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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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POOR QUALITY PAGES

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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 the 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.

/S/

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

OFFICE ▶		DOR:ORB#1			
SURNAME ▶		ABurger:lb	CMTrammell		
DATE ▶		6/22/77			

POOR ORIGINAL

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

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 2 2 1977

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		

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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 separatior of the valves in question from thе break location, including the existence of barriers, precludes any d'rect 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

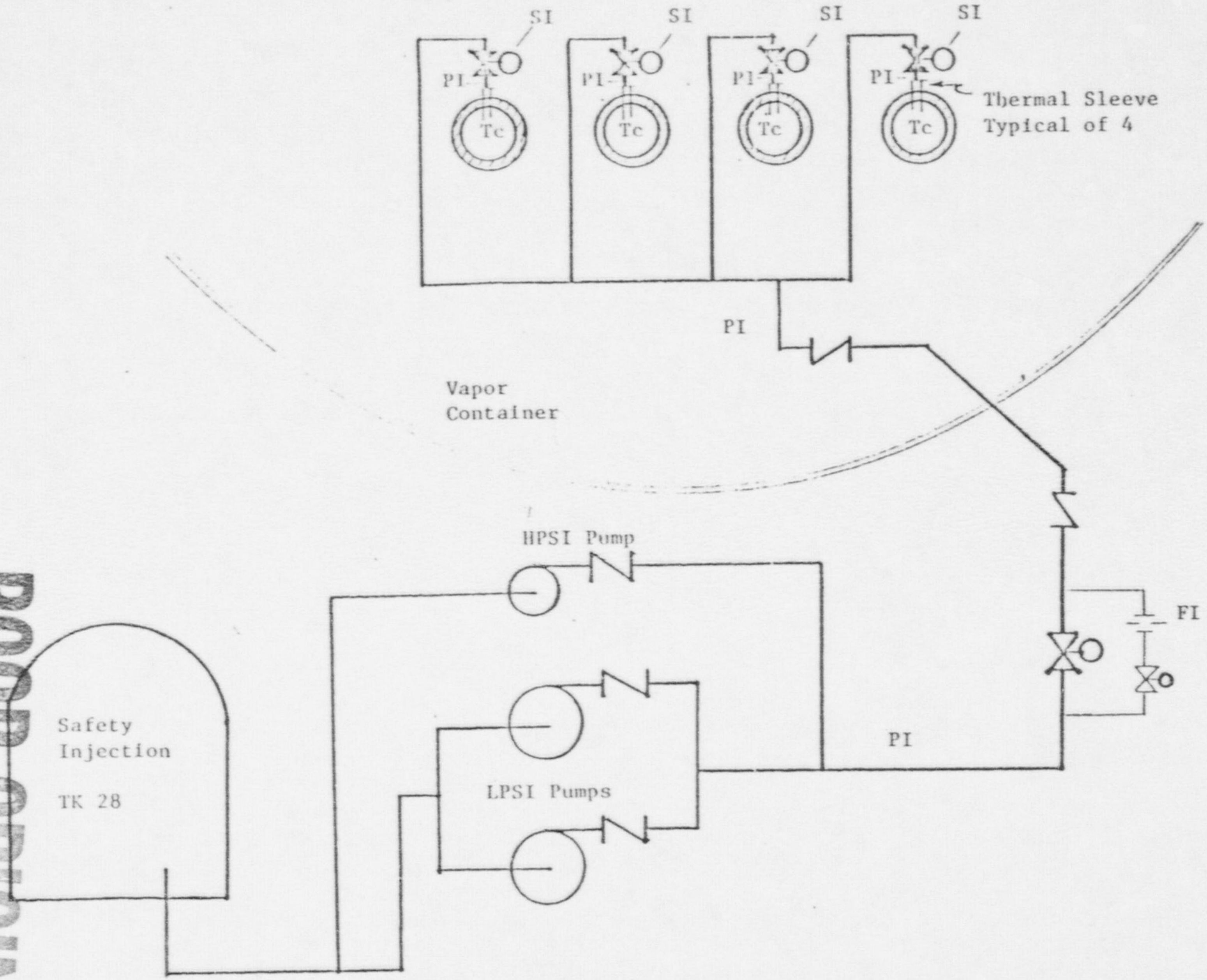
HISTORY

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

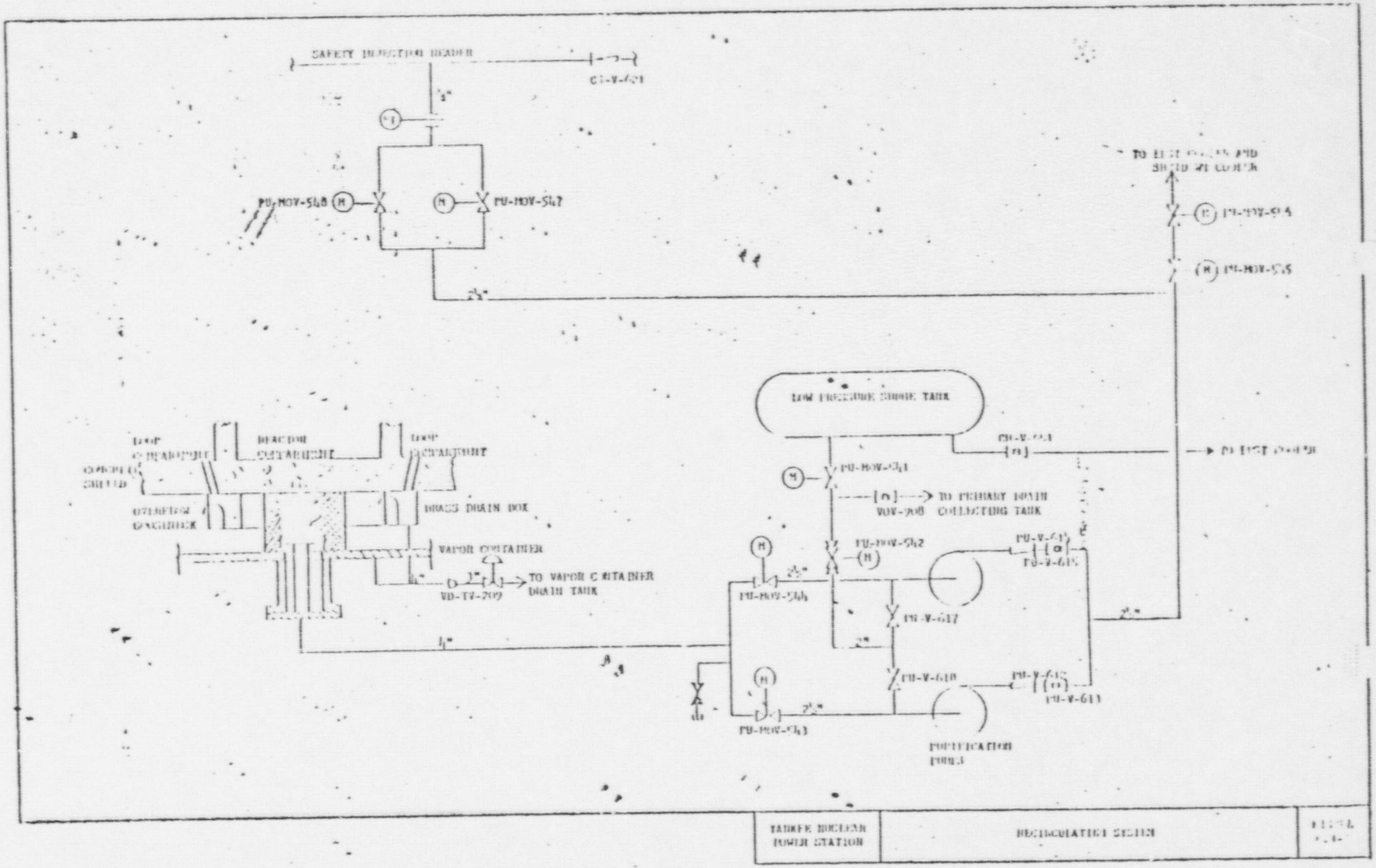
1. TWO LOW PRESSURE, HIGH VOLUME PUMPS.
2. CHARGING SYSTEM CONSISTING OF THREE 33 GPM POSITIVE DISPLACEMENT PUMPS PROVIDED HIGH PRESSURE INJECTION.
3. BACK UP POWER PROVIDED BY TWO OUTSIDE LINES.
4. SI PUMPS AND FILL HEADER ROOT VALVES OPENED AUTOMATICALLY ON SI SIGNAL.
5. OPERATOR ACTION REQUIRED TO 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


SAFETY INJECTION HEADER
PU-MOV-548
PU-MOV-547
TO ... AND SHIELD ... COOLER
LOW PRESSURE SURGE TANK
PU-MOV-541
VOV-908
TO PRIMARY DRAIN COLLECTING TANK
PU-MOV-542
PU-MOV-544
PU-V-617
PU-V-618
PU-MOV-543
PURIFICATION PUMPS
LOOP COMPARTMENT
REACTOR CONTAINMENT
CONCRETE SHIELD
OVERFLOW STANDPIPE
BRASS DRAIN BOX
VAPOR CONTAINER
TO VAPOR CONTAINER DRAIN TANK
VD-TV-209
YANKEE NUCLEAR POWER STATION
RECIRCULATION SYSTEM

C. OPERATOR ACTION WAS REQUIRED TO INITIATE RECIRCULATION.

CURRENT CONFIGURATION

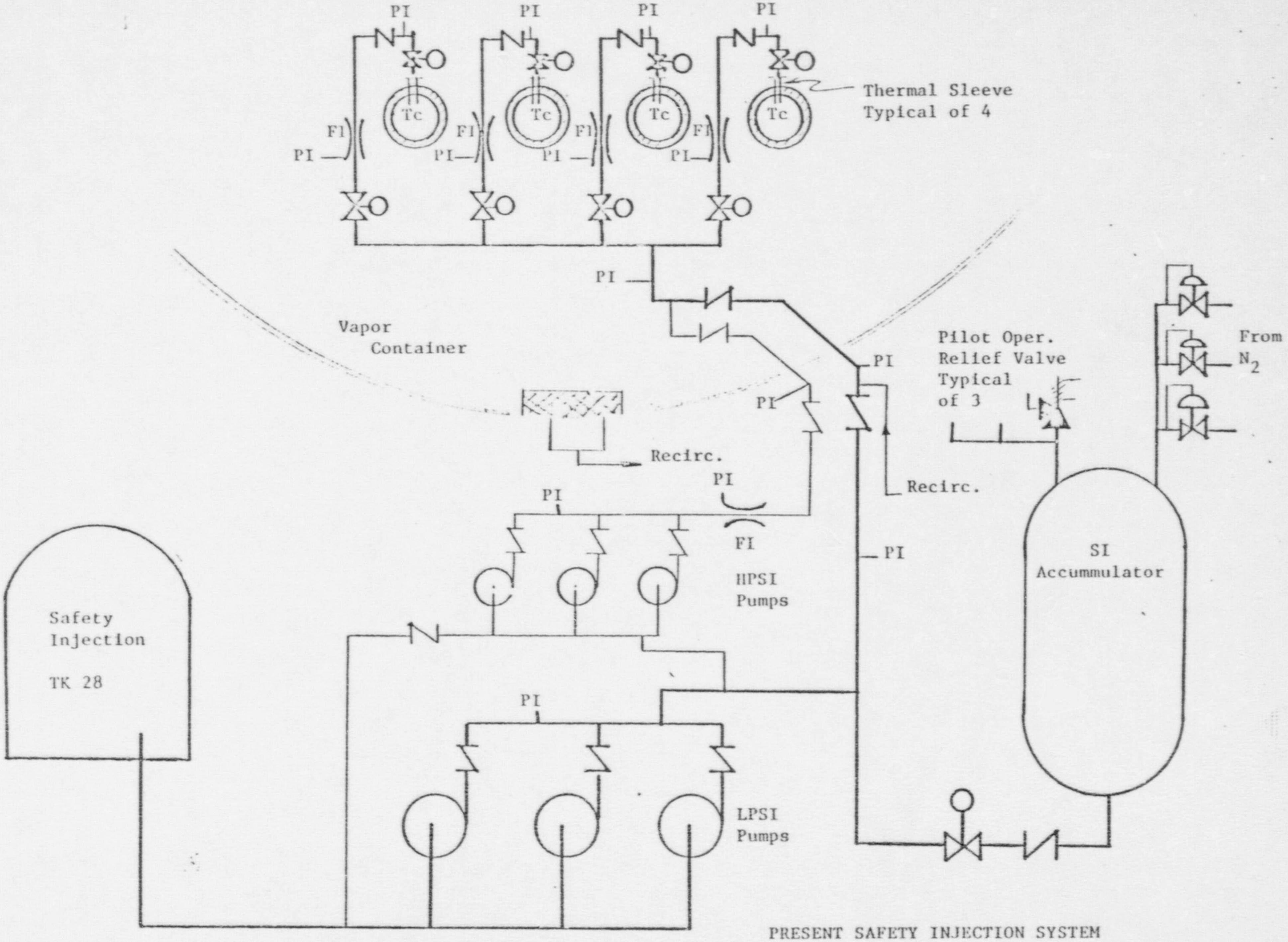
FEATURES

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 ACT' FAILURE.
4. INJECTION FLOW COMMENCES ON CS 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

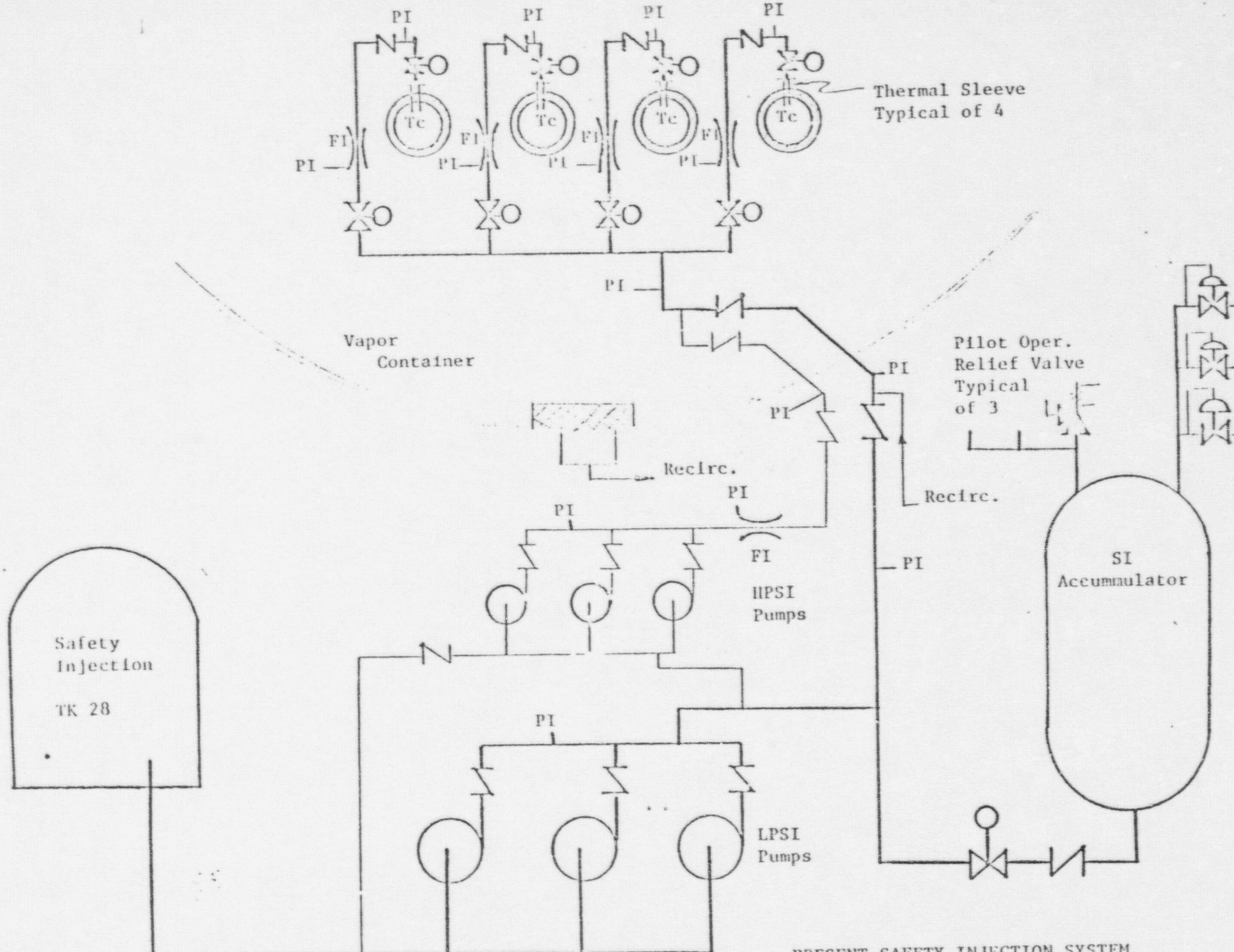
OPERATOR ERROR AND SPURIOUS FAILURE IN ACCORDANCE WITH THE INTENT OF BTP-18.

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

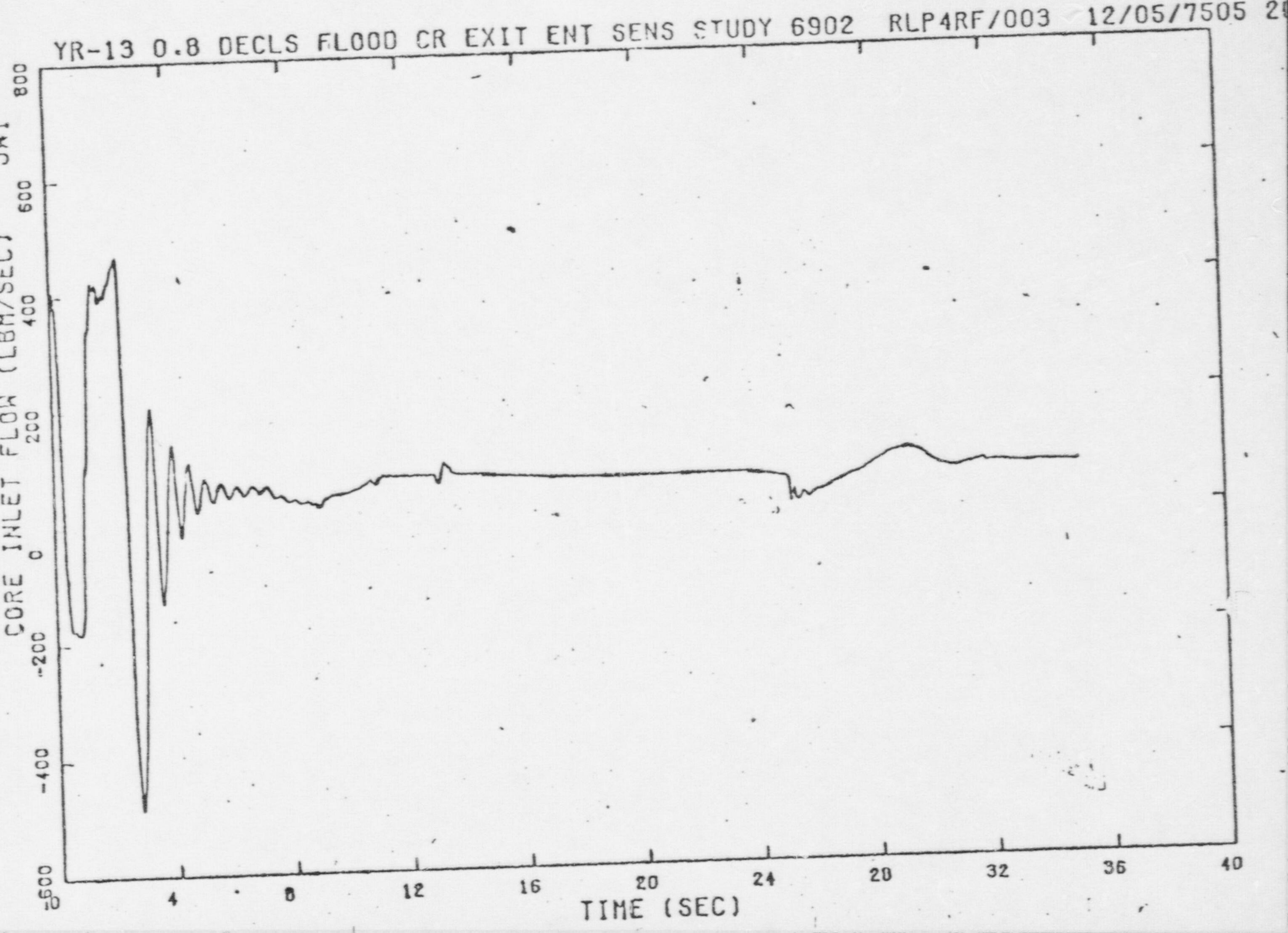
- LARGE BREAK ANALYSIS
  - ECC INJECTION DELAY
  - ALTERNATE DEFINITION FOR EOBY
    - BREAK SPECTRUM STUDY
    - BURN-UP STUDY
      - REFLOOD INSTABILITY FIX
- SMALL BREAK ANALYSIS
  - POOL BOILING HEAT TRANSFER
  - BREAK SPECTRUM STUDY
    - CORE 12 METHOD
    - CORE 13 (WORST BREAK LOCATION)
   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

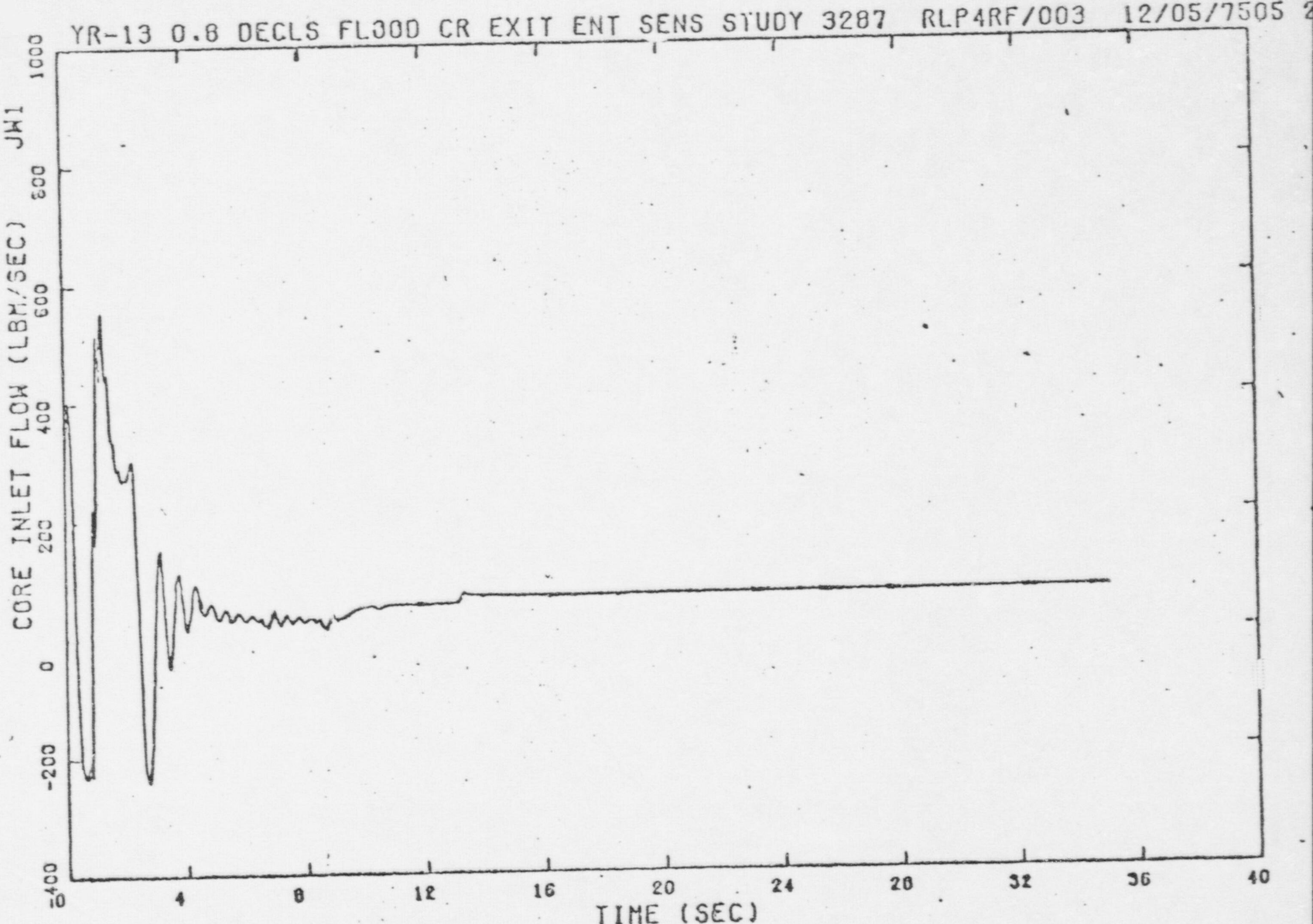
CORE 12

- 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 2
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)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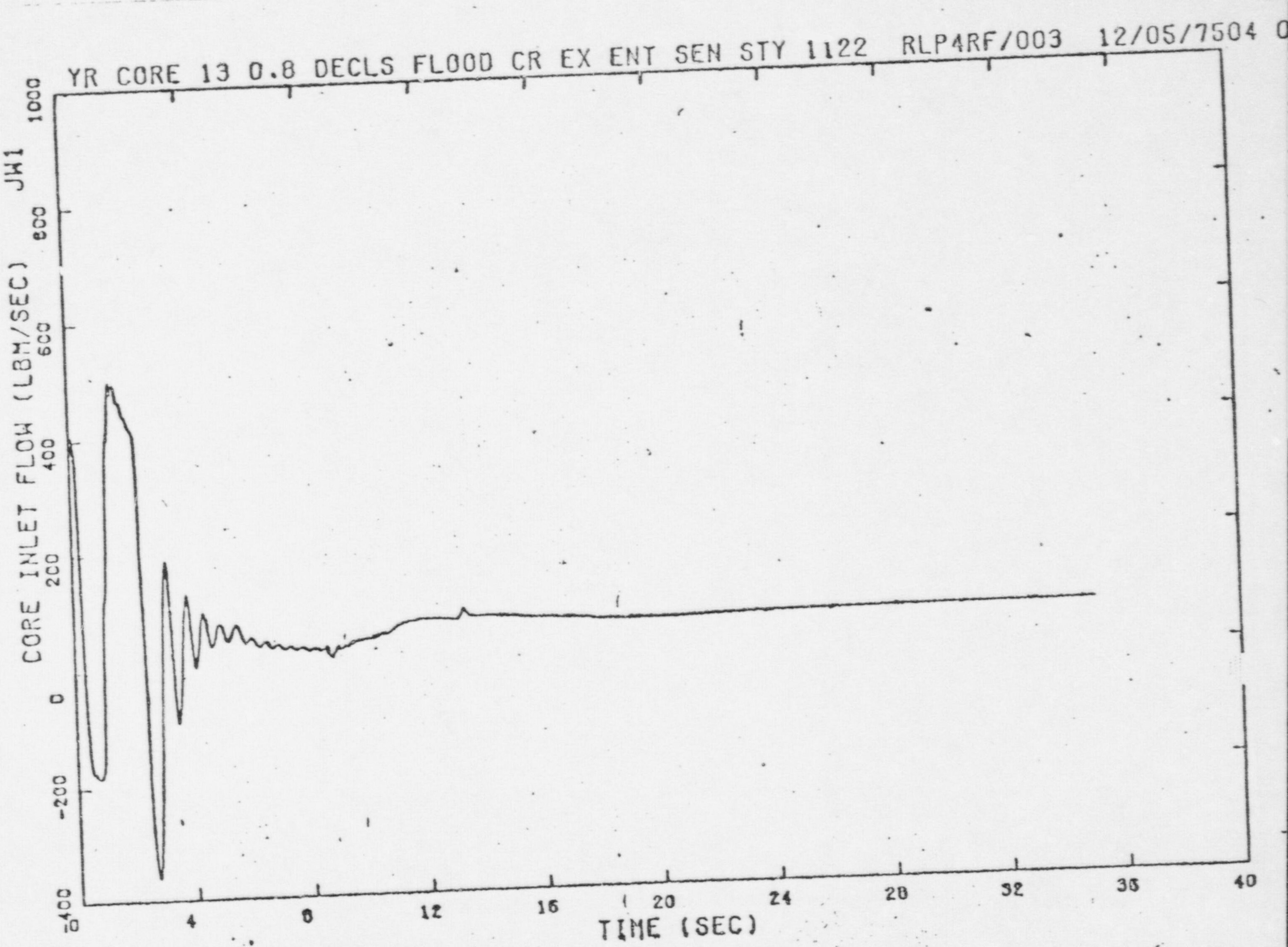
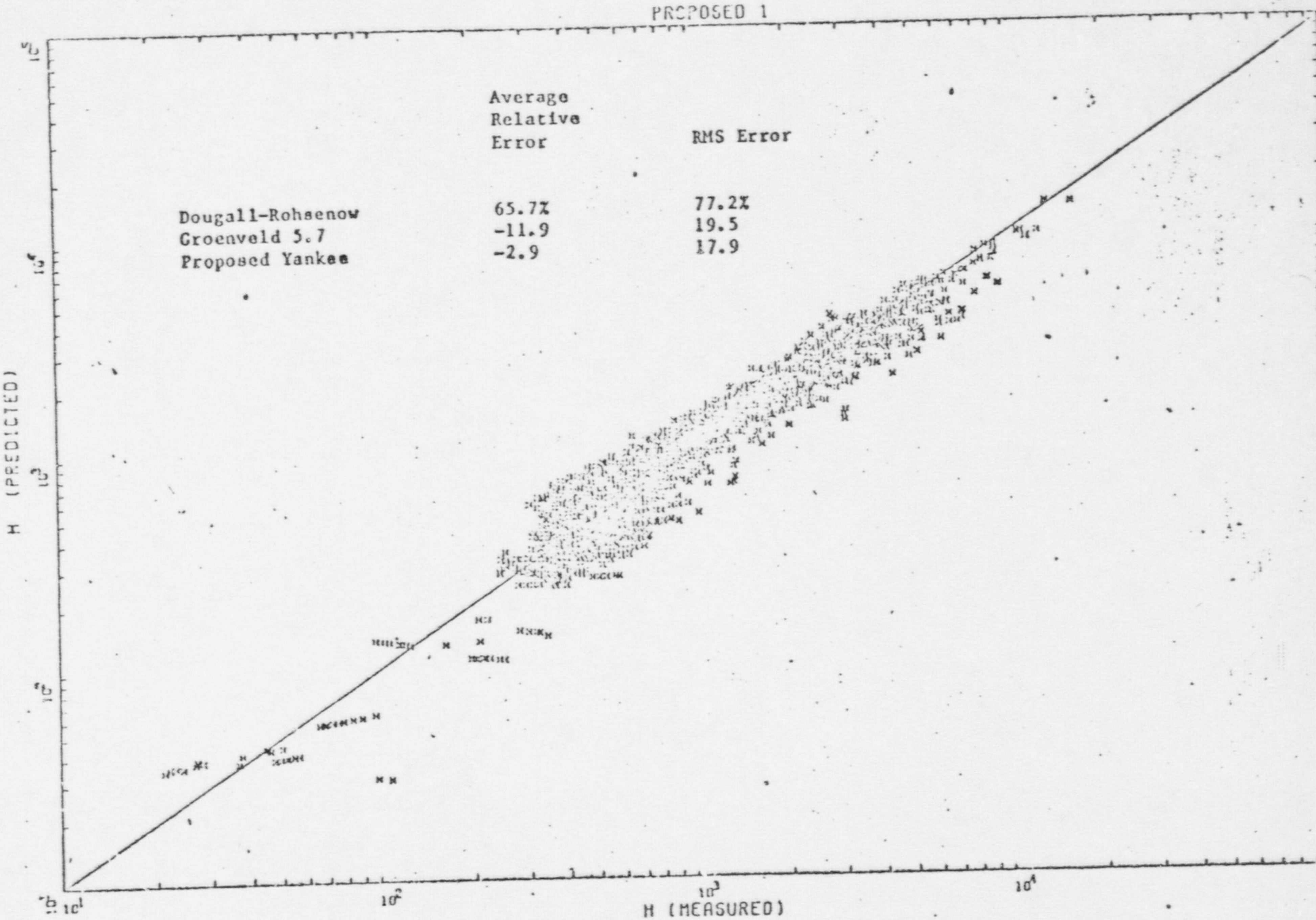
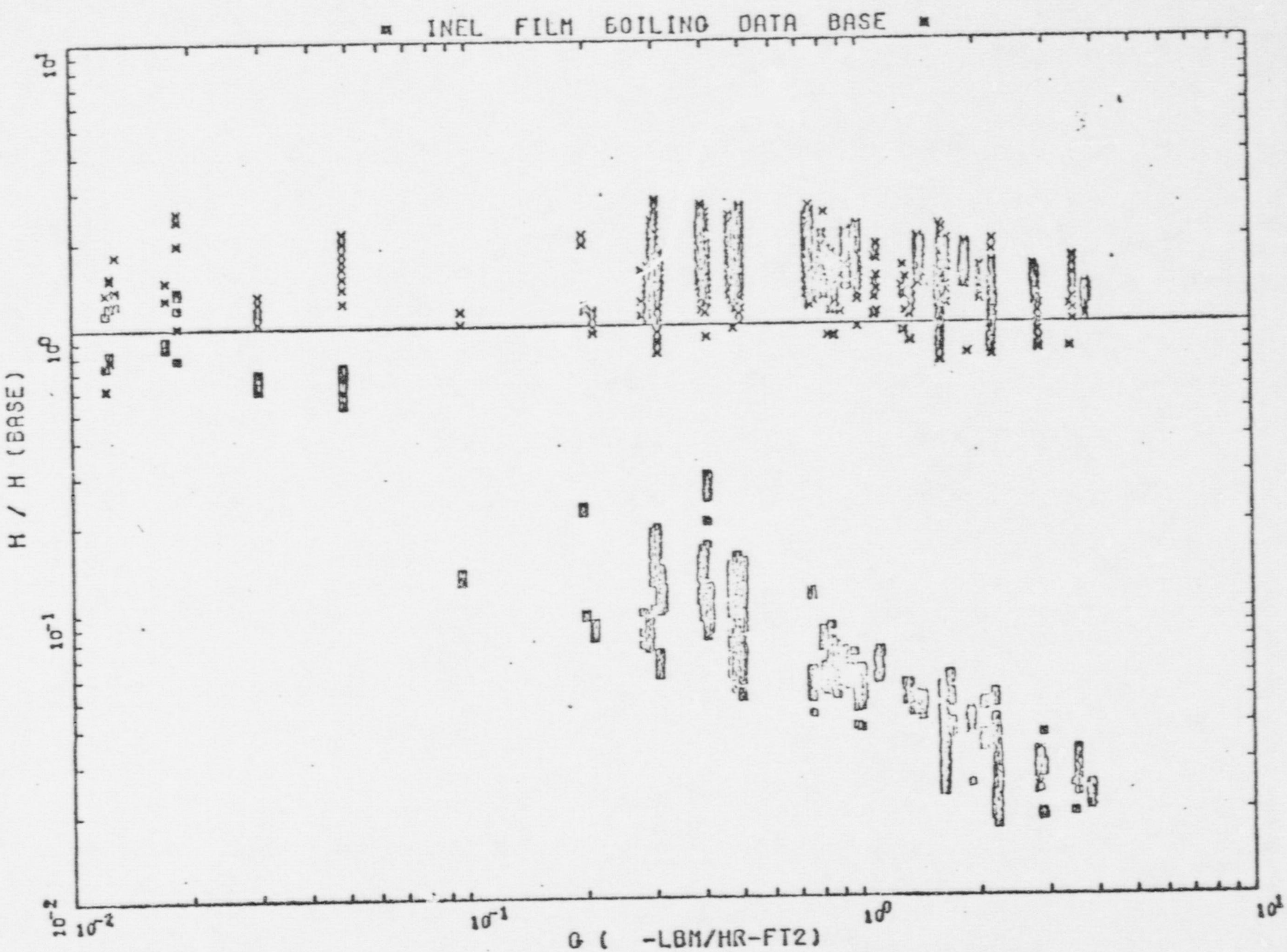
CORE INLET FLOW (LBM/SEC) JW1
1000
800
600
400
200
0
-200
-400
0
4
8
12
16
20
24
28
32
36
40
TIME (SEC)

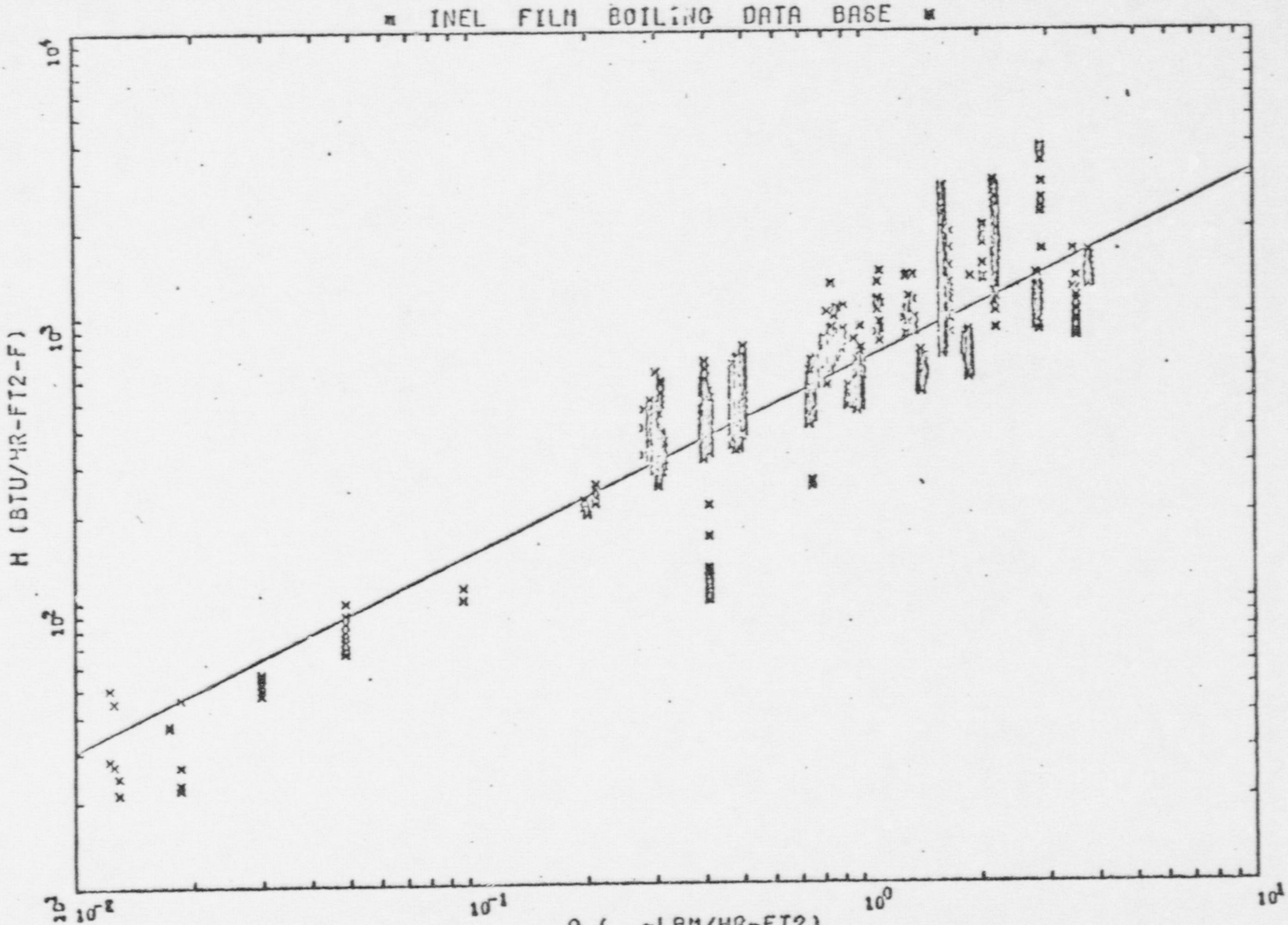


YR CORE 13 0.8 DECLS FLOOD CR EX ENT SEN STY 1122 RLP4RF/003 12/05/7504 0
JW1
CORE INLET FLOW (LBM/SEC)
1000
800
600
400
200
0
-200
-400
0
4
8
12
16
20
24
28
32
36
40
TIME (SEC)


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)
10^1
10^2
10^3
10^4
10^5

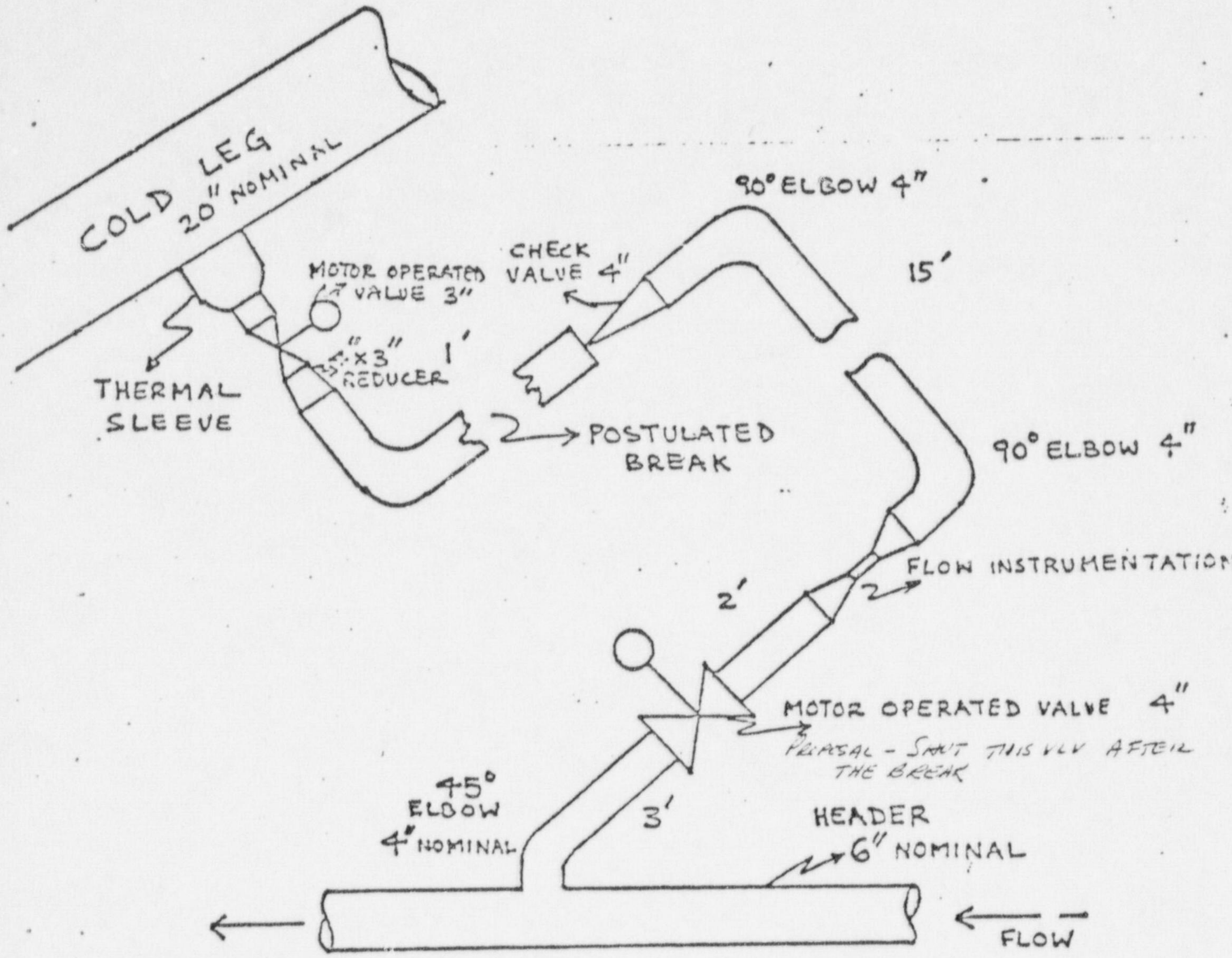


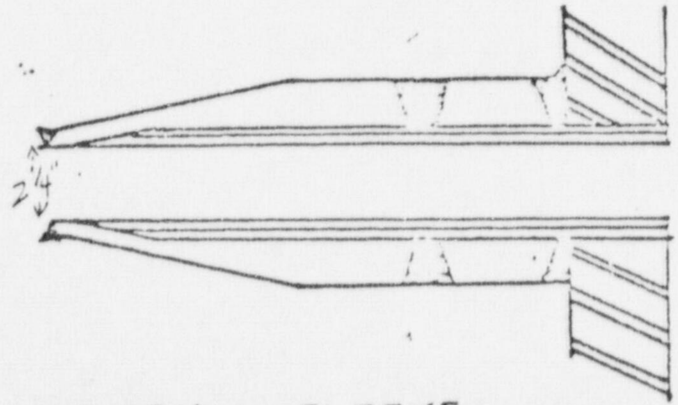
* INEL FILM BOILING DATA BASE *
H / H (BASE)
G (-LBM/HR-FT2)
10^{1}
10^{0}
10^{-1}
10^{-2}


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

YANKEE ROWE

ECCS INJECTION LOOP GEOMETRY

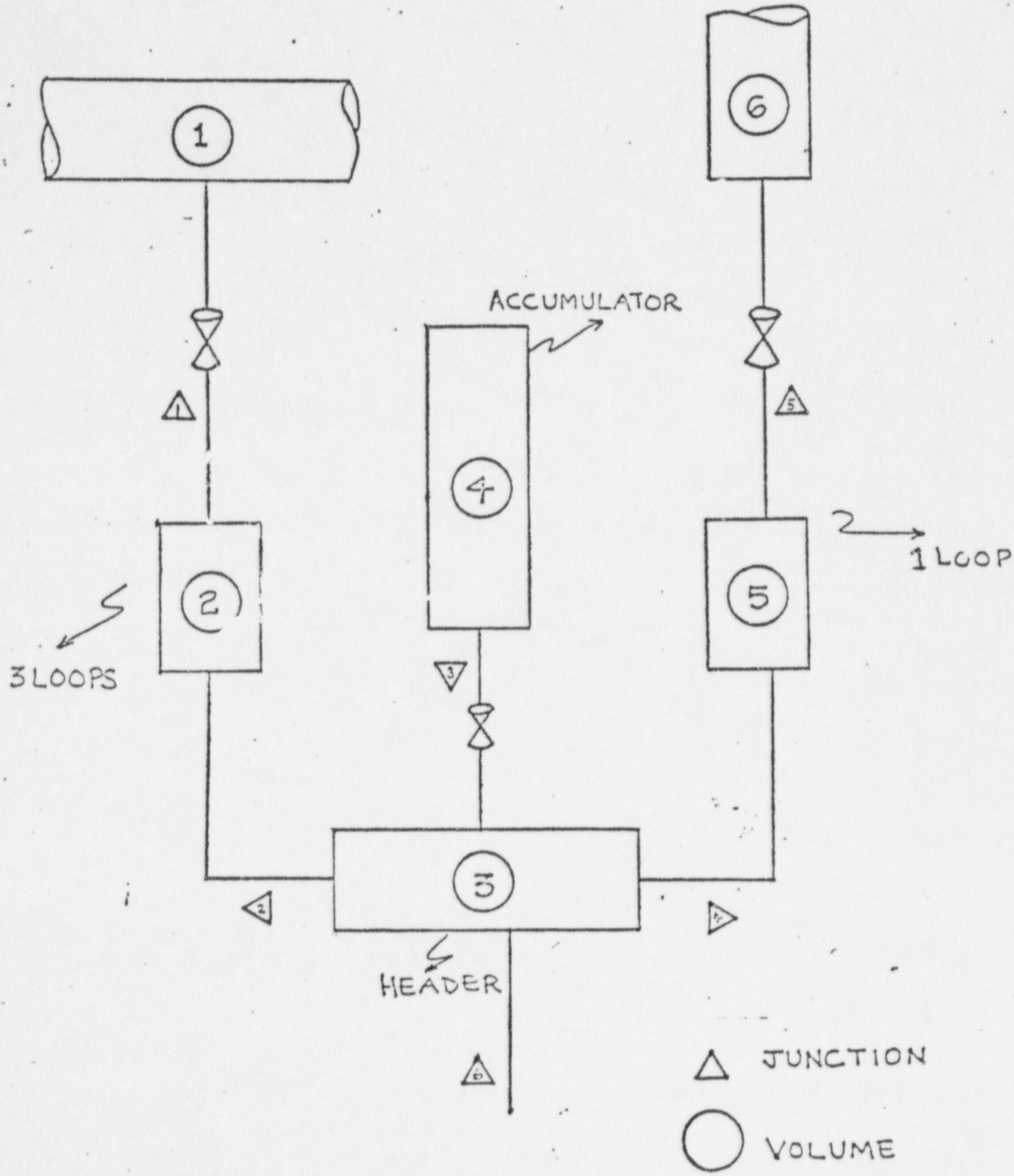




THERMAL SLEEVE

YANKEE ROWE

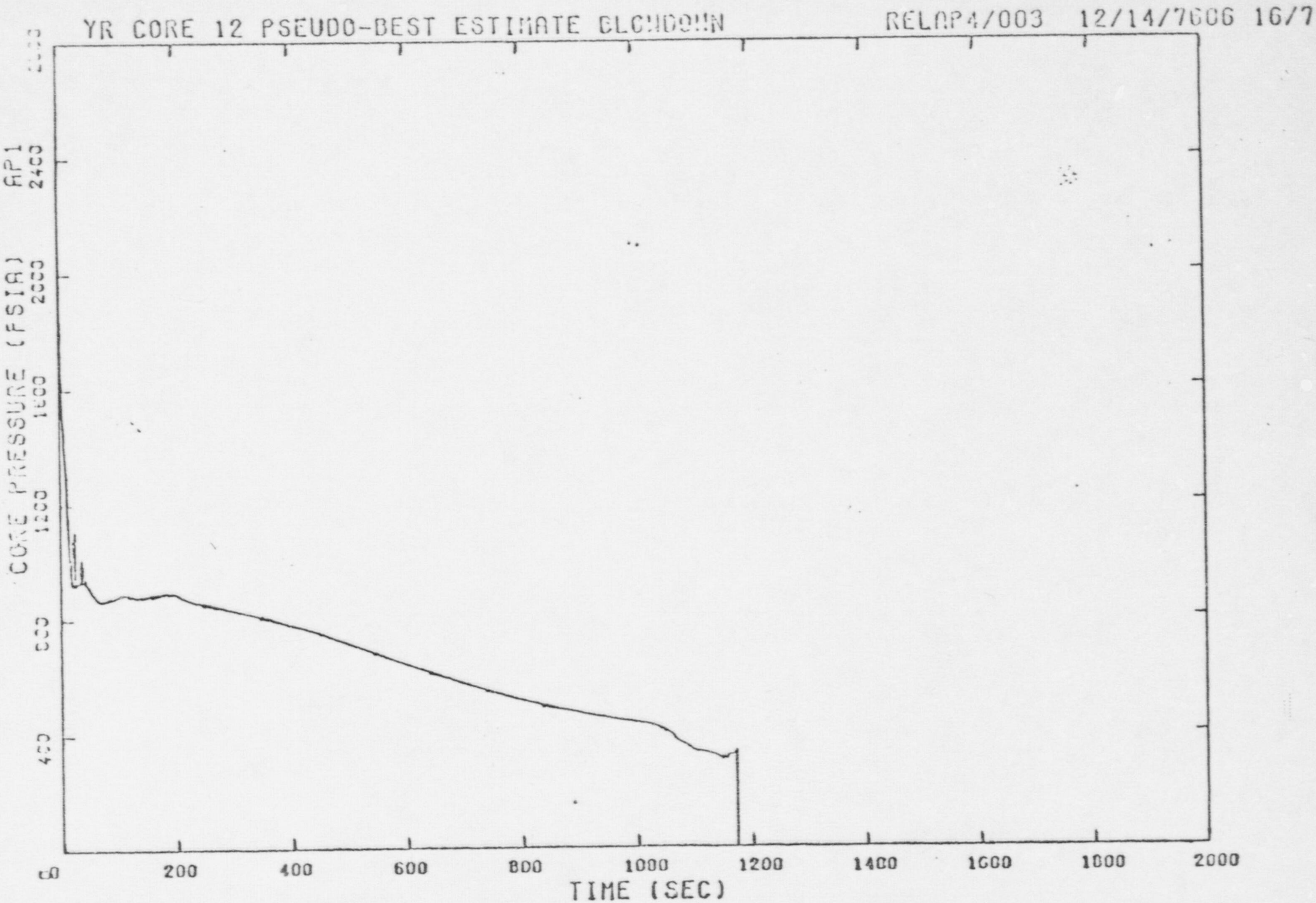
ECCS SUB-MODEL



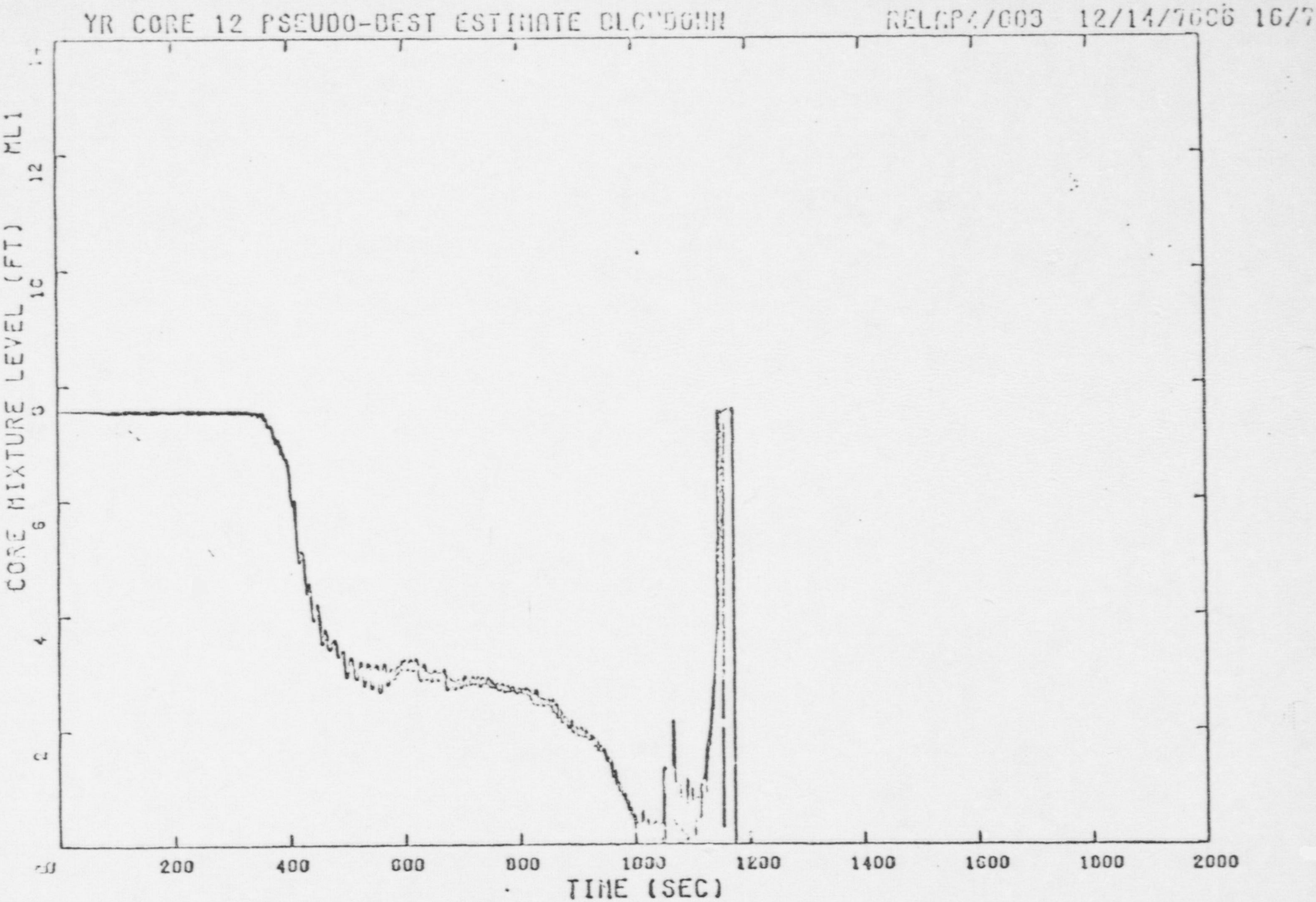
LOCA ANALYSES

CORE 12 BEST ESTIMATE ASSUMPTIONS

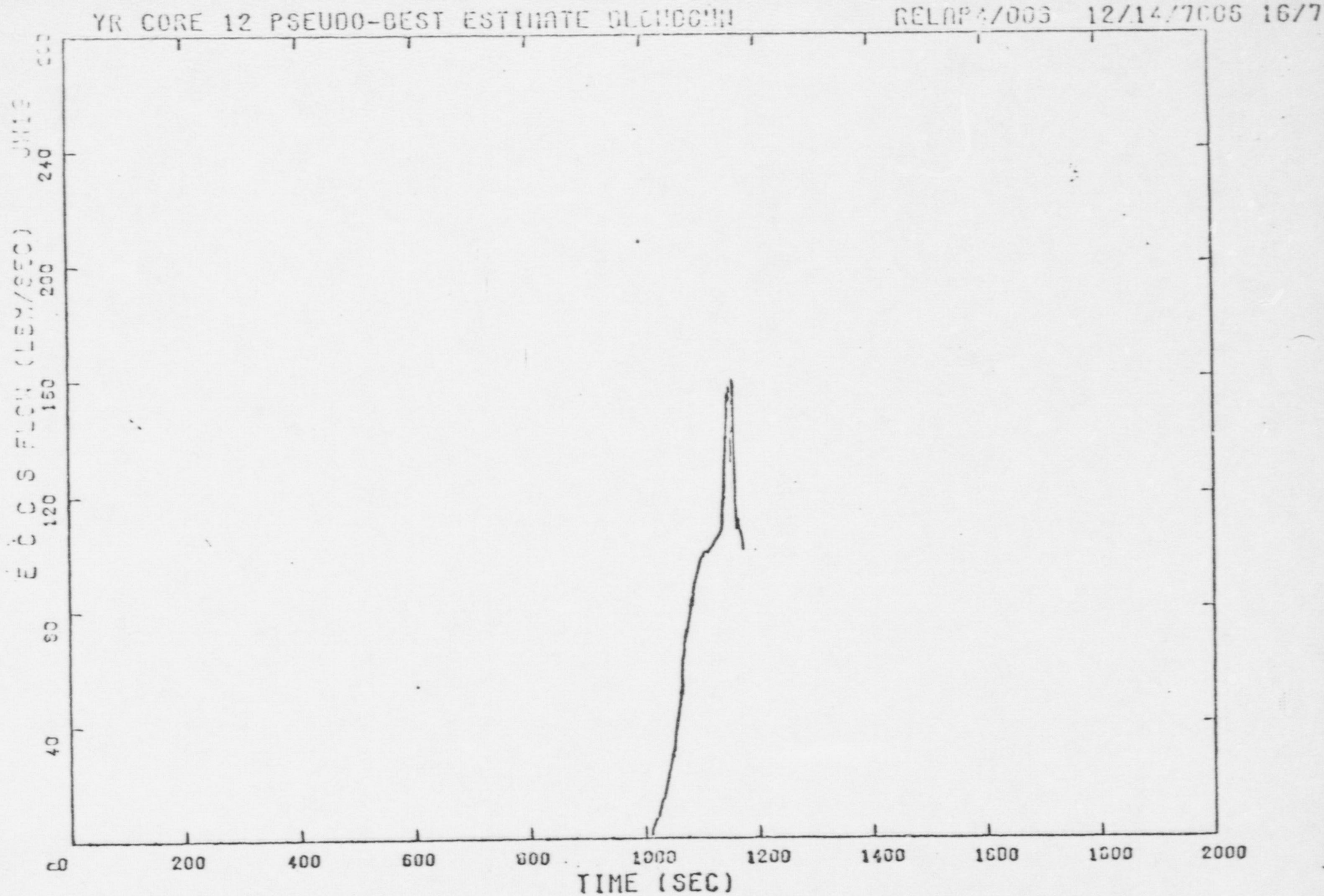
* AVAILABILITY OF OFF-SITE POWER
    - o 3 LPSI & 3 HPSI AVAILABLE
    - o CHARGING PUMPS AVAILABLE
    - o MAIN COOLANT PUMPS RUNNING UNTIL CAVITATION
    - o STEAM DUMP ON HIGH SECONDARY PRESSURE UNTIL CONTAINMENT ISOLATED
* NO UNCERTAINTY ON ANS DECAY CURVE
* NON-EM HEAT TRANSFER LOGIC
* MODIFIED HEAT TRANSFER FLOOR
* ENVELOPING PIN CONDITION



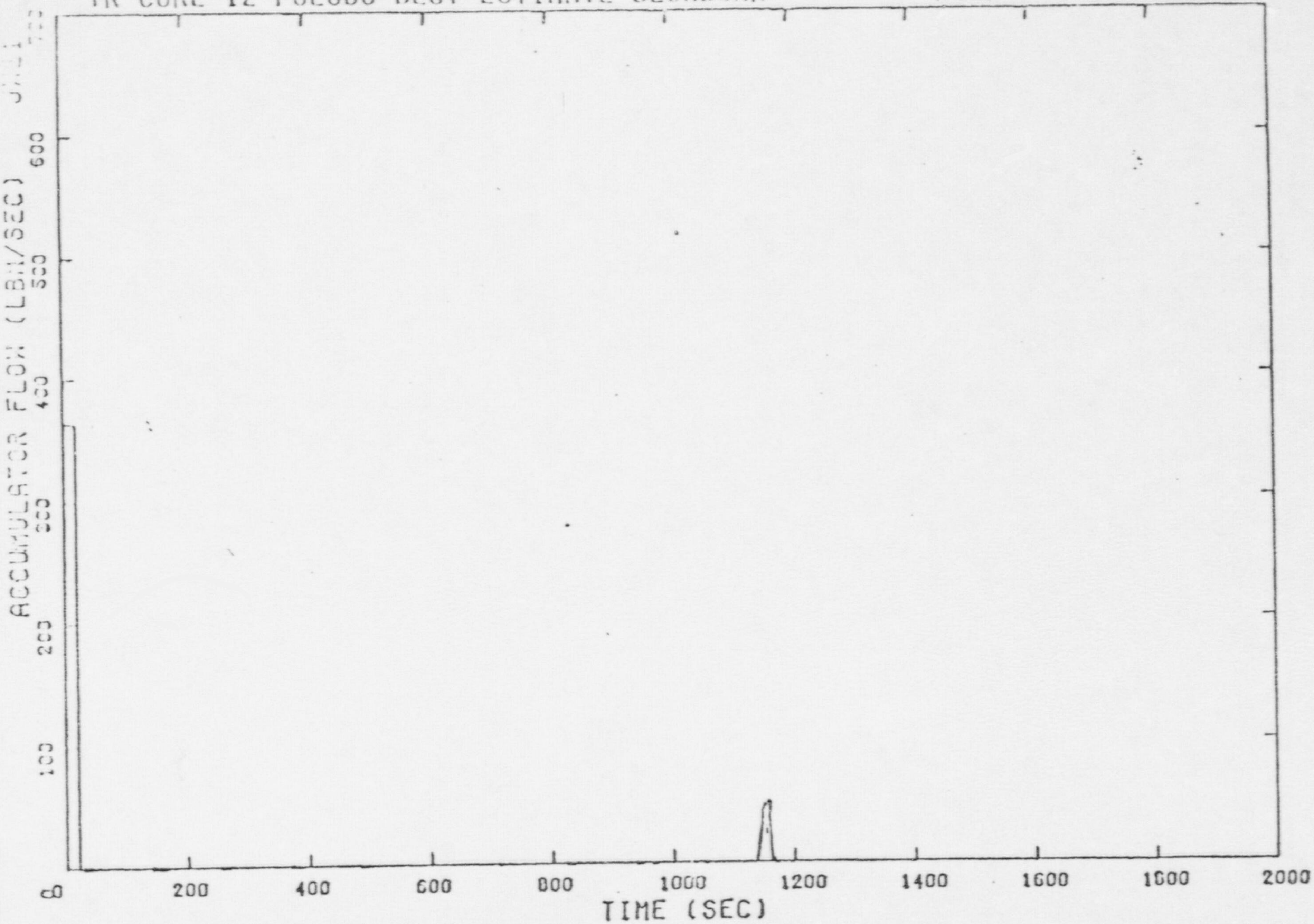
YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/003 12/14/76 16/7
CORE PRESSURE (PSIA) AP1
2400
2000
1600
1200
800
400
0
200
400
600
800
1000
1200
1400
1600
1800
2000
TIME (SEC)

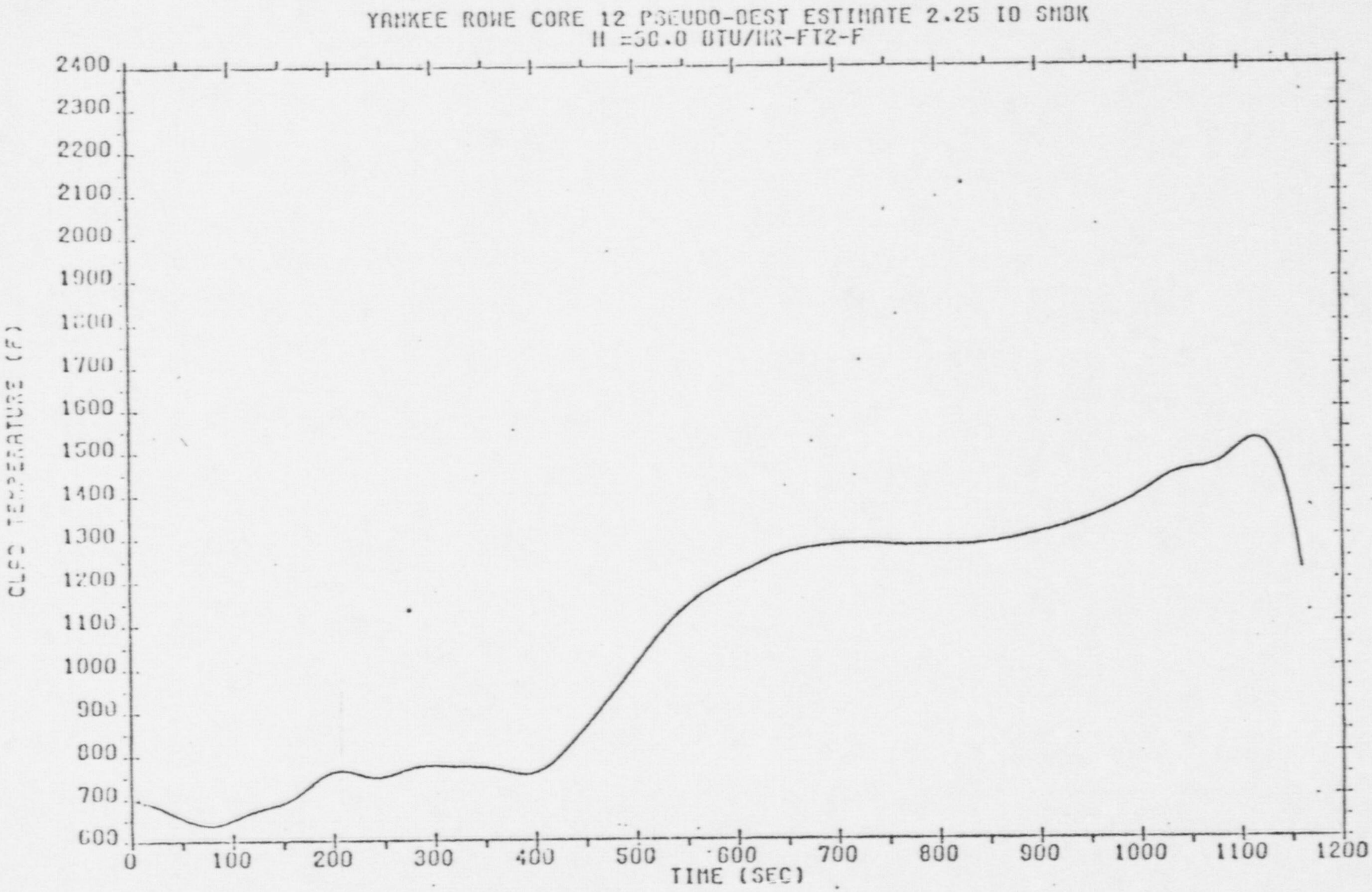


YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/003 12/14/7606 16/7
CORE MIXTURE LEVEL (FT)
ML1
12
10
8
6
4
2
0
200
400
600
800
1000
1200
1400
1600
1800
2000
TIME (SEC)


YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN
RELAP4/006 12/14/76
ECCS FLOW (LBM/SEC)
240
200
160
120
80
40
0
200
400
600
800
1000
1200
1400
1600
2000
TIME (SEC)

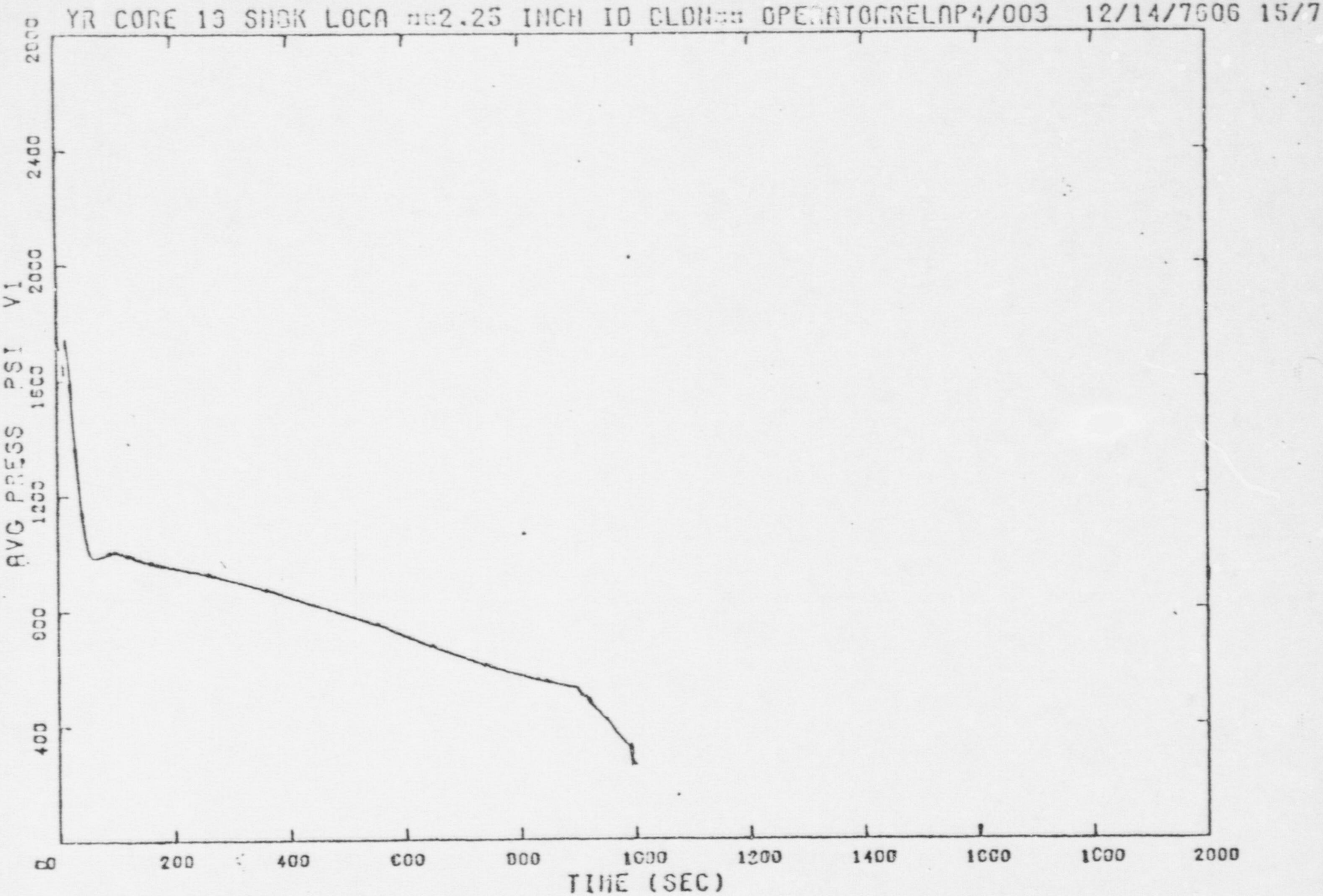
YR CORE 12 PSEUDO-BEST ESTIMATE BLOWDOWN RELAP4/003 12/14/7COS 16/7

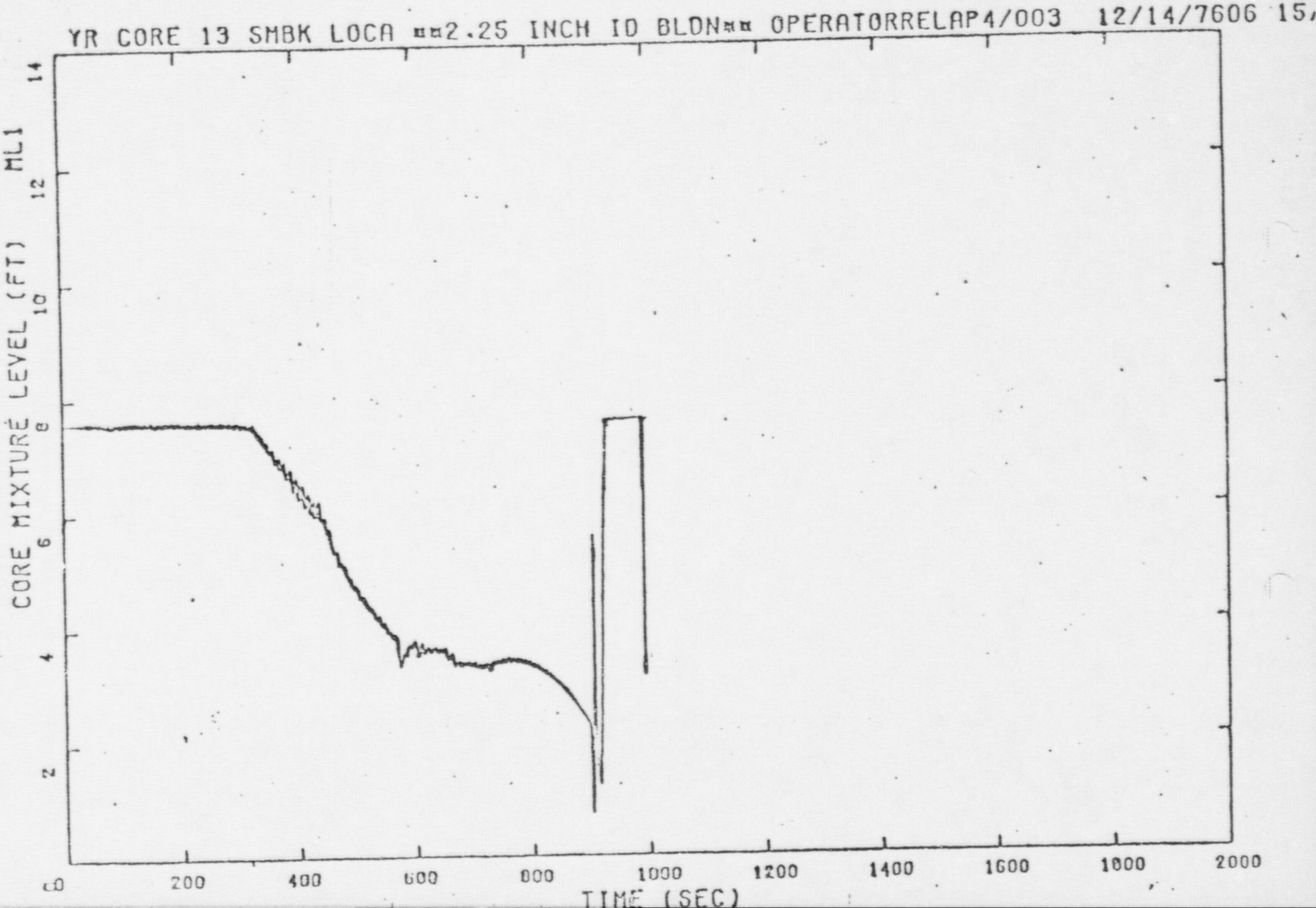




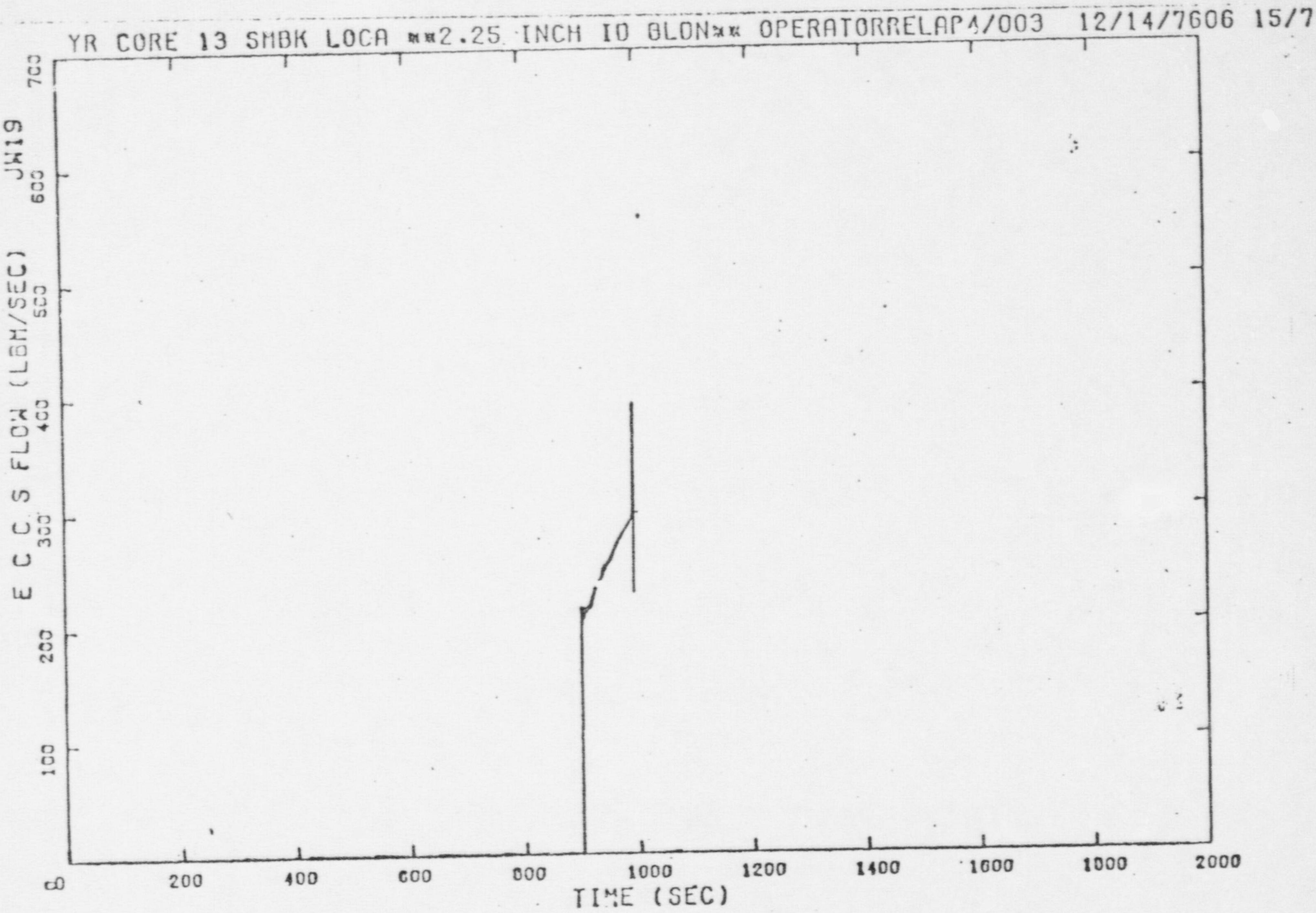
YANKEE ROWE CORE 12 PSEUDO-BEST ESTIMATE 2.25 ID SMDK
H =50.0 BTU/HR-FT2-F
CLAD TEMPERATURE (F)
TIME (SEC)
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

06/16/77

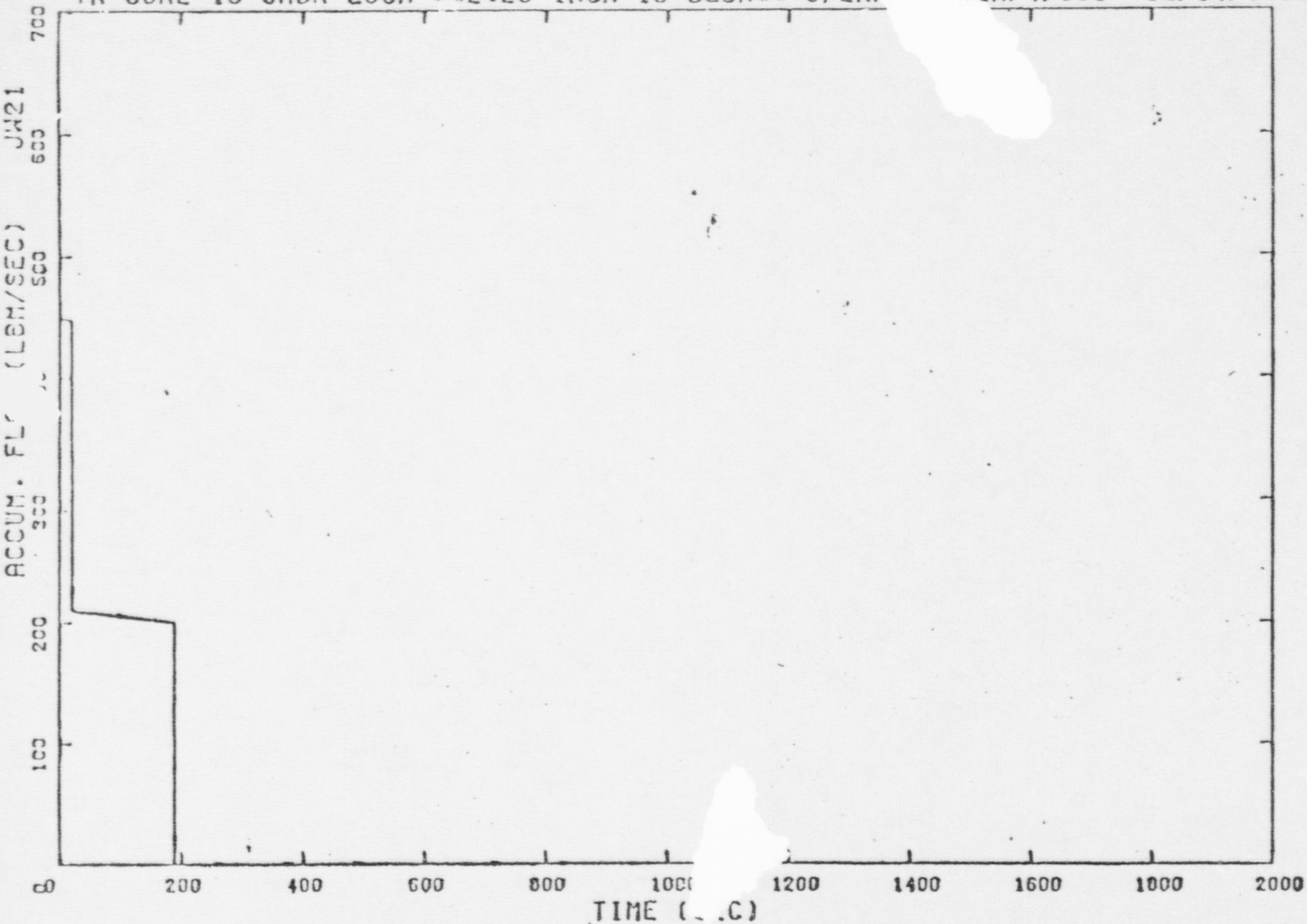

YR CORE 13 SNBK LOCA ==2.25 INCH ID CLDN== OPERATORRELAP4/003 12/14/7606 15/7
AVG PRESS PSI V1
TIME (SEC)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
400
800
1200
1600
2000
2400
2800



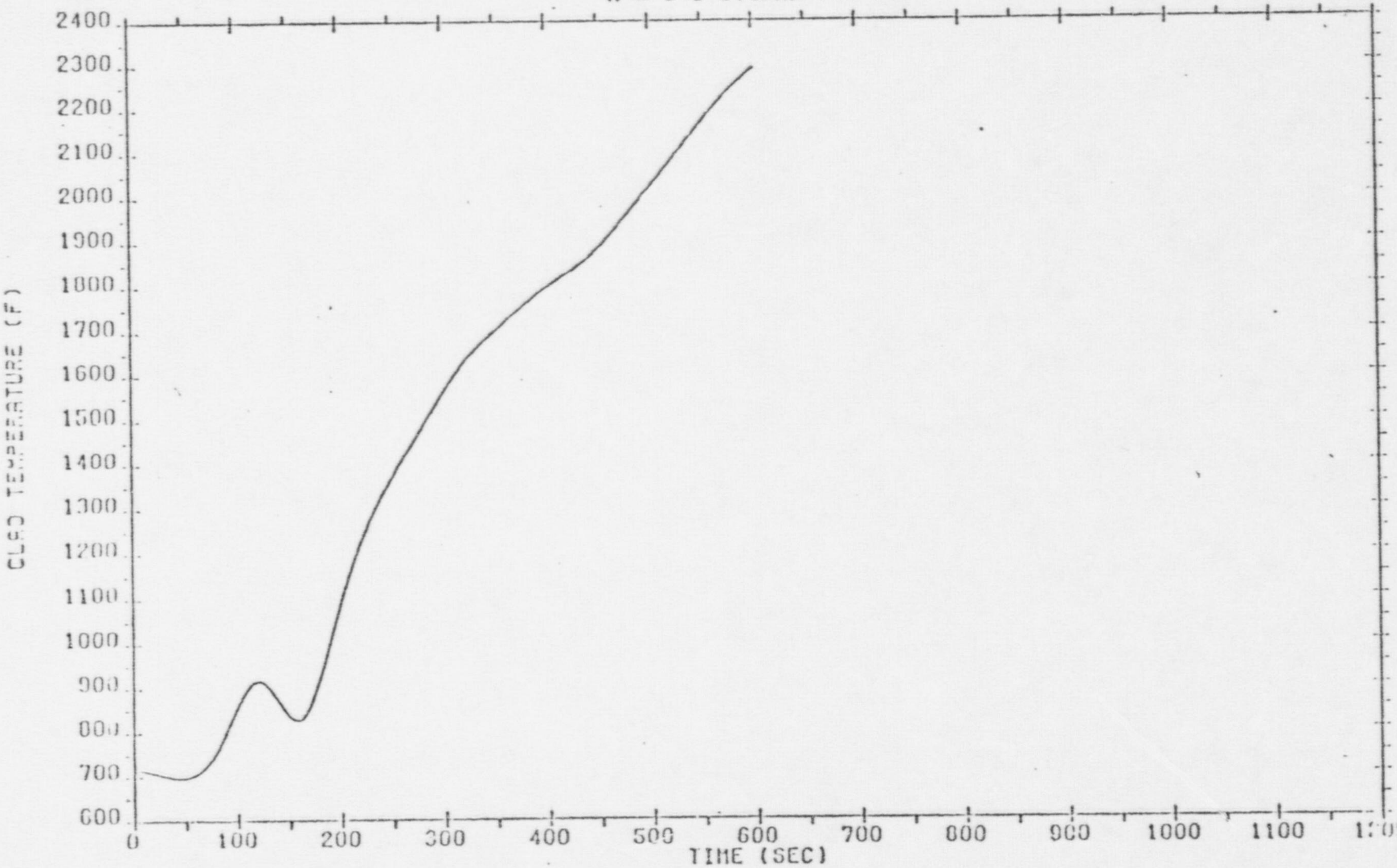
YR CORE 13 SMBK LOCA ¤¤2.25 INCH ID BLDN¤¤ OPERATORRELAP4/003 12/14/7606 15,
CORE MIXTURE LEVEL (FT)
ML1
TIME (SEC)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2
4
6
8
10
12
14


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

YR CORE 13 SMBK LOCA **2.25 INCH ID BLON** OPER[illegible]RELAP4/003 12/14/7606 15/7

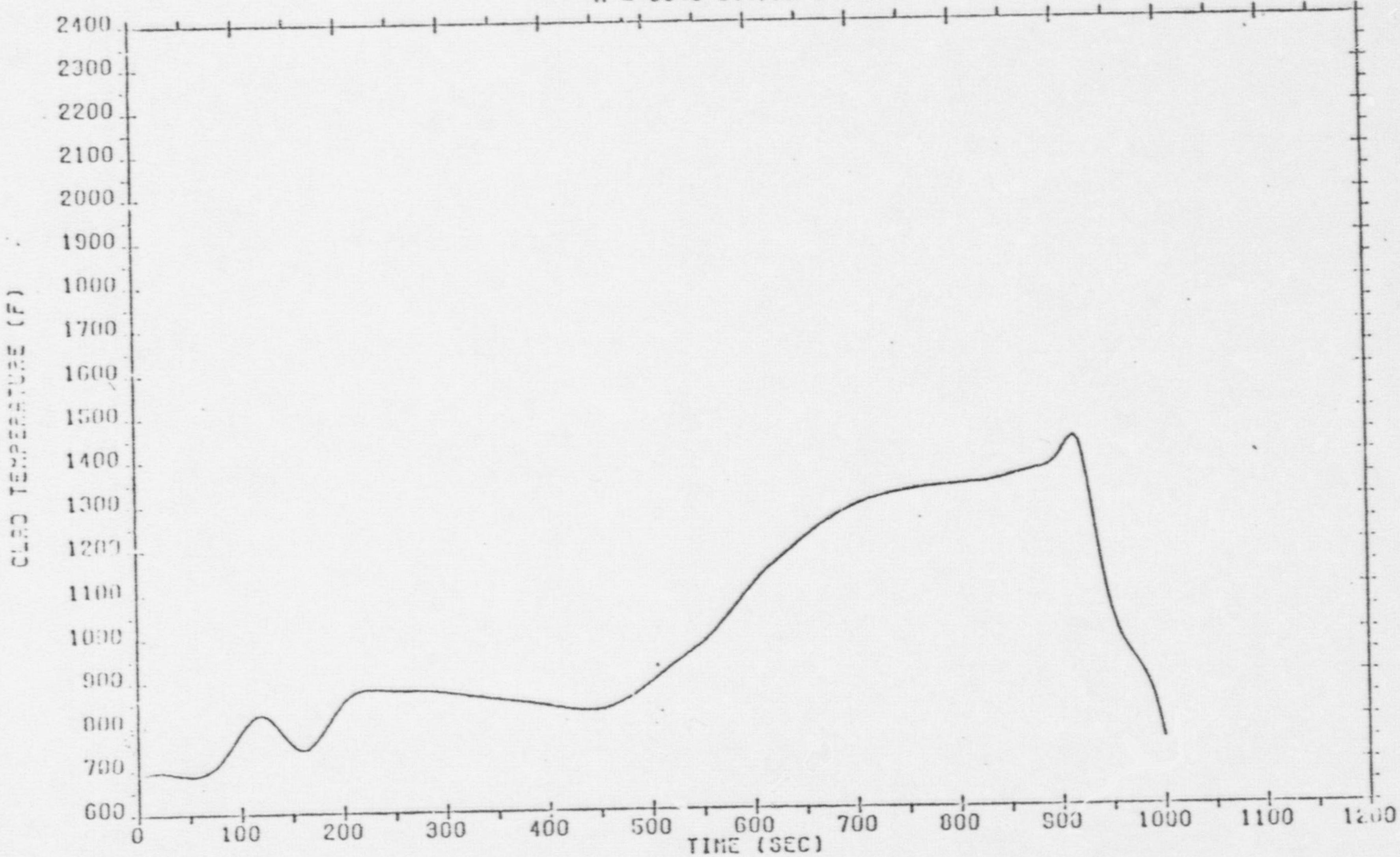


YANKEE ROWE CORE 13 OPERATOR ACTION TOODEE
H = 5.0 BTU/HR-FT2-F



06/16/77

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



06/16/77

ECCS PERFORMANCE VERIFICATION TESTS

OJBECT:

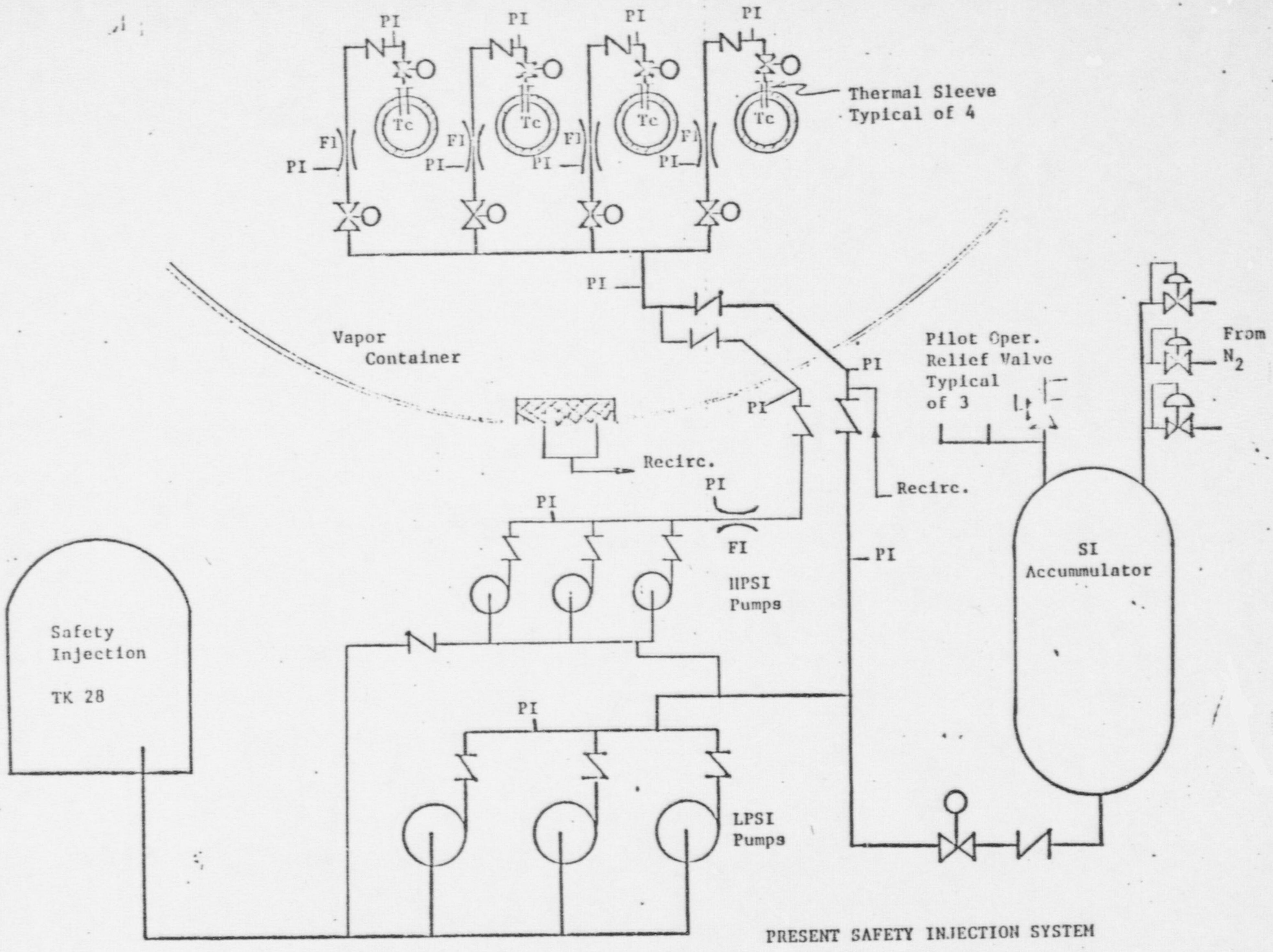
1. VERIFY SYSTEM RESISTANCE CALCULATIONS.
2. VERIFY PUMP CHARACTERISTICS.
3. SIMULATE WORST SMALL BREAK ACCIDENT AS REALISTICALLY AS IS FEASIBLE.

METHOD:

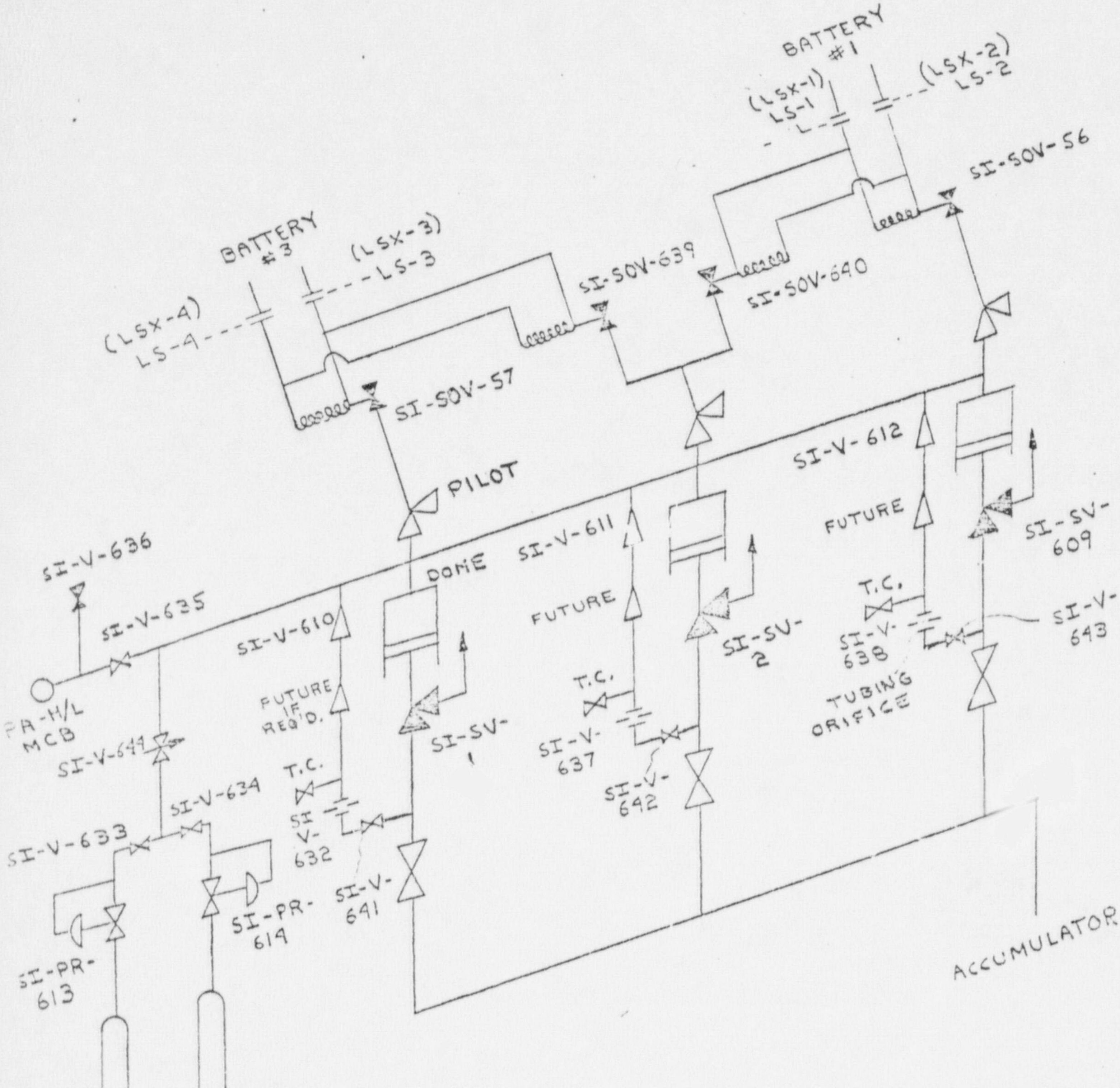
1. VARIOUS PUMP COMBINATIONS AND FLOW PATHS WILL BE USED. ADDITIONAL INSTRUMENTATION WILL BE ADDED AS REQUIRED.

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.



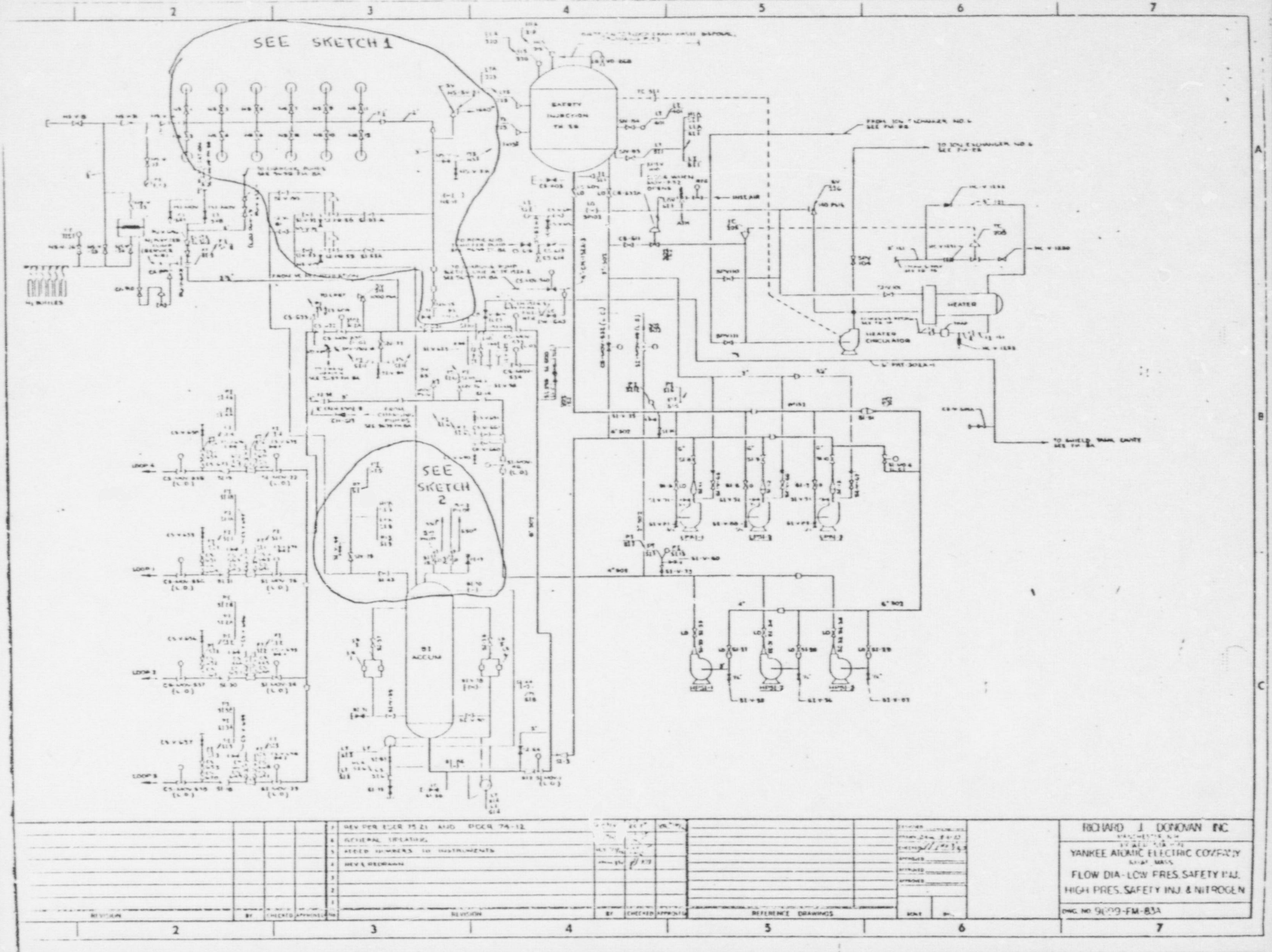
PRESENT SAFETY INJECTION SYSTEM

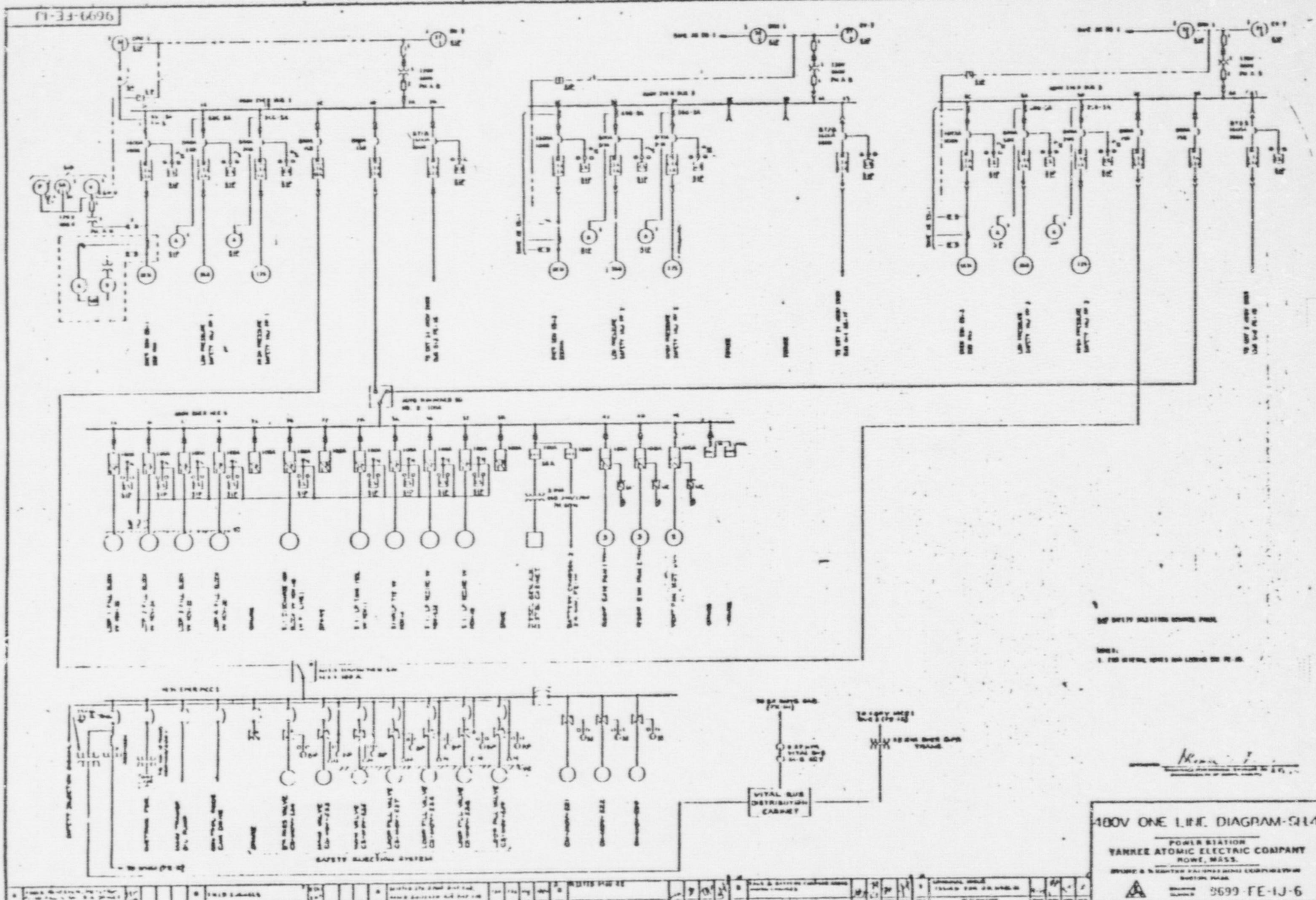


SK-2

REVISED 5/9/77

P.A. Rawnic

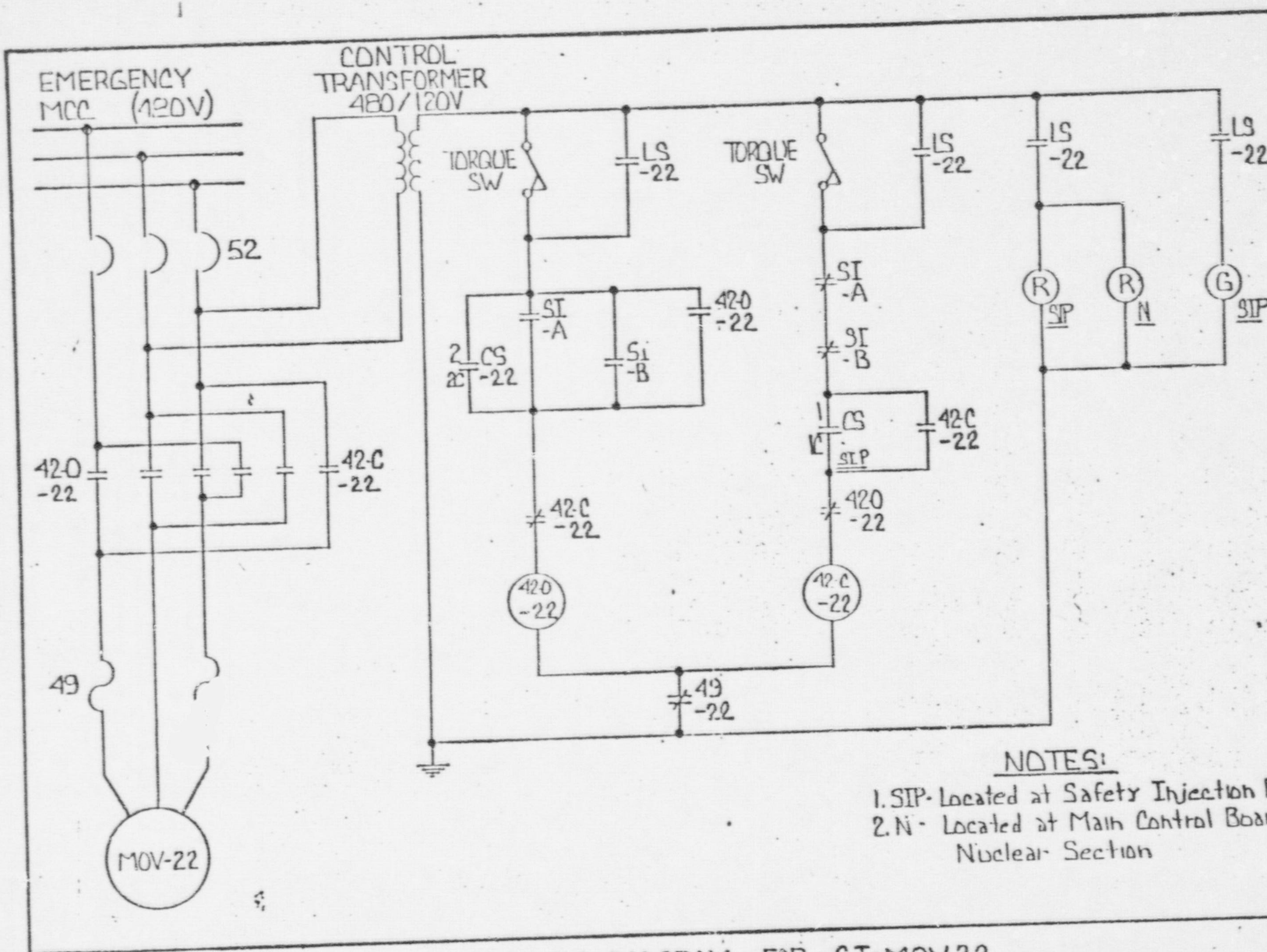

SEE SKETCH 1
SEE SKETCH 2
SAFETY INJECTION TK-56
HEATER
HEATER CIRCULATOR
SI ACCUM
LOOP 4
LOOP 1
LOOP 2
LOOP 3
N2 BOTTLES
INST AIR
REV PER ESER 75-21 AND PDCR 74-12
GENERAL UPDATING
ADDED NUMBERS TO INSTRUMENTS
REV & REDRAWN
REVISION
BY
CHECKED
APPROVED
REFERENCE DRAWINGS
RICHARD J. DONOVAN INC
YANKEE 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

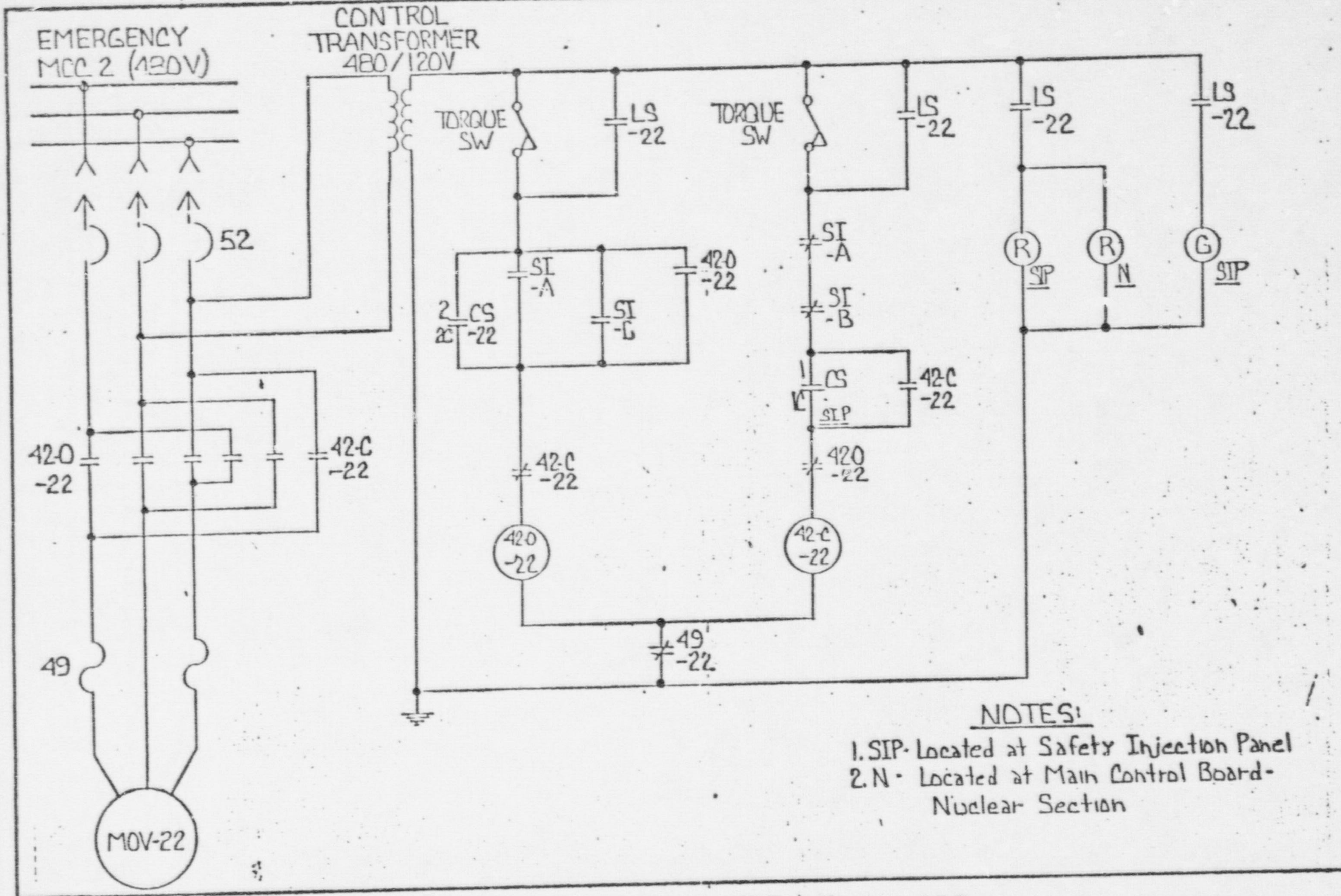


NOTES:

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

ELEMENTARY DIAGRAM FOR SI-MOV22

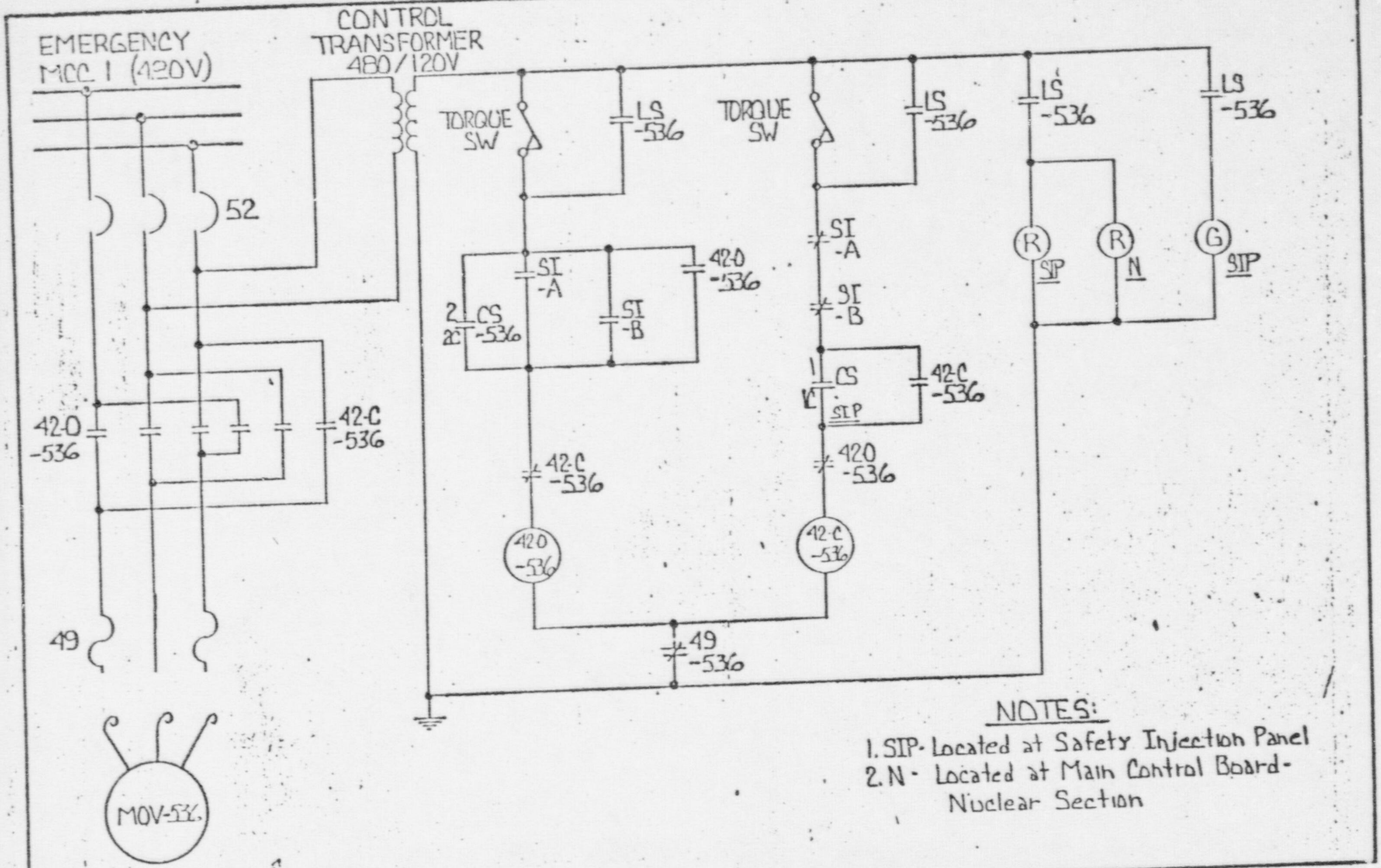
SIMILAR FOR SI-MOV 23, SI-MOV24, SI-MOV25,
CS-MOV536, CS-MOV537, CS-MOV538, CS-MOV539



NOTES:

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

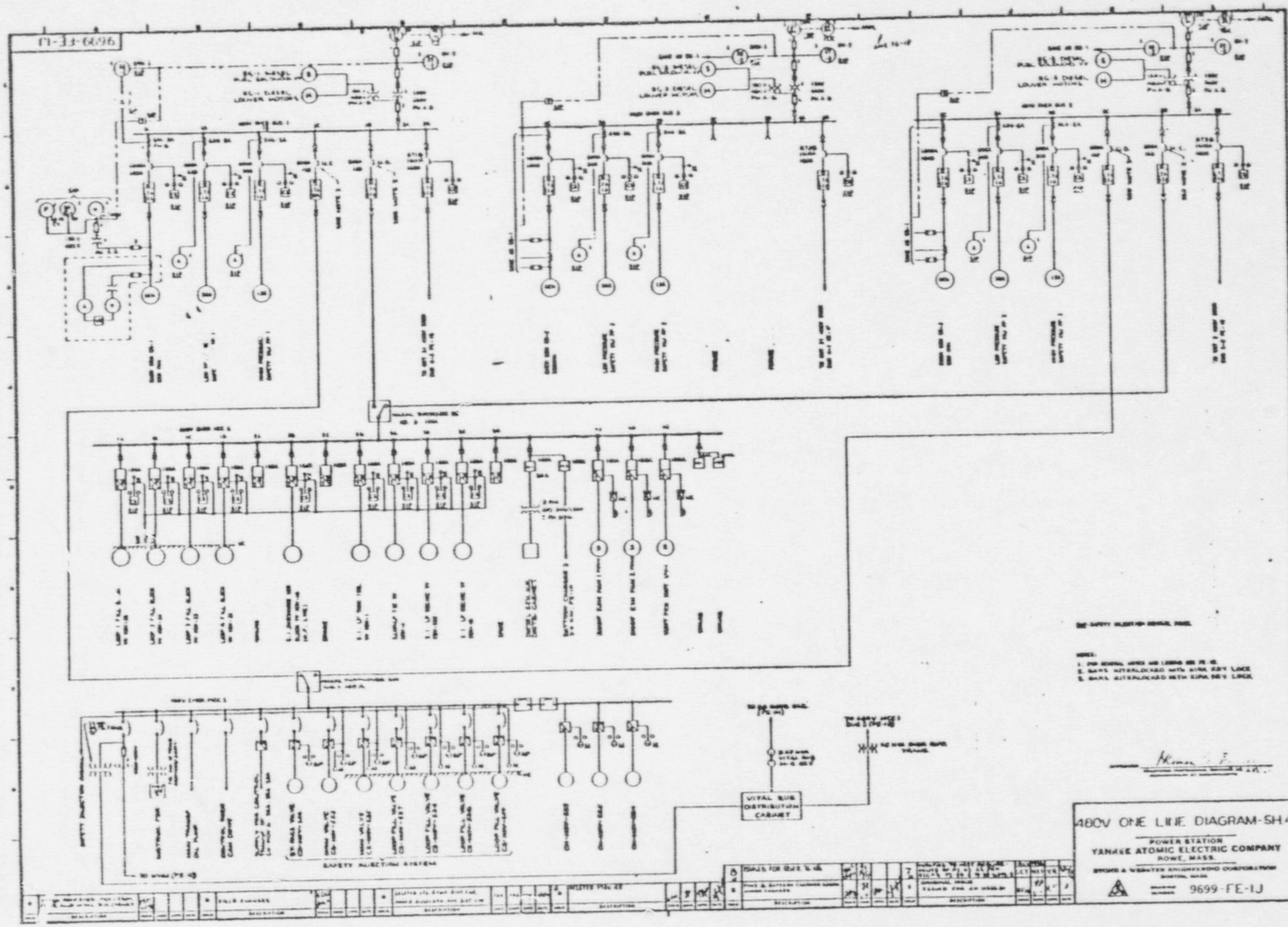
ELEMENTARY DIAGRAM FOR SI-MOV22
SIMILAR FOR SI MOV 23, 24, & 25

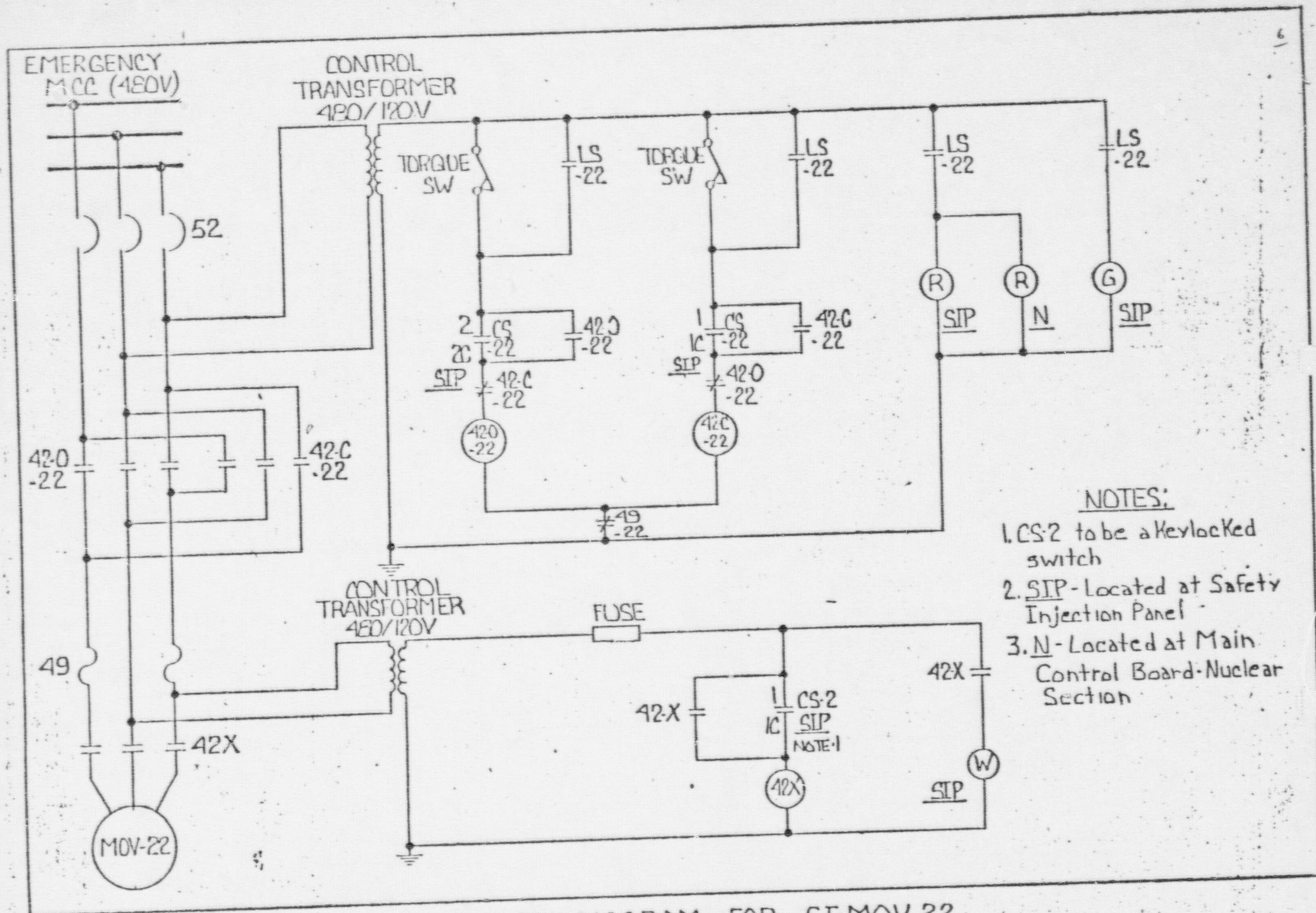


NOTES:

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

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


5
11-33-6696
480V ONE LINE DIAGRAM-SH.4
POWER STATION
YANKEE ATOMIC ELECTRIC COMPANY
ROWE, MASS.
9699-FE-1J
VITAL BUS DISTRIBUTION CABINET
SAFETY INJECTION SYSTEM



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