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J. Phillip Bayne
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October 5, 1983
JPN-83-85

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactor Branch No. 2
Division Of Licensing

Subject: James A. Fitzpatrick Nuclear Power Plant
Docket No. 50-333
NUREG-0737 Item II.B.3
Post-Accident Sampling System

References:
1. NRC letter, D. B. Vassallo to L. W. Sinclair, dated July 27, 1982.
2. NYPA letter, J. P. Bayne to D. B. Vassallo, dated November 16, 1982 (JPN-82-83).
3. NYPA letter, J. P. Bayne to D. B. Vassallo, dated August 5, 1983 (JPN-83-72).
4. NEDC-30088, "Responses to NRC Post-Implementation Review Criteria for Post-Accident Sampling Systems", dated April, 1983.

Dear Sir:

As discussed in References 1 and 2, Attachment 1 to this letter provides the Phase I responses for Criteria 1, 2d, 3, 6, 11a, and 11b for NUREG - 0737 Item II.B.3. for the post-implementation review of the Fitzpatrick Post Accident Sampling System. The remaining responses will be submitted 6 months after this submittal.

If you have any questions, please contact Mr. J. A. Gray, Jr. of my staff.

Very truly yours,

J. P. Bayne
Executive Vice President
Nuclear Generation

cc: Office of the Resident Inspector
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NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
JPN-83-85
ATTACHMENT 1

Criterion: (1) The licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample.

Response: (1) The James A. FitzPatrick Nuclear Power Plant has the capability to obtain a liquid sample within the required 3 hours. The longest run of piping for the liquid sample is the RHR line, totaling about 625 feet. To assure that the sample is representative of actual plant conditions, the time to draw the sample was estimated assuming 3 full volumes circulate through the sample station. This sample time is about 10 minutes with a 1 gpm flow. Contingent upon completion of items identified in Reference 3, the Plant will have the capability to obtain dissolved gas samples of the primary coolant. The Plant has the capability to obtain a primary containment atmosphere sample. This sample, with a 210 foot run at 18 SCFH can be taken in about 3 minutes.

The sample station, supplied and designed by General Electric Company, has been installed in the Recirculation M-G Set Room adjacent to the Reactor Building on Elevation 300'. The control panel is about 2 feet away and perpendicular to the sample station. The main transport route of the sample cask in accident conditions, shown in Figure 1, would be from the Recirculation M-G Set Room through the Administration Building and down the elevator to the chemistry lab, located between the Turbine & Reactor Buildings on Elevation 272' where the samples are analyzed. The total travel distance on this route is approximately 330 feet.

Shielded casks are provided at the plant for transporting the liquid and gaseous samples to the chemistry lab. The sample panel and its associated solenoid operated valves (SOV's) are powered through the normal 120V AC supply. In the event of a loss of off-site power, the alternate power supply is a 600V emergency bus powered by the emergency diesel generator.

Contract arrangements have been made with Babcock & Wilcox for all off-site analyses. The FitzPatrick plant will use the shipping cask, being procured by the Pooled Inventory Management (PIM) organization, which will be located at their Memphis, Tennessee warehouse for off-site shipments.

The following is a breakdown of the times for obtaining, handling, and analyzing a sample:

a.	obtain the sample i.e. (recirculate line, install vial and operate the control panel)	60 min
b.	transport sample to lab	15 min
c.	sample preparation	20 min
d.	sample analysis	80 min

Criterion: (2d) Alternatively, have in-line monitoring capabilities to perform all or part of the above analyses.

Response: (2d) The GE PASS employed at FitzPatrick only uses a grab sample system. The only in-line capability is a conductivity indicator which can be used to perform all or part of the analysis for boron concentration. A solumeter used with an appropriate conductivity cell can perform this but will not be used to meet the criterion of NUREG-0737.

Criterion: (3) Reactor coolant and containment atmosphere sampling during post accident conditions shall not require an isolated auxiliary system [e.g., the letdown system, reactor water cleanup (RWCUS)] to be placed in operation in order to use the sampling system.

Response: (3) The use of an isolated auxiliary system is not required for the PASS to sample reactor coolant and containment atmosphere during post-accident conditions.

The RHR (Residual Heat Removal) liquid sample lines tap into the discharge line of the RHR system shown in Figure 2. This system must be in operation in order to obtain a pressurized sample. No auxiliary system is needed to take this sample.

Jet pump liquid sample lines tap into the downstream side of the excess flow check valves in the jet pump instrument lines of pumps 7 and 15, shown in Figure 3. The samples are circulated at approximately 1/2 to 1, gpm, so the excess flow check valve will not close unless there is a break in the line. Recirculation pumps are not needed, and no auxiliary system is needed for this sample.

There is a common return line that goes from the liquid sampling station directly to a torus penetration, shown in Figure 4. This again needs no auxiliary system for returning or recirculating the sample coolant, and is not affected by post-accident operation.

The gas samples are obtained from the primary containment, torus and secondary containment as marked on Figures 5,6 and 7. The common return line, Figure 8, goes back to the torus. No auxiliary system is necessary to draw the gas sample. Vacuum pumps are located in the gas sample station and are used to obtain the samples.

The PASS valves which are not accessible after an accident but are required to operate the sampling system, have been incorporated in the environmental qualification program for FitzPatrick. The solenoid operated valves (SOV's) which serve as redundant isolation valves, have been analyzed in the Authority's I&E Bulletin 79-01B report for the FitzPatrick Plant. Although these SOV's would normally close on a containment isolation signal, they may be opened after an accident at the primary containment purge panel (in the relay room) by use of keylocked switches if a

sample needs to be taken. The manual globe valves associated with the RHR sample lines are normally open, and are part of a Cat. 1 system, therefore they only need to be seismically qualified, which they are.

Criterion: (6) The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain and analyze a sample without radiation exposures to any individual exceeding the criteria of GDC 19 (Appendix A, 10CFR, Part 50) (i.e. 5 rem whole body, 75 rem extremities).

Response: (6) Adequate design has been provided at FitzPatrick to obtain and analyze a post accident sample without exceeding personnel radiation exposure limits of 5 rem whole body and 75 rem to the extremities (GDC 19). Table 2, "Expected Dose Rates", is based on Reg. Guide 1.4 source terms and NEDC-30088 (Ref. 4) values for dose rates from the casks and sample station.

Plant specific values have been calculated using a correction factor to incorporate the different core inventories at FitzPatrick (Table 1) versus the generic plant (NEDC-30088) Ref. 4. In Table 2 the times shown are the actual times the body or extremity is being exposed and not the entire time required for each particular task.

Criterion: (11) In the design of the post accident sampling and analysis capability, consideration should be given to the following items:

(a) Provisions for purging sample lines, for reducing plateout in sample lines, for minimizing sample loss or distortion, for preventing blockage of sample lines by loose material in the RCS or containment, for appropriate disposal of coolant loss from a rupture of the sample line. The post accident reactor coolant and containment atmosphere samples should be representative of the reactor coolant in the core area and the containment atmosphere following a transient or accident. The sample lines should be as short as possible to minimize the volume of fluid to be taken from containment.

The residues of sample collection should be returned to containment or to a closed system.

(b) The ventilation exhaust from the sampling station should be filtered with charcoal absorbers and high-efficiency particulate air (HEPA) filters.

Response: (11a) The gas lines are heat traced to prevent condensation and minimize plateout. The design of the heat tracing system utilizes Thermon's type SSK heating cable. Thermon's solid state control system is used for controlling the heat tracing with temperature and current alarm functions.

From the analysis for Criterion 1, it can be shown that the purge velocity for the entire PASS system is approximately 180 ft./min. The PASS lines shall be purged subsequent to each use. This will also reduce plateout thereby minimizing distortion of the sample results. The use of restricting orifices was eliminated to prevent blockage of sample lines by loose material in the RCS or containment. Solenoid operated shut-off valves and reduced line size (1/2" tube) limit reactor coolant loss from a rupture of the sample line. The sample lines have been designed as short as possible to minimize the volume of fluid to be taken from the containment.

The FitzPatrick PASS system was designed to take reactor coolant and suppression chamber samples that are representative of actual core conditions both short and long term. The primary sample point is the jet pump discharge line which would be used for large or small breaks as long as a sample could be drawn. While maintaining nearly normal water level, natural circulation would occur with flow from downcomers to the shroud area through the jet pumps. This would force flow past the PASS sample tap and allow a sample to be taken which will be used to evaluate to the actual core conditions.

In a large break condition in which normal water level cannot be maintained, water level is controlled by the height of the jet pumps. In this case, the RHR-LPCI pumps would supply coolant via

the recirculation line to the core, up through the jet pumps and out the break (i.e. recirculation pump suction break). This would again provide flow directly from the core to the sample point.

As reactor pressure decays, the sample point at the jet pump discharge may not have enough pressure to draw the sample, so the RHR pump discharge would have to be utilized. This water is from the torus and at first would not be representative of core conditions. As time progresses the reactor coolant will be recirculated to the torus, and a more representative sample of actual core conditions could be analyzed.

(11b) A dedicated sample exhaust filtration system has been installed which has a HEPA filter in series with a charcoal absorber and another HEPA filter whose exhaust leads to the turbine building ventilation system. In Figure 9 the filter arrangement as well as a flow diagram of the entire PASS system is shown.

Table 1

CORE INVENTORY OF MAJOR FISSION PRODUCTS IN THE FITZPATRICK PLANT OPERATED AT 2436 MWt FOR THREE YEARS

Chemical Group	Isotope	T1/2	Inventory (10^6 Curies)
Noble Gases	Kr-85m	4.48h	16.4
	Kr-85	10.72y	0.73
	Kr-87	76.30m	31.4
	Kr-88	2.84h	44.6
	Xe-133	5.25d	134.8
	Xe-135	9.11h	17.4
Halogens	I-131	8.04d	64.1
	I-132	2.30h	93.4
	I-133	20.80h	134.1
	I-134	52.60m	147.4
	I-135	6.61h	126.1
Alkali Metals	Cs-134	2.06y	13.1
	Cs-137	30.17y	8.1
	Cs-138	32.20m	1973.
Noble Metals	Mo-99	66.02h	122.1
	Ru-103	39.40d	103.4
Alkaline Earths	Sr-91	9.50h	76.7
	Sr-92	2.71h	82.1
	Ba-140	12.8 d	115.4
Rare Earths	Y-92	58.6 d	82.7
	La-140	40.20h	122.8
	Ce-141	32.50d	107.4
	Ce-143	284.30d	86.1
Refractories	Zr-95	64.00d	107.4
	Zr-97	16.90h	110.8

Table 2

EXPECTED DOSE RATES (1 hr. after accident)

Notes: E = Extremity doses calculated at 10cm.
W = Whole body doses calculated at 60cm.

1. Liquid Sample	Time (min)	Background (mr/hr)	Sample Dose (mr/hr)	Integdose (mr)
(W) obtain sample	10	99	93	32.0
(E) handle sample	.5	99	1,300	11.7
(W) transport cask	10	45.8	5.7	8.6
(W) sample preparation	6	99	240	33.9
(E) sample preparation	4	99	79,200	5,286.6
(W) sample analysis	8.5 (Boron)	99	44	20.3
(E) sample analysis	1.5 (Boron)	99	1,580	39.5
(W) sample analysis	20 (isotopic)	99	-	33
2. Gas Sample				
(W) obtain sample	10	99	300	66.5
(W) handle sample	1	99	350	7.5
(W) transport cask	10	44.6	45	14.9
(E) transport cask	10	44.6	2,000	340.8
(W) sample preparation	6	99	520	61.9
(E) sample preparation	4	99	186,000	12,466.0
(W) sample analysis	30 (Hydrogen)	99	18.5	58.8
(E) sample analysis	1.5 (Hydrogen)	99	186,000	4,652.5
(W) sample analysis	20 (isotopic)	99	-	33

Total integrated whole body dose for liquid sample = 127.8 mr

Total integrated whole body dose for gas sample = 242.6 mr

Total integrated whole body dose for samples = 370.4 mr

Total integrated extremity dose for liquid samples = 5,337.8 mr

Total integrated extremity dose for gas samples = 17,459.3 mr

Total integrated extremity dose for samples 22,797.1 mr

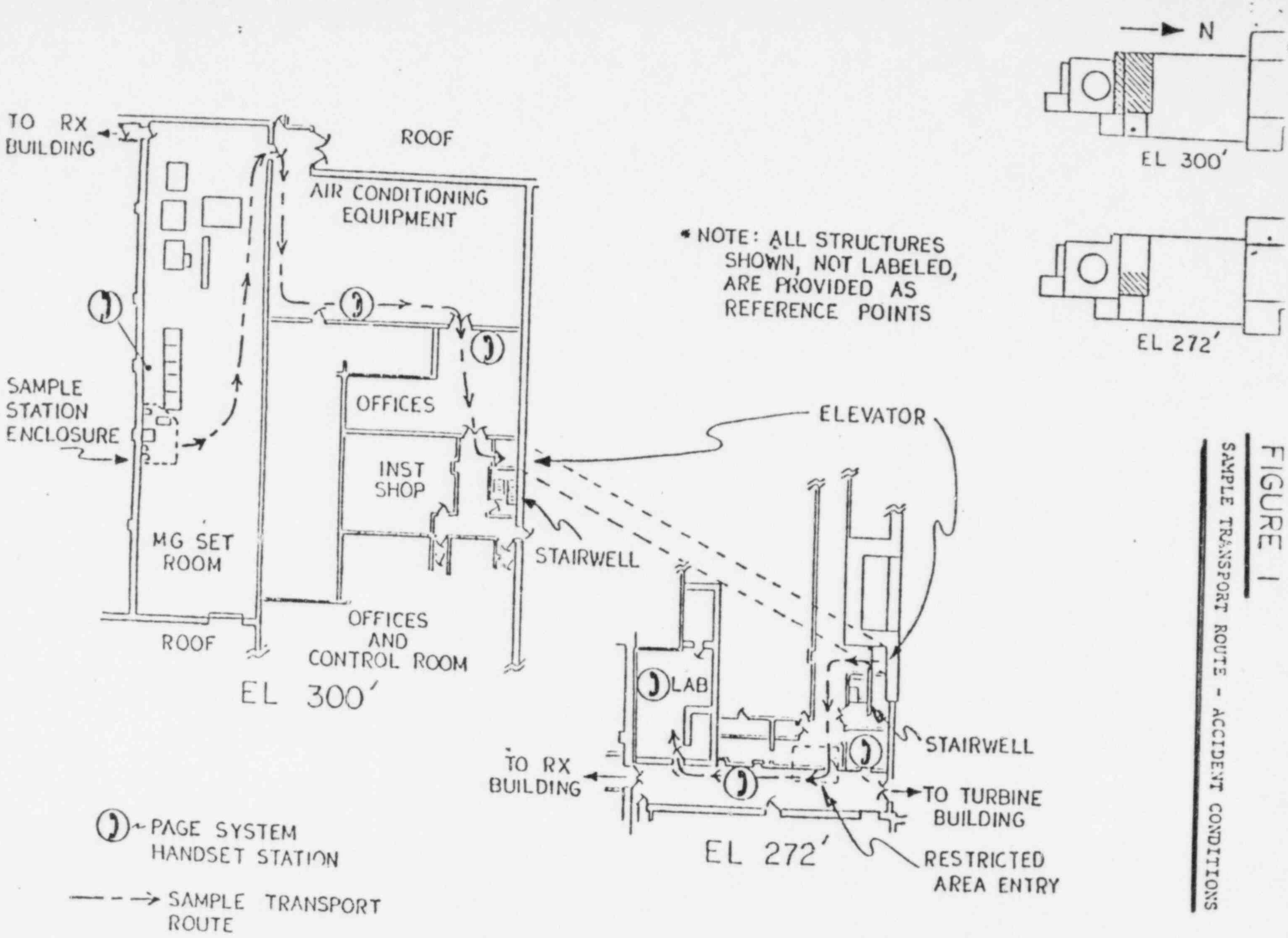
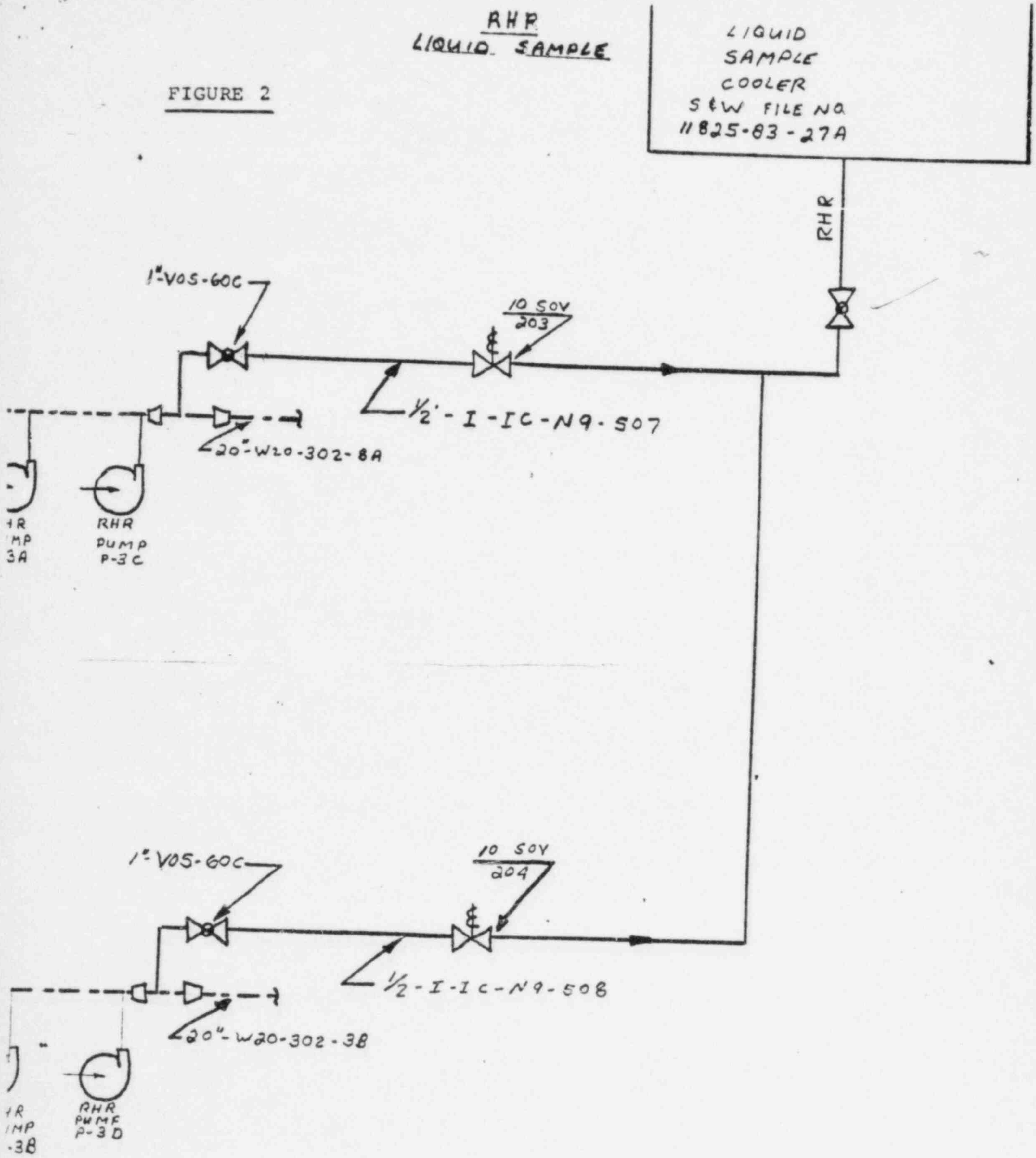


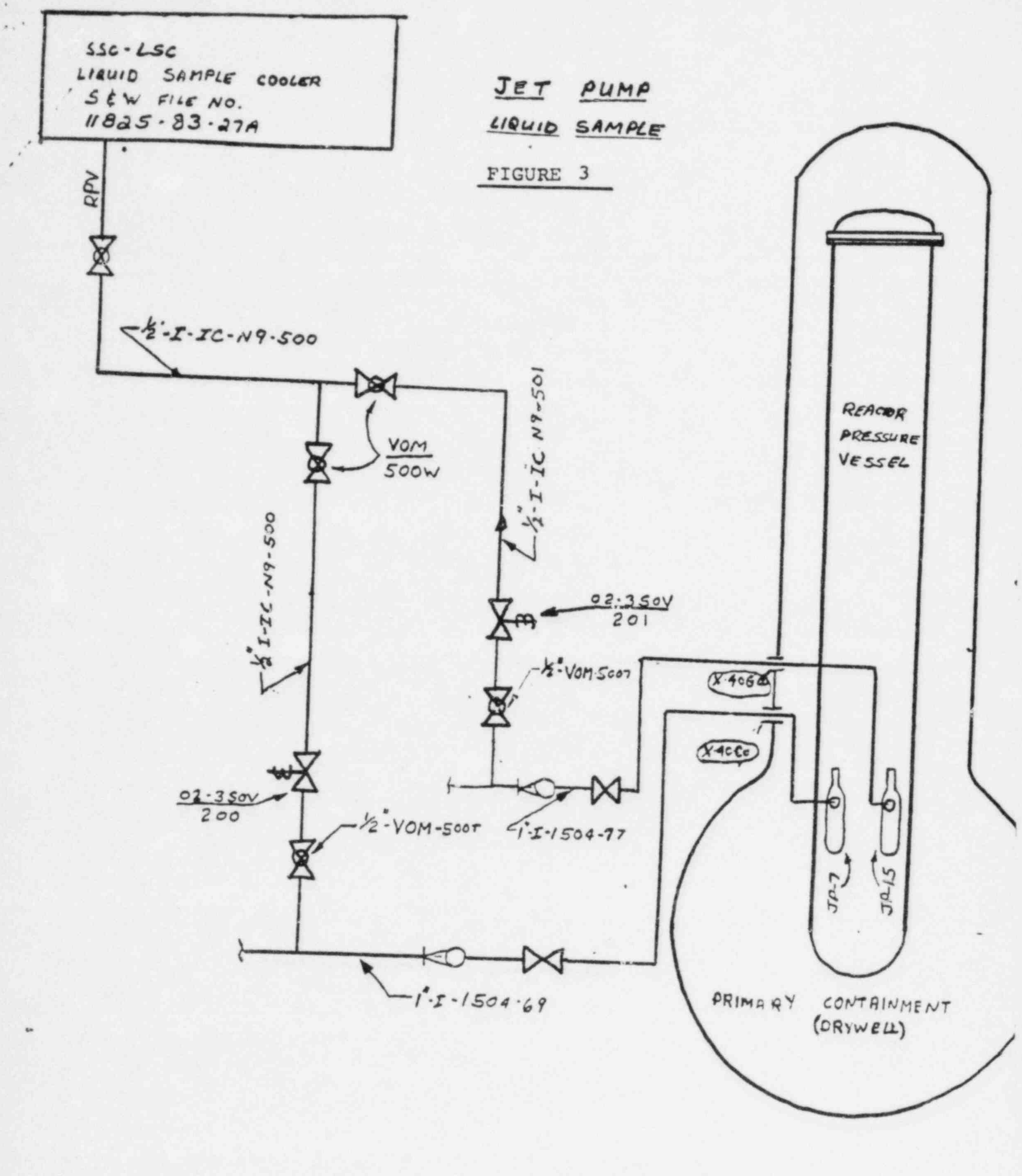
FIGURE 1
SAMPLE TRANSPORT ROUTE - ACCIDENT CONDITIONS

FIGURE 2


RHR
LIQUID SAMPLE
LIQUID
SAMPLE
COOLER
S&W FILE NO.
11825-83-27A
RHR
1"-VOS-60C
10 SOV
203
1/2"-I-IC-N9-507
20"-W20-302-8A
RHR
PUMP
P-3C
1"-VOS-60C
10 SOV
204
1/2-I-IC-N9-508
20"-W20-302-3B
RHR
PUMP
P-3D

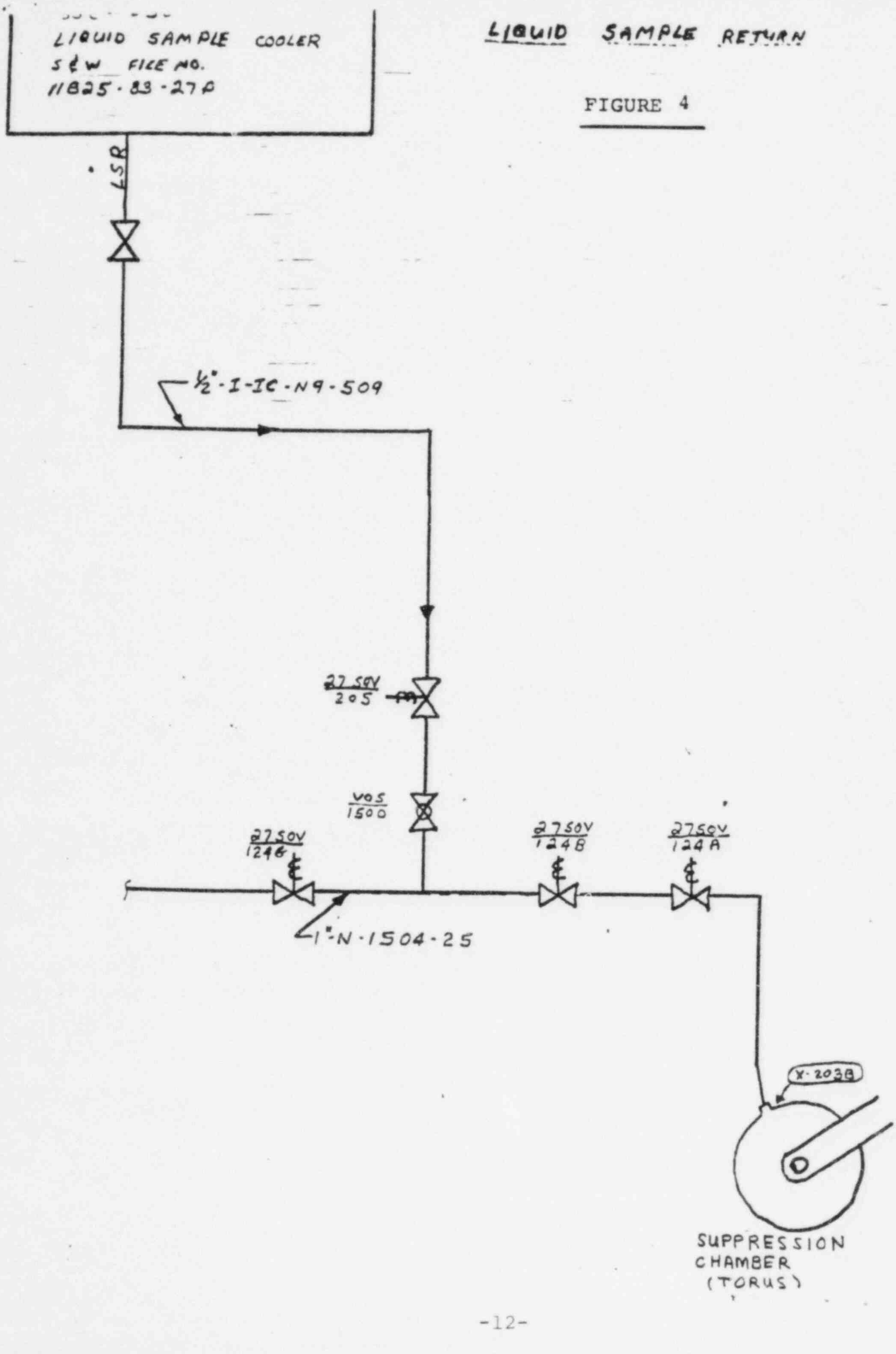
JET PUMP
LIQUID SAMPLE

FIGURE 3



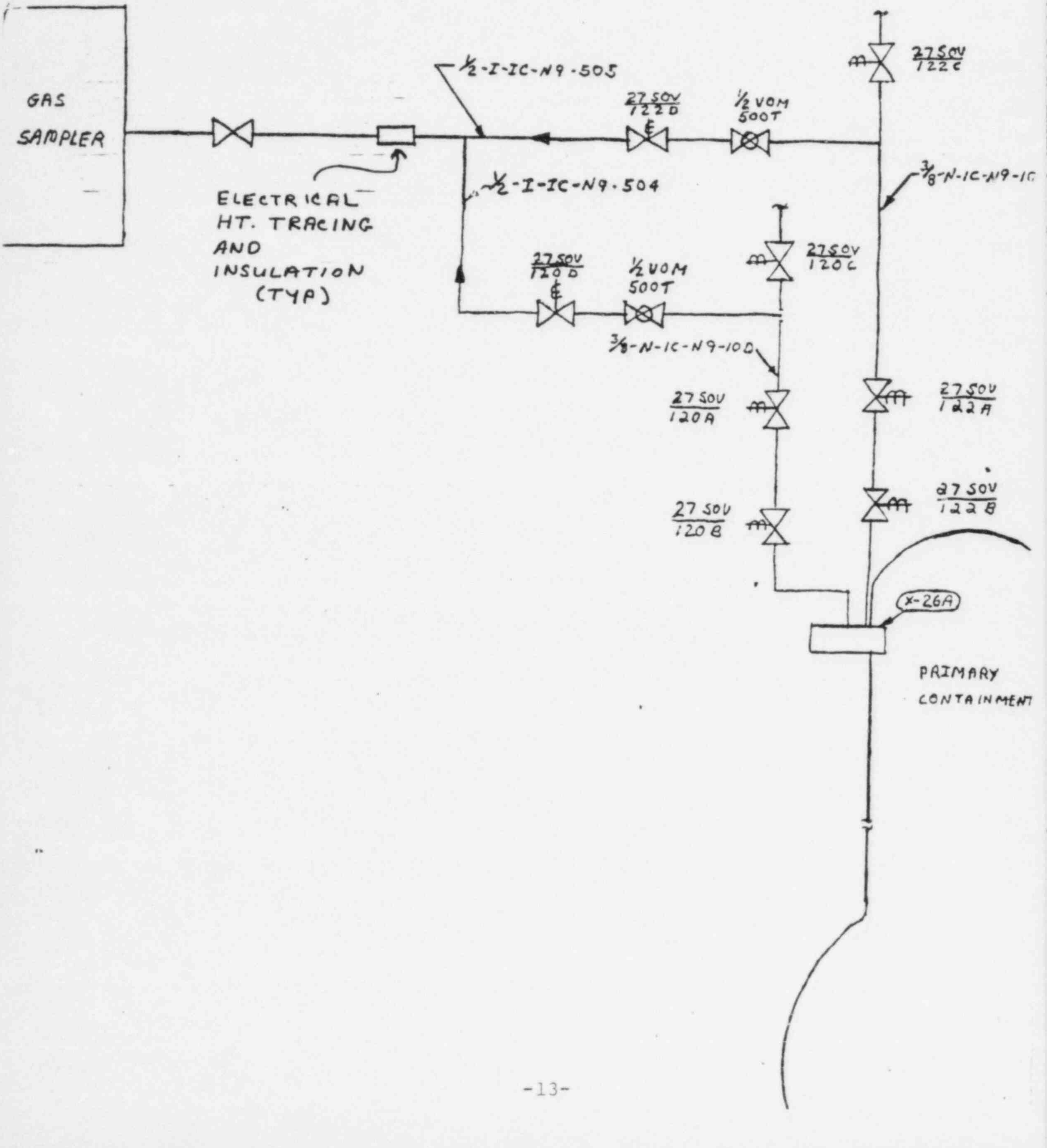
LIQUID SAMPLE RETURN

FIGURE 4



PRIMARY CONTAINMENT
GAS SAMPLE

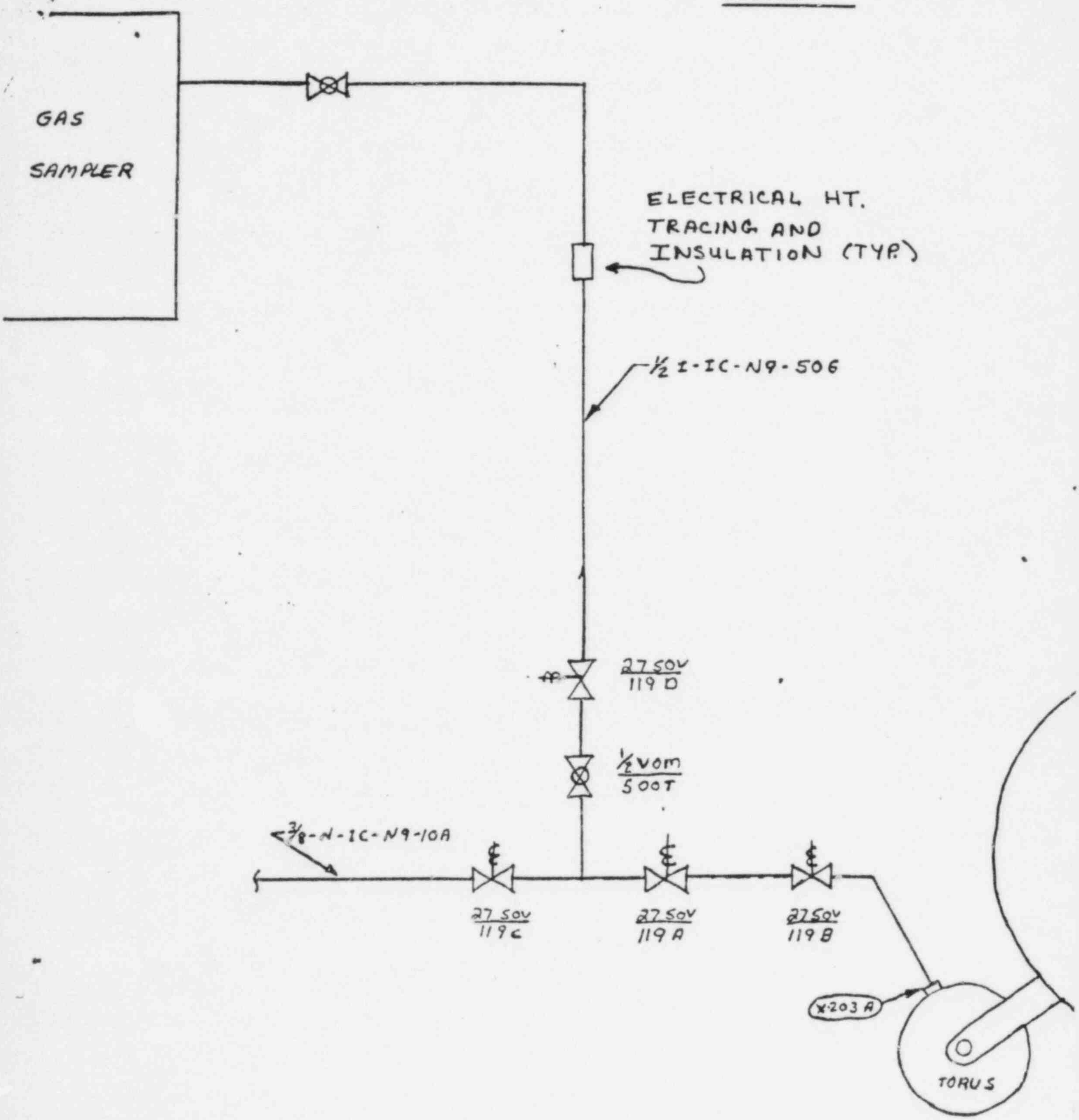
FIGURE 5



SUPPRESSION POOL (TORUS)

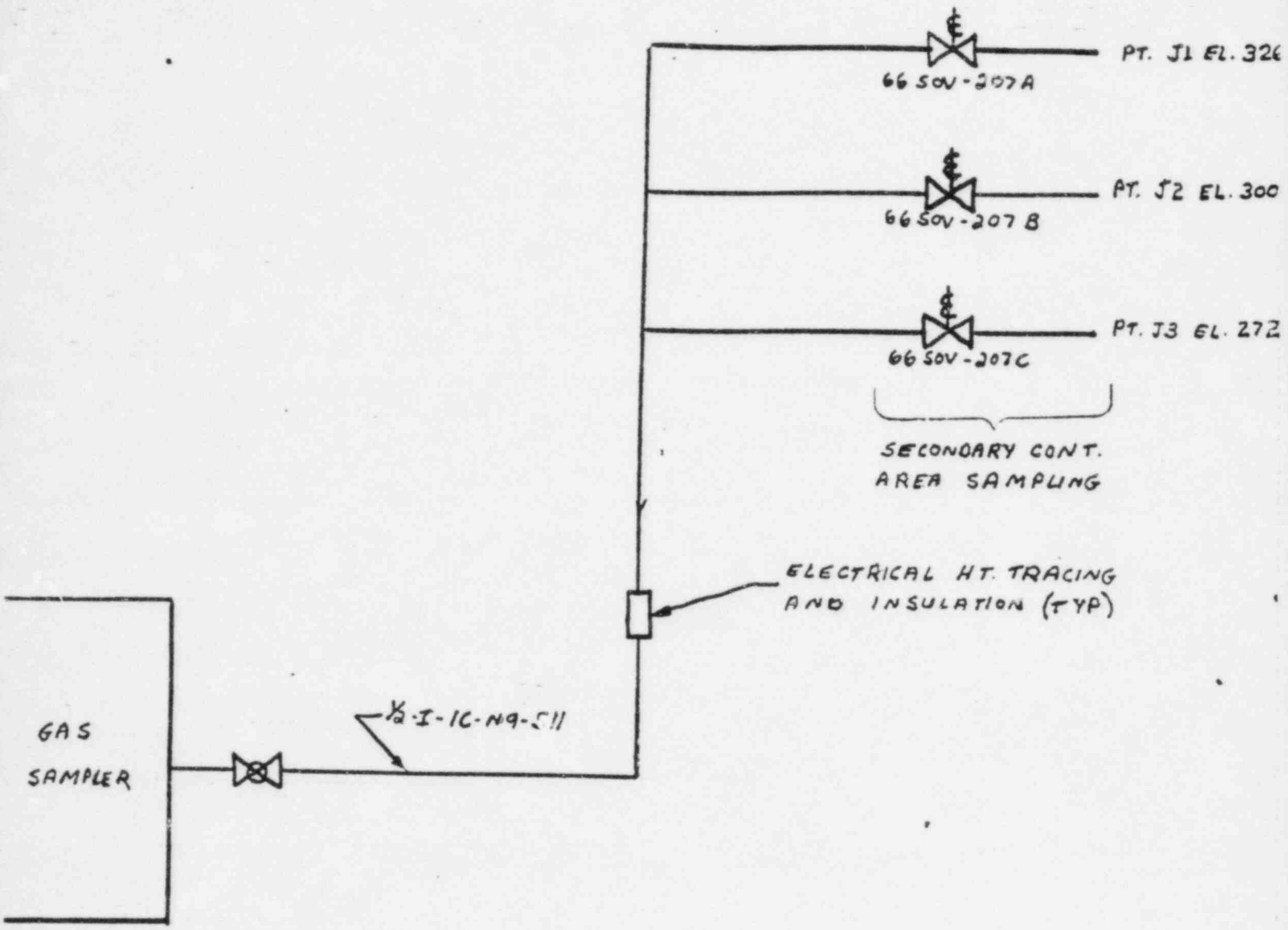
SAMPLE LINE.

FIGURE 6



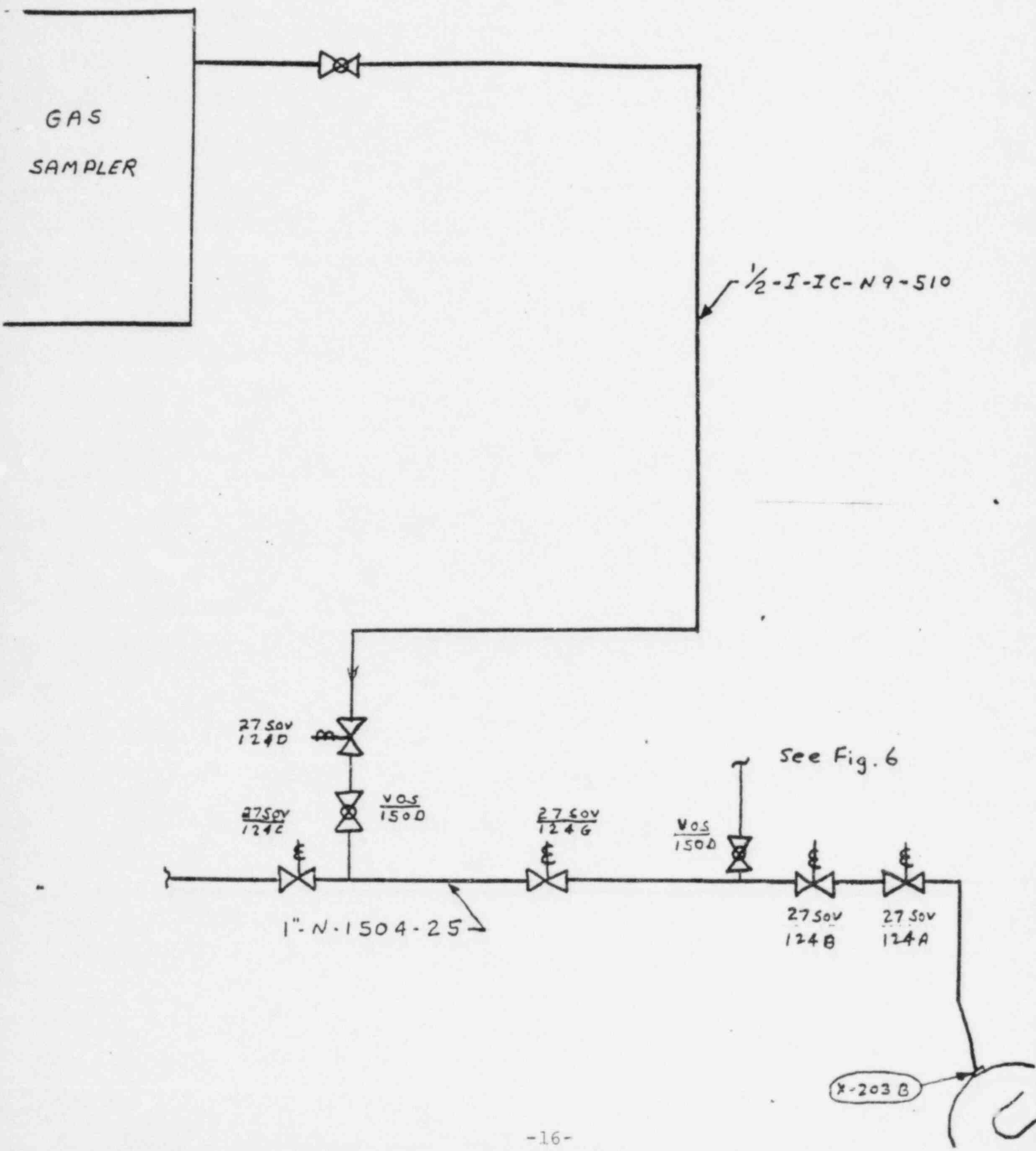
SECONDARY CONTAINMENT
GAS SAMPLE

FIGURE 7



GAS SAMPLE RETURN LINE

FIGURE 8



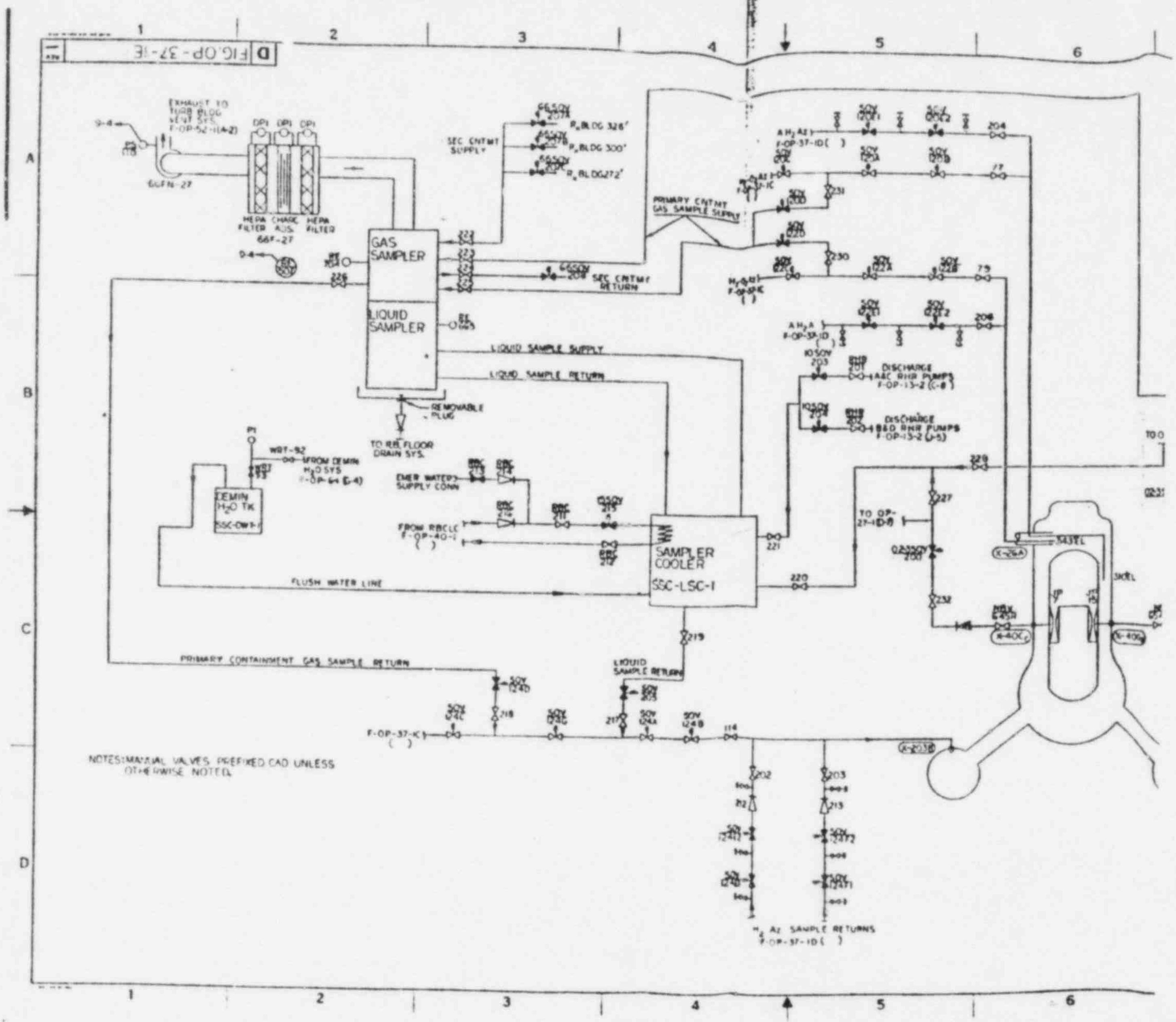


FIG. OP-37-1E
EXHAUST TO TURB BLDG VENT SYS. F-OP-52-1(A-2)
HEPA FILTER
CHARC ADS.
HEPA FILTER
66F-27
66FN-27
SEC CNTMT SUPPLY
PRIMARY CNTMT GAS SAMPLE SUPPLY
SEC CNTMT RETURN
GAS SAMPLER
LIQUID SAMPLER
LIQUID SAMPLE SUPPLY
LIQUID SAMPLE RETURN
REMOVABLE PLUG
TO R.B. FLOOR DRAIN SYS.
DEMIN H2O TK
SSC-DWT-1
FROM DEMIN H2O SYS
EMER WATER SUPPLY CONN
FROM RBCLC F-OP-40-2 ( )
SAMPLER COOLER
SSC-LSC-1
FLUSH WATER LINE
DISCHARGE A&C RHR PUMPS F-OP-13-2 (C-8)
DISCHARGE B&D RHR PUMPS F-OP-13-2 (J-5)
PRIMARY CONTAINMENT GAS SAMPLE RETURN
LIQUID SAMPLE RETURN
F-OP-37-K ( )
H2 A2 SAMPLE RETURNS F-OP-37-1D ( )
NOTES: MANUAL VALVES PREFIXED CAD UNLESS OTHERWISE NOTED.

FIGURE 9.