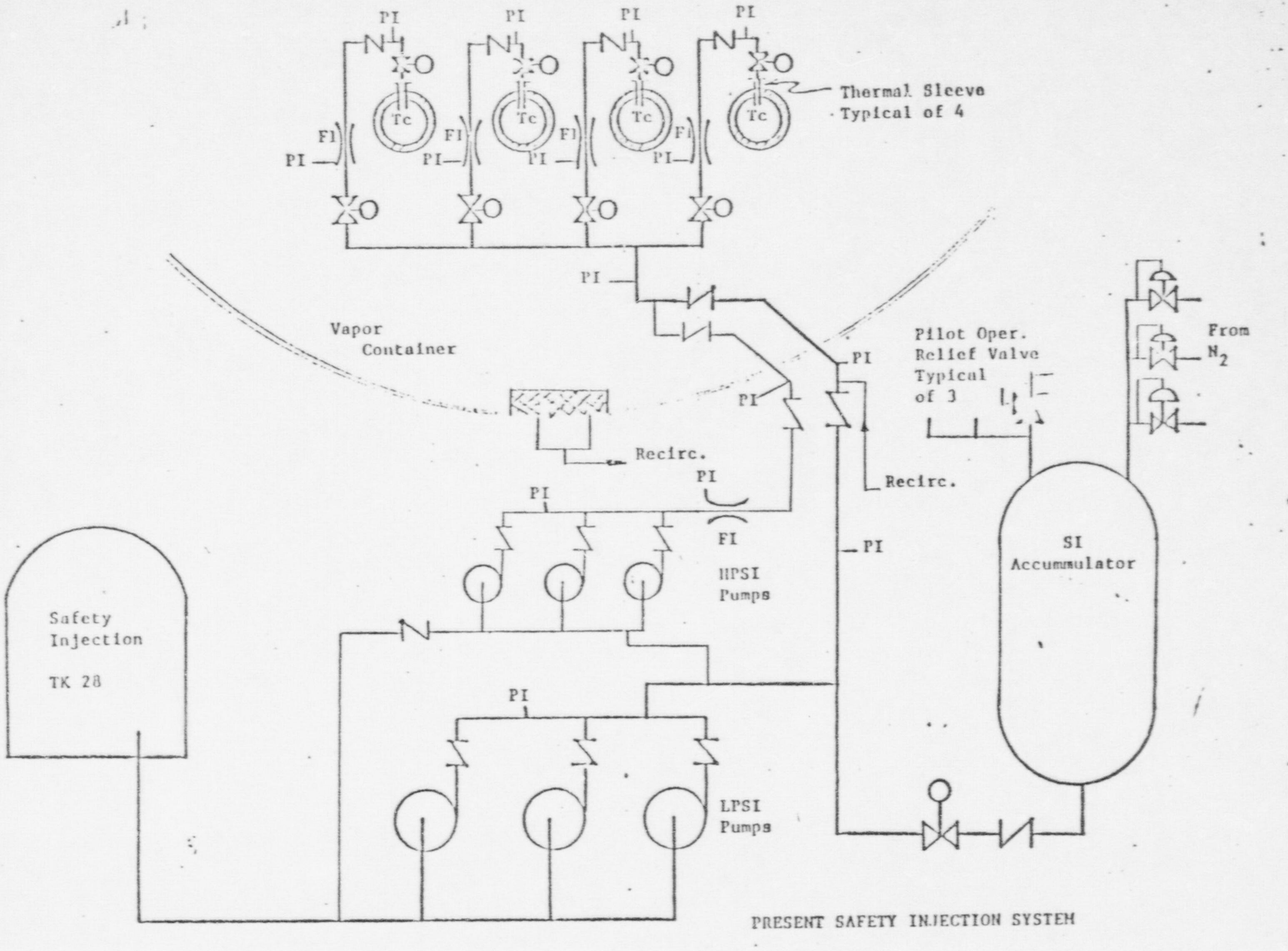
1. VERIFY SYSTEM RESISTANCE CALCULATIONS.
2. VERIFY PUMP CHARACTERISTICS.
3. SIMULATE WORST SMALL BREAK ACCIDENT AS REALISTICALLY AS IS FEASIBLE.

METHOD:

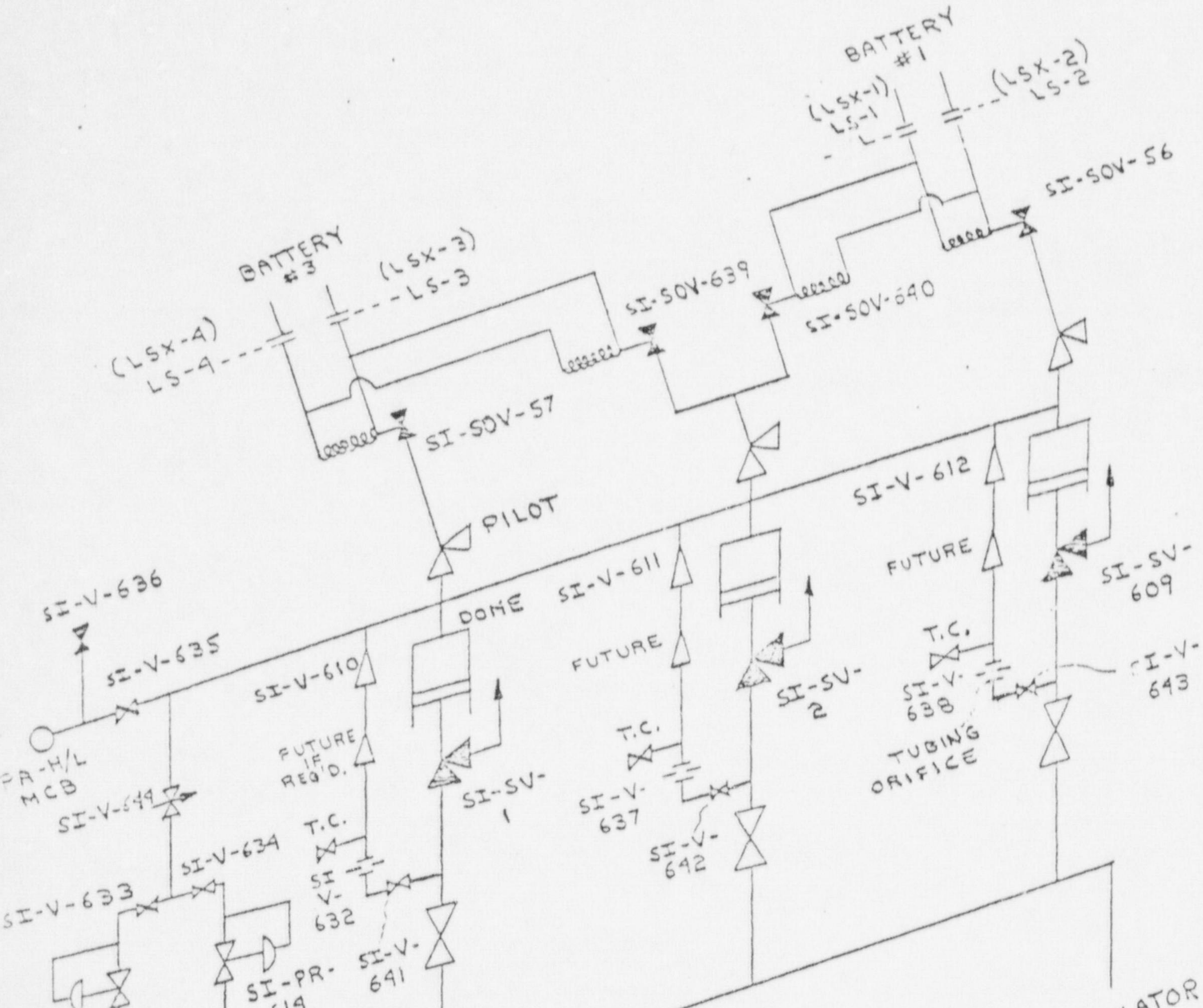
1. VARIOUS PUMP COMBINATIONS AND FLOW PATHS WILL BE USED. ADDITIONAL INSTRUMENTATION WILL BE ADDED AS REQUIRED.

TESTS:

1. TWO TRAINS (HPSI & LPSI PUMPS) INJECTING TO LOOP #2 ONLY.
2. THREE TRAINS (HPSI & LPSI PUMPS) INJECTING TO LOOP #2 ONLY.
3. TWO TRAINS INJECTING TO 3 OR 4 LOOPS.
4. THREE TRAINS INJECTING TO 3 OR 4 LOOPS.



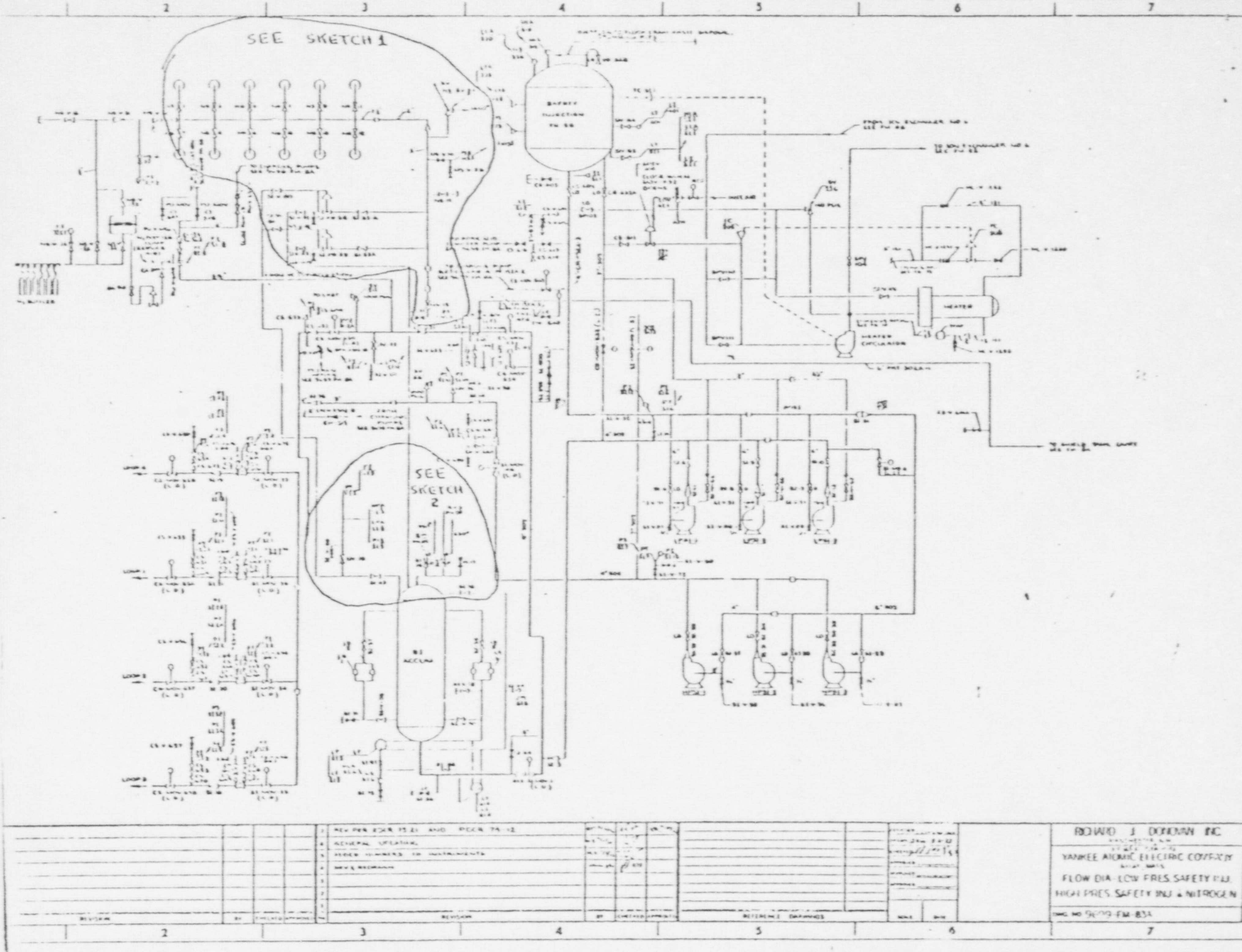
PRESENT SAFETY INJECTION SYSTEM

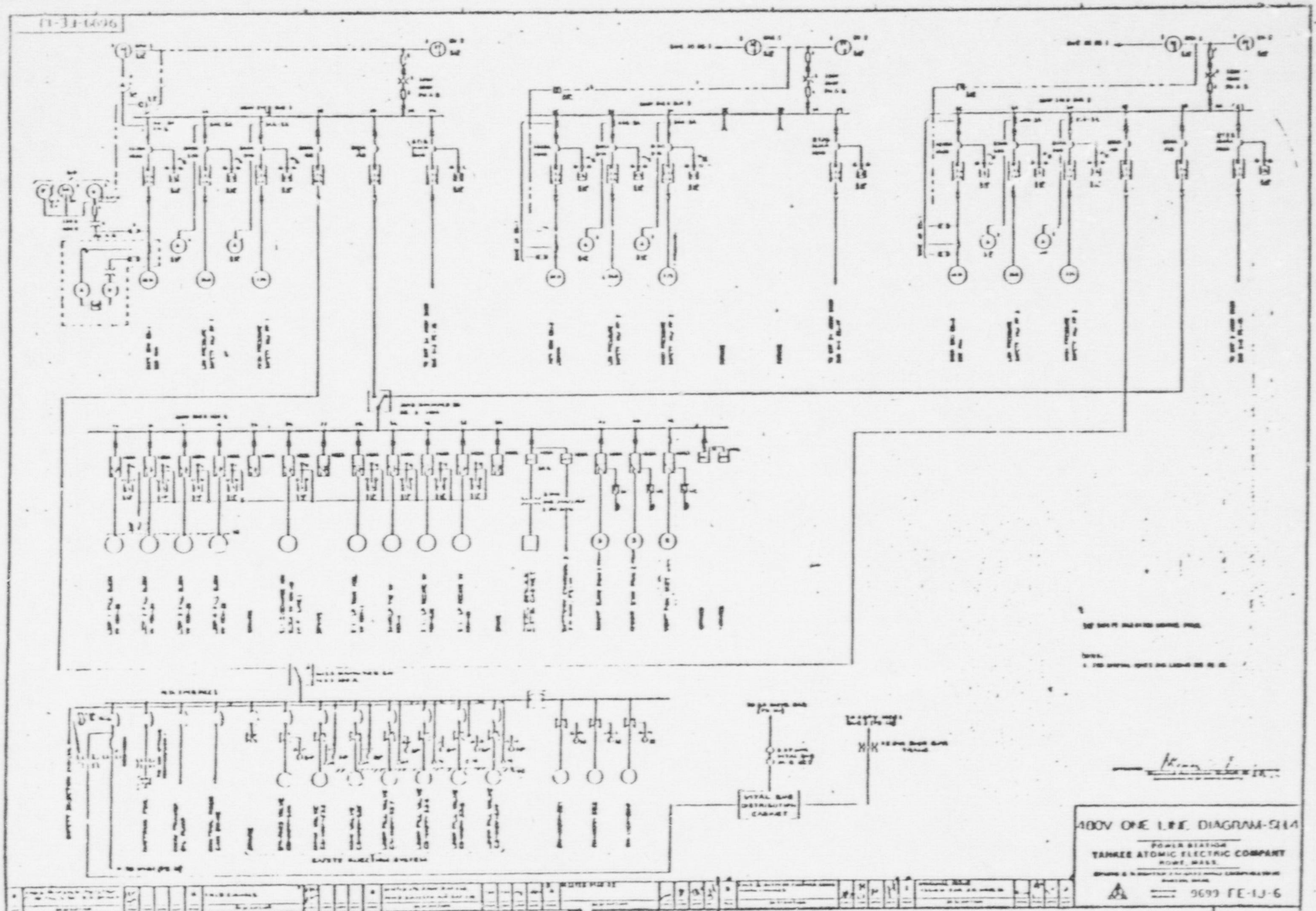


SK-2

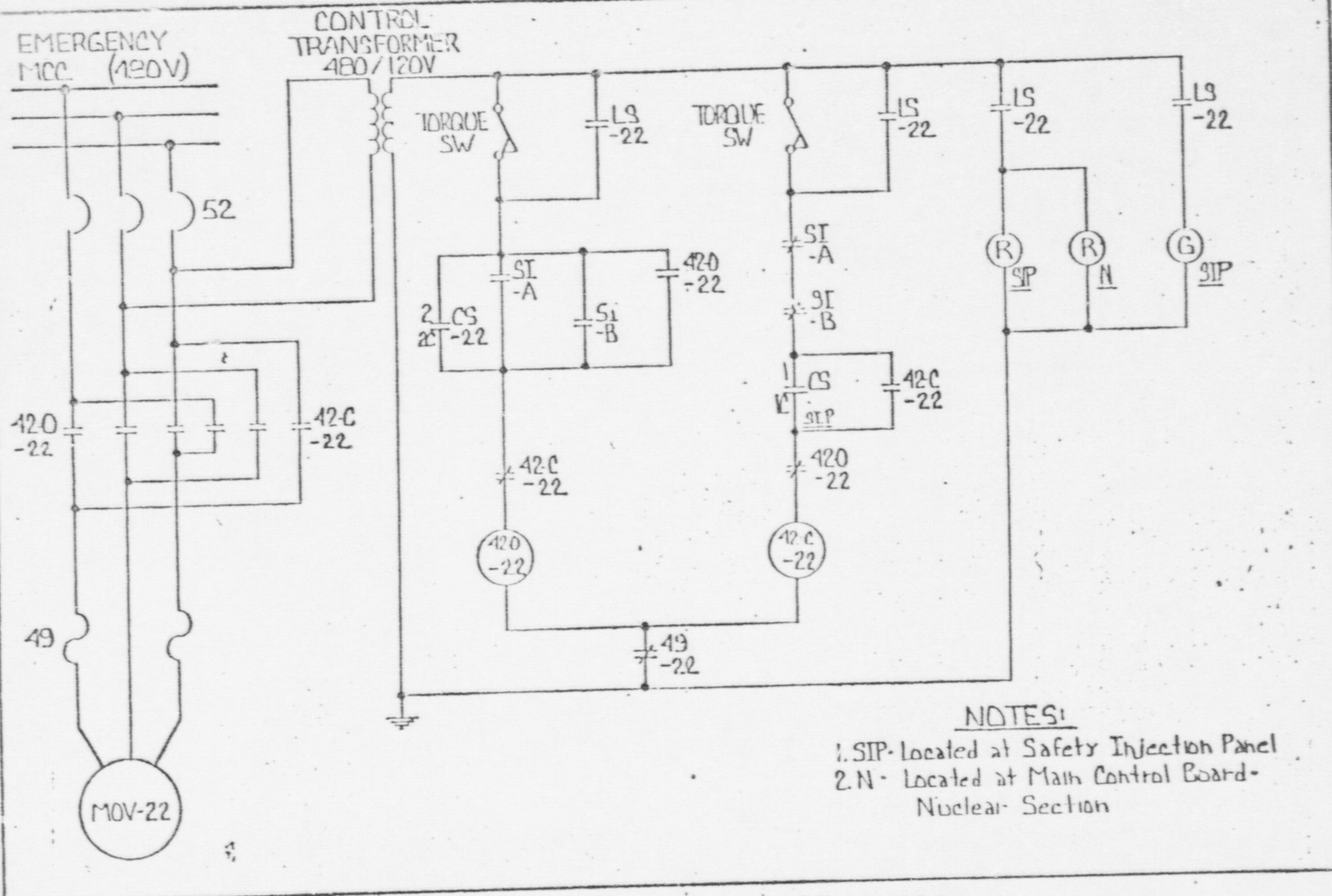
REVISED 5/9/77

P.A. Rawnis


SEE SKETCH 1
SEE SKETCH 2
SAFETY INJECTION TK-58
HEATER
HEATER CIRCULATOR
ACCUM
LOOP 1
LOOP 2
LOOP 3
LOOP 4
REV PER EDCR 73-21 AND PDCR 74-12
GENERAL UPDATING
REVISION
REFERENCE DRAWINGS
RICHARD J. DONOVAN INC.
YANKEE ATOMIC ELECTRIC COMPANY
FLOW DIA. LOW PRES. SAFETY INJ.
HIGH PRES. SAFETY INJ. & NITROGEN
DWG NO 9699-FM-83A



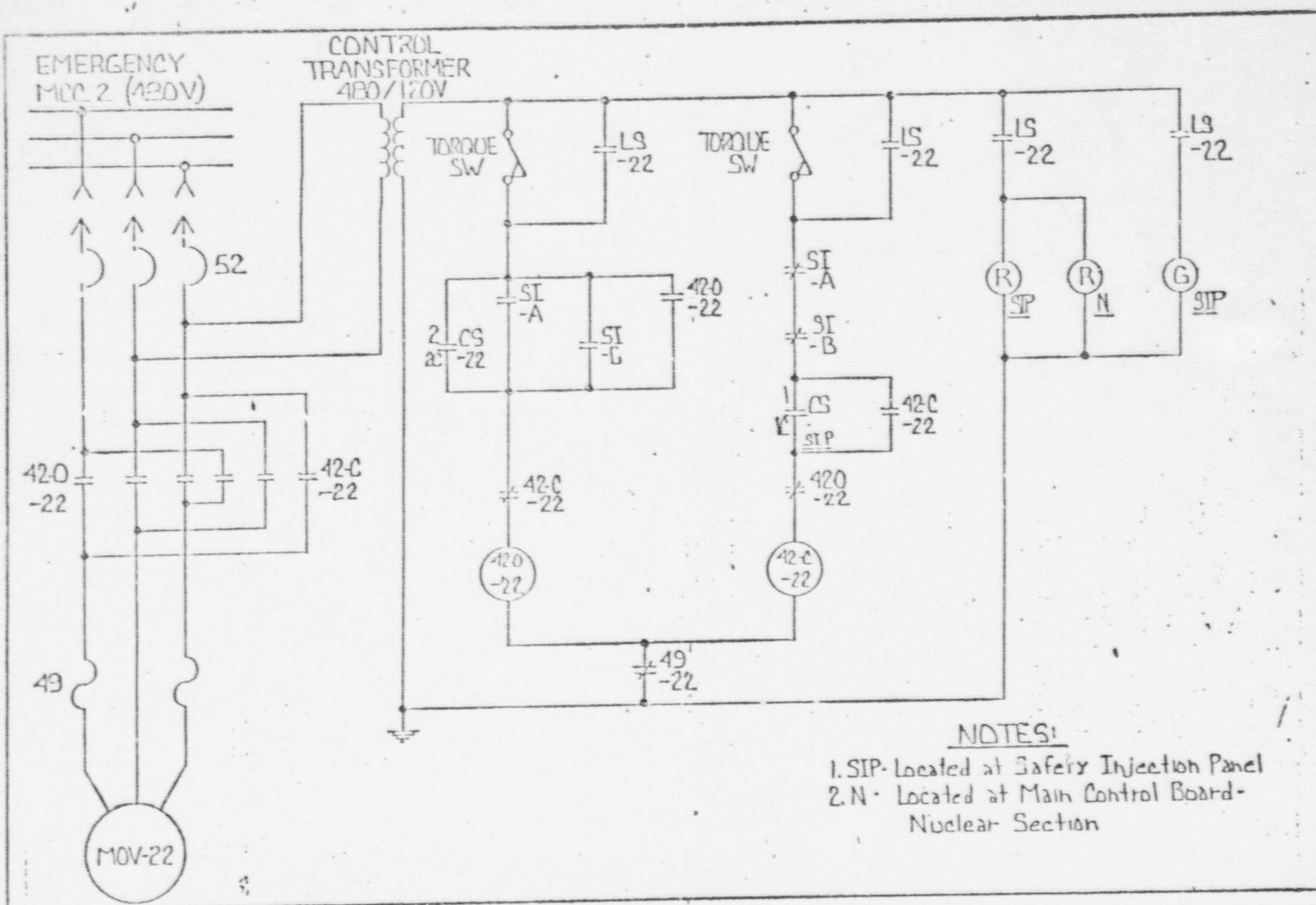
YANKEE NUCLEAR POWER STATION	480V ONE LINE DIAGRAM	FIGURE 8.3-1



NOTES:

1. SIP- Located at Safety Injection Panel
2. N - Located at Main Control Board- Nuclear Section

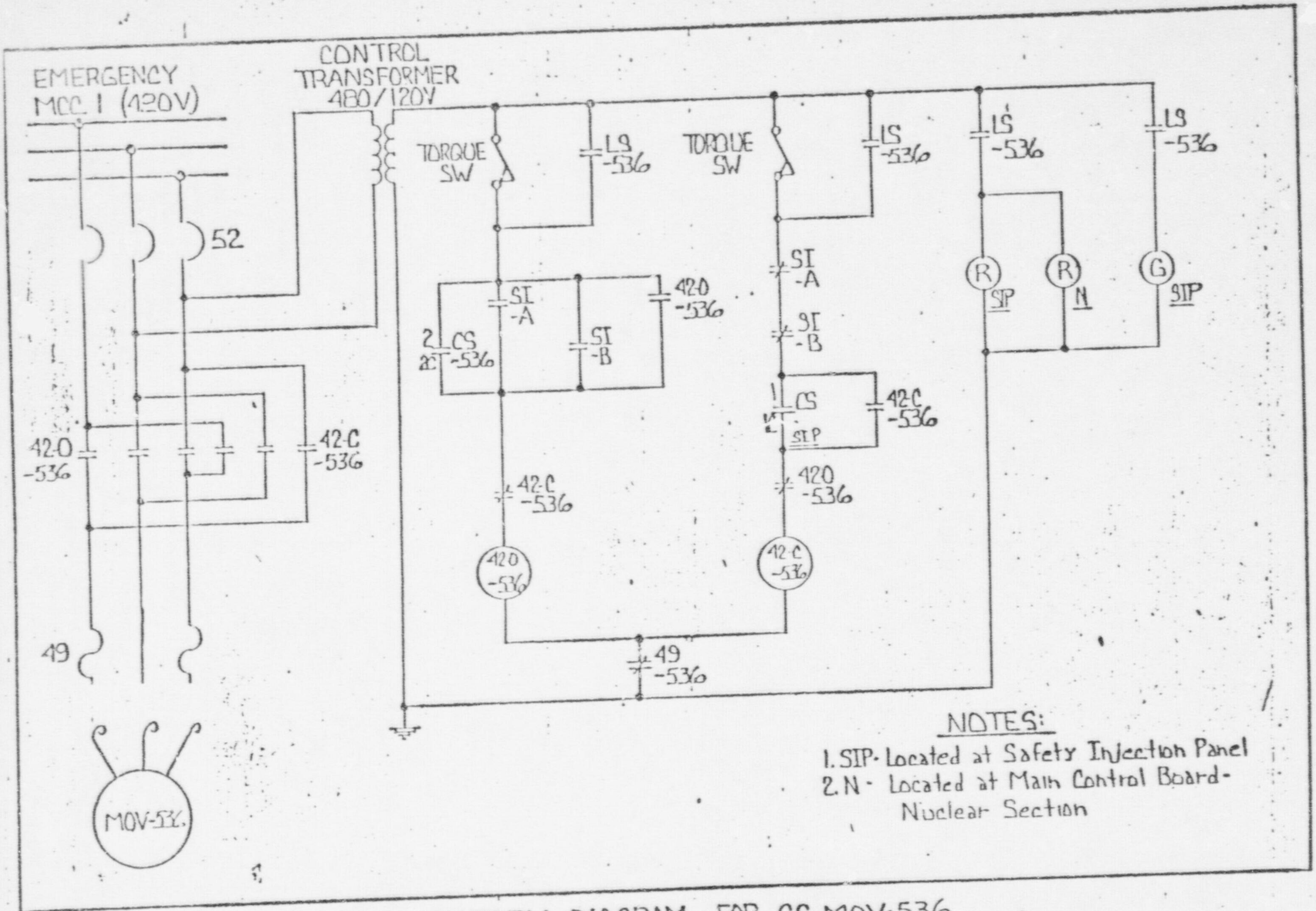
ELEMENTARY DIAGRAM FOR SI-MOV22
SIMILAR FOR SI-MOV 23, SI-MOV24, SI-MOV25, CS-MOV536, CS-MOV537, CS-MOV538, CS-MOV539



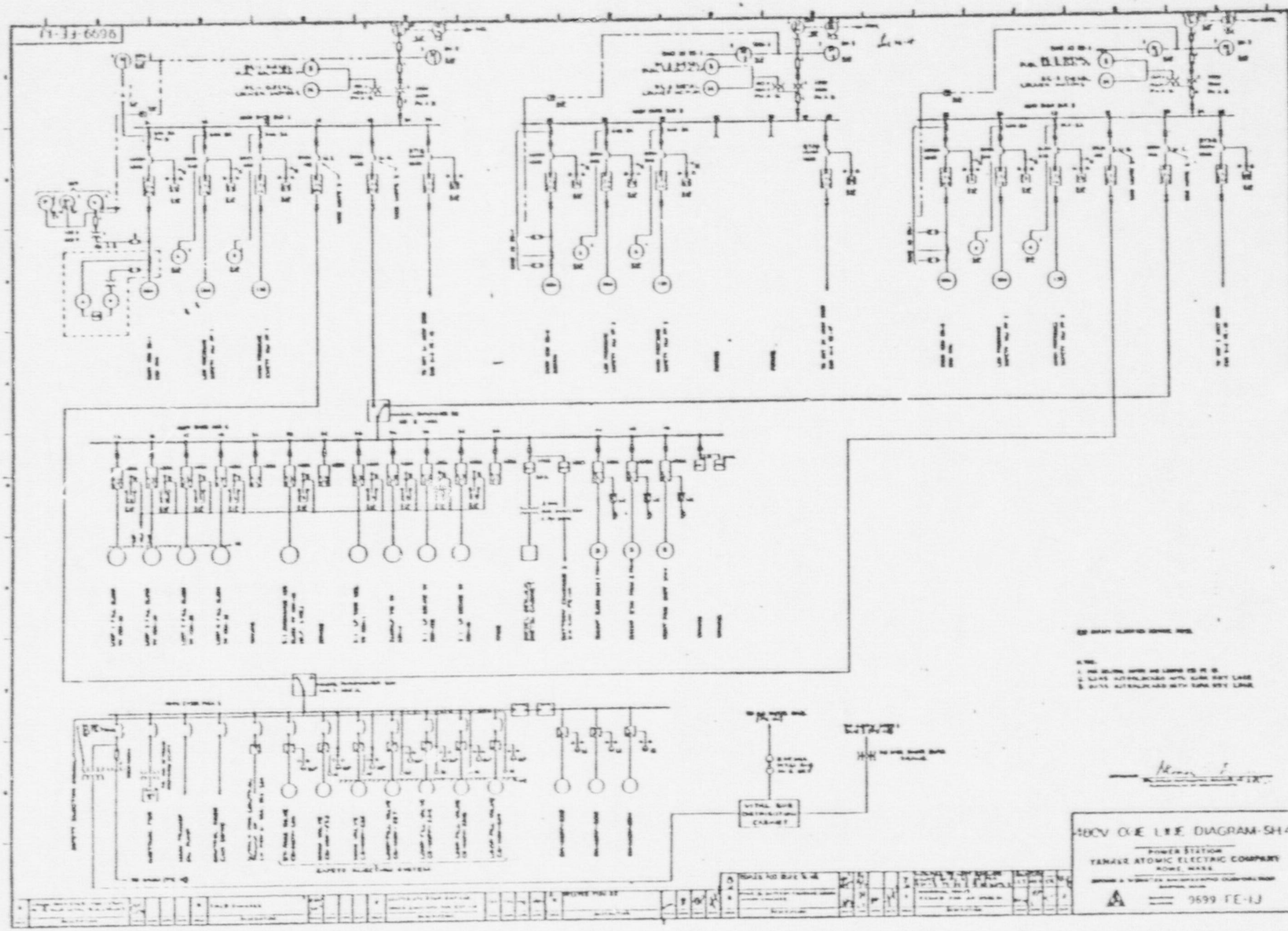
NOTES:

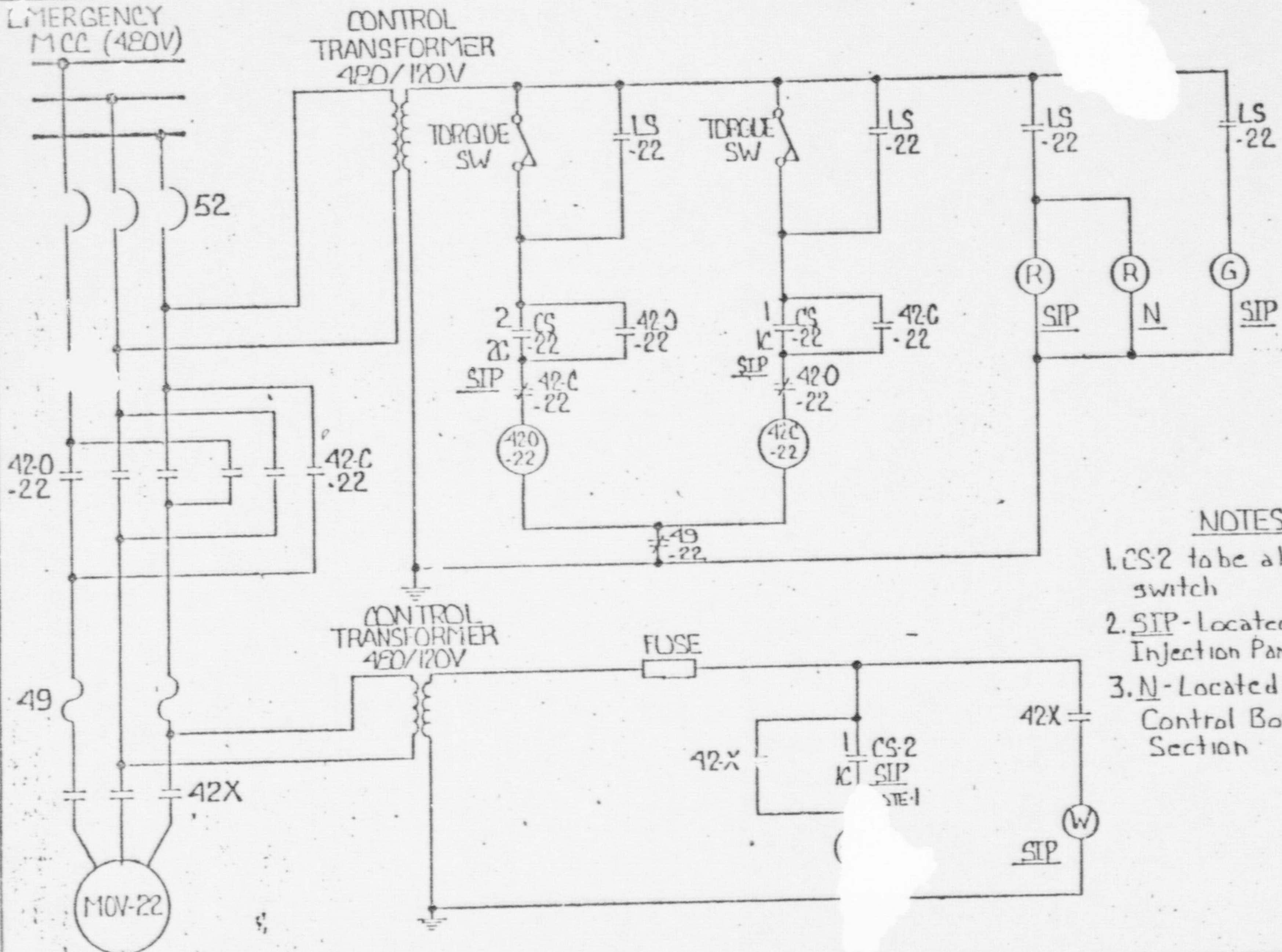
1. SIP- Located at Safety Injection Panel
2. N - Located at Main Control Board-
   Nuclear Section

ELEMENTARY DIAGRAM FOR SI-MOV22
SIMILAR FOR SI MOV 23, 24, & 25



ELEMENTARY DIAGRAM FOR CS MOV-536
SIMILAR FOR CS MOV-537, 538, 539


11-33-6698
480V ONE LINE DIAGRAM-SH 4
POWER STATION
YANKEE ATOMIC ELECTRIC COMPANY
ROWE, MASS.
9699-FE-1J



NOTES:

1. CS-2 to be a Keylocked switch
2. SIP - Located [illegible] Safety Injection Panel
3. N - Located at Main Control Board - Nuclear Section

ELEMENTARY DIAGRAM FOR SI-MOV 22

SIMILAR FOR SI-MOV 23, SI-MOV 24, SI-MOV 25, AND CS-MOV 536, CS-MOV-537, CS-MOV 538, CS-MOV 539

(8)

THE COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF THE ATTORNEY GENERAL

JOHN W. MC CORMACK STATE OFFICE BUILDING
ONE ASHBURTON PLACE, BOSTON 02108

FRANCIS X. BELLOTTI
ATTORNEY GENERAL

July 22, 1977

Mr. Edson G. Case
Director of Regulation
U.S. Nuclear Regulatory
 Commission
Washington, D.C. 20555

Dear Mr. Case:

We recently learned that the shutdown of the Yankee Atomic nuclear power plant in Rowe, Massachusetts, involves substantially more than a normal refueling. In pursuing this matter, persons from this staff have spoken with Mr. Fred Burger, the Project Manager, and Messrs. Eldon Brunner, Burt Davis, and Bill Lazarus at N.R.C. in King of Prussia, Pennsylvania. They indicated their intention to send this office the available written material including meeting minutes and accident analyses reports. This letter will confirm our request for that information.

It is my understanding, based on the conversations with these gentlemen, that Yankee Atomic was shut down during a "coast-down," a few weeks before a scheduled refueling. The "problem" has been described to us as an Emergency Core Cooling System condition that had not been considered in the evaluation of ECCS effectiveness. Apparently the omission was discovered during a routine re-fueling analysis.

Certain questions surrounding this incident continue to concern us. Primarily, I am interested in understanding the problem at the Rowe plant from a layperson's perspective, how it happened and what steps are being taken to correct it. I hope that you can clarify the situation for me by answering the following questions:

(1) What, precisely, is the nature of the situation which resulted in the plant shutdown? Is it a violation of, or nonconformity with, any N.R.C. regulations?

(2) Yankee Atomic was preparing for Core 13. Presumably, therefore, several pre-refueling analyses were prepared in the past. Why did this situation go undiscovered until so recently?

(3) What, precisely, is being undertaken to remedy this situation? We were told that some computer tests are being done

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and that some piping is being modified. Are the entire ECCS and other safety systems being reanalyzed in a search for other "omissions?" Are other design or equipment modifications necessary?

(4) Mr. Burger explained that Yankee Atomic shut down because it was the prudent thing to do but that it could have operated, at least until refueling, at a lower power level. Yankee Atomic was at 68% capacity when it shut down. At what level could it have safely operated, staying within NRC regulation specifications for heat rate?

(5) Will the plant be able to operate at its licensed power level after this problem is resolved, or will a license amendment be forthcoming?

(6) What is the relationship between the computer analysis and the piping modifications, both of which are apparently being undertaken now? Is the computer analysis intended to test the effectiveness of the ECCS as modified? If so, how can it be performed prior to completion of the changes in the ECCS?

I thank you in advance for your attention to this matter.

Very truly yours,

Ellyn R. Weiss

ELLYN R. WEISS
Assistant Attorney General
Environmental Protection Division
One Ashburton Place, 19th Floor
Boston, Massachusetts 02108
(617) 727-2265

ERW:JK

cc. Mr. Fred Burger
Project Manager

Thomas Merrigan, Esq.
Greenfield, Mass.

Mr. Eldon Brunner
U.S. N.R.C.
King of Prussia, Pa.