William O. Miller, Chief
License Fee Management Branch, ADM

Date: 3/19/79
Amended Form Date: ______

FACILITY AMENDMENT CLASSIFICATION - DOCKET NO(S). 50-261

Licensee: CAROLINA POWER & LIGHT

Plant Name and Unit(s): ROBINSON 2

License No(s): DPR-23 Mail Control No: ______

Request Dated: 3/15/79 Fee Remitted: Yes ______ No ✓

Assigned TAC No: 11540

Licensee's Fee Classification: Class I ___, II ___, III ___, IV ___, V ___, VI ___, None ✓.

Amendment No. ______ Date of Issuance ______

☐ 1. This request has been reviewed by DOR/DPM in accordance with Section 170.22 of Part 170 and is properly categorized.

☑ 2. This request is incorrectly classified and should be properly categorized as Class III. Justification for classification or reclassification: This action requires a review of the isolation valve seal water system.

☐ 3. Additional information is required to properly categorize the request:

______

☐ 4. This request is a Class ____ type of action and is exempt from fees because it:

(a) ____ was filed by a nonprofit educational institution,

(b) ____ was filed by a Government agency and is not for a power reactor,

(c) ____ is for a Class ____ (can only be a I, II, or III) amendment which results from a written Commission request dated ______ for the application and the amendment is to simplify or clarify license or technical specifications, has only minor safety significance, and is being issued for the convenience of the Commission, or

(d) ____ other (state reason therefor): ______

RECEIVED BY LFMB
Date 3/28/79
Time 9 M
By
From Rita Jacques
Cy to
Action Compl

jon 3/19/79 [signature] 3/19

Division of Operating Reactors/Project Management

☐ The above request has been reviewed and is exempt from fees.

______
William O. Miller, Chief
License Fee Management Branch

______
Date

LFMB 6/78

Carolina Power & Light Company

FILE: NG-3514(R) March 15, 1979 SERIAL: GD-79-694

Office of Nuclear Reactor Regulation
Division of Operating Reactors
ATTENTION: Mr. A. Schwencer, Chief
Operating Reactors Branch No. 1
United States Nuclear Regulatory Commission
Washington, D. C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
ISOLATION VALVE SEAL WATER SYSTEM

Dear Mr. Schwencer:

Reactor Containment Leakage Testing requirements are specified in Appendix J to 10CFR50. Section III.C.3 of Appendix J gives the acceptance criteria for Type C tests and exempts those isolation valves sealed with fluid from a seal system from the requirements for individual valve tests. This exemption is conditional on the seal system being demonstrated operable within the limits specified in the Technical Specifications and the system fluid inventory being sufficient to assure the sealing function for at least 30 days at a pressure of 1.10 Pa.

Until the 1978 refueling, H. B. Robinson compliance with Appendix J included the testing of the Isolation Valve Seal Water (IVSW) System pursuant to Technical Specifications and the use of the exemption of Section III.C.3. This interpretation was based on the Company's review of the system design and the apparent acceptance of the system by the NRC staff. The system is described in the FSAR, the original AEC safety evaluation and the unit Technical Specifications, all of which were approved by the Commission.

In late February 1978, during the unit refueling, the Office of Inspection and Enforcement with support from staff members from the Office of Nuclear Reactor Regulation briefly reviewed the H. B. Robinson IVSW system as it applies to Appendix J, Type C testing. Their conclusion was that the IVSW system could not be used to meet the requirements of III.C.3. This determination was based on the fact that no credit is taken for the IVSW system operation in the accident off-site dose calculations. It was decided that in lieu of positive evidence that a satisfactory pre-license review was performed on the IVSW system, other than that presented in the safety evaluation and Technical Specifications, the NRC could not conclude that the H. B. Robinson IVSW system meets the conditional requirements of III.C.3. The plant was thus required to perform both the IVSW system test as required by Technical Specifications and the individual (Type C) leak tests required by Appendix J on the valves sealed by the IVSW system during the 1978 refueling. Discussions with I&E over the past few months have resulted in a recent confirmation of this position with regard to future testing.

Carolina Power & Light Company believes that the IVSW system meets the exemption criteria and requests that the NRC again review the H. B. Robinson IVSW system and determine that it is an acceptable system as described in Appendix J of

10CFR50. It is requested that this review be completed by April 15, 1979, since resolution by that time could result in very significant manpower savings (approximately 150 man-days) and a reduction in occupational exposure during the upcoming refueling outage. As you are aware, the Company is undertaking major modifications during the outage (scheduled to begin April 21) to comply with NRC fire protection requirements. Therefore, a savings of 150 man-days is of major significance during refueling. The reasons that Carolina Power & Light Company believes that the IVSW system meets the exemption criteria are listed in the following paragraphs:

The H. B. Robinson IVSW system is a conservatively designed system which is required to be operable by the unit Technical Specifications. No credit is taken for the operation of the system in the accident off-site dose calculations. This simply demonstrates the acceptability of the overall plant design in the most conservative possible manner, and does not reflect any uncertainty over the performance of the IVSW system.

Attached to this letter is a description of the H. B. Robinson IVSW system. Our review over the last few months has indicated minor changes which will further enhance the reliability of the IVSW system. These changes will be made during the next refueling outage. Both the present and the proposed systems are shown in the attached figures (Figure 1 and Figure 2 respectively). These changes do not in any way constitute an unreviewed safety concern, and we are not asking for approval for the specific changes or credit for the seal functions of the system with regard to our dose calculations.

Prior to receiving notification that individual leak rate tests of the IVSW supplied isolation valves were required, the refueling interval functional test on the IVSW system had been performed during the 1978 outage. The system had performed satisfactorily, although leakage greater than the acceptance criteria leak rate was detected through some of the valves. Adjustments were made for some of the valves and maintenance was scheduled for the remaining leaking valves. Prior to this maintenance, the individual leak tests were performed on all valves serviced by the IVSW system, including those requiring maintenance. During these leak tests, all the valves which had passed the IVSW test showed leakage rates well within the individual valve acceptance criteria established for the local tests. Correspondingly, the only valves which indicated significant leakage had previously been indentified by the routine refueling interval test. After concluding the local leak testing, including required maintenance, the leakage from the IVSW system was again checked and all header leakages were well within the limits based on valve design.

The agreement between the refueling interval periodic test results and those of the individual local tests adds additional support to the acceptability of the IVSW system. Based on this agreement and the design of the IVSW system, CP&L requests future leak tests on isolation valves supplied by this system be performed using the IVSW system and that the exemption stated in 10CFR50, Appendix J be allowed. Such a determination will allow the IVSW system to be used for isolation valve leak rate tests and still assure large conservation in the accident off-site dose calculations.

If you have any questions concerning this item, please contact our staff.

Yours very truly,

M. A. McDuffie

for E. E. Utley
Senior Vice President
Power Supply

EEU/tl

ISOLATION VALVE SEAL WATER SYSTEM

Design Basis

The Isolation Valve Seal Water (IVSW) System assures the effectiveness of certain containment isolation valves, during any condition which requires containment isolation, by providing a water seal at the valves. These valves are located in lines that are connected to the Reactor Coolant System, or that could be exposed to the containment atmosphere in the unlikely event of a loss-of-coolant accident. The system provides a simple and reliable means for injecting seal water between the seats and stem packing of the globe and double disc types of isolation valves, and into the piping between closed diaphragm type isolation valves. This system operates to limit the fission product release from the containment.

Although no credit is taken for operation of this system in calculation of off-site accident doses, it does provide assurance that the containment leak rate will be lower than that assumed in the accident analysis or as indicated by the results of the unit Integrated Leak Rate Tests should an accident occur. The system is required to be operable by the unit Technical Specifications and is functionally tested at each refueling outage.

System Design and Operation

The present Isolation Valve Seal Water System flow diagram is shown in Figure 1. Changes to the system to increase its reliability are presented on Figure 2. These changes will be performed during the next refueling outage. Additional information is presented in Chapter 5 of the H. B. Robinson FSAR.

System operation is initiated by a Phase A containment isolation signal which accompanies any safety injection (SI) signal. When actuated, the Isolation Valve Seal Water System interposes water inside the penetrating line between two isolation points located outside the containment. The resulting water seal blocks leakage of the containment through valve seats and stem packing. The water is introduced at a pressure slightly higher (1.1Lp, approximately 46 psig) than the maximum calculated containment design pressure of 42 psig for a postulated LOCA event. The possibility of leakage from the containment or Reactor Coolant System under post-accident conditions past the first isolation point is thus prevented by assuring that if leakage does exist, it will be from the seal water system into the containment.

The system includes one seal water tank capable of supplying the total requirements of the system. The tank is pressurized with a nitrogen blanket supplied from two independent sources. Primary supply is from the plant nitrogen supply header through a pressure regulating control valve. Automatic backup supply is provided from two high pressure nitrogen bottles through separate high & low pressure regulating valves as shown on Figue 1. Design pressure of the tank and piping is 150 psig. The injection piping runs and nitrogen supply piping runs are fabricated using 3/8 inch O.D. stainless steel tubing, which is capable of 2500 psig service. Relief valves are provided to prevent over-pressurization of the system if a pressure control valve fails, or if a seal water injection line communicates with a high pressure line due to a check valve failure in the seal water line. The seal water tank requires no external power source to maintain the required driving pressure.

The tank supplies pressurized water to four distribution headers. Header "A" is the manual header, meaning an isolation valve on this header must be pressurized by opening a manual valve supplying the individual isolation valve. Headers "B", "C", and "D" are automatic headers that are pressurized through one or both of two redundant, fail open air operated valves in parallel. These valves open on receipt of an SI signal. A loss of power will cause the automatic valves to open since automatic initiation is a de-energize signal to vent air from the valve operators.

Liquid carrying piping two inches and larger with design pressure or temperature exceeding 200 psig or 200^{o}F are isolated by one manual or remote operated double-disc gate valve. Redundant isolation barriers are provided when the valve is closed. The upstream and downstream discs are forced against their respective seats by the closing action of the valve. Seal water is injected through the valve bonnet or body and pressurizes the space between the two valve discs.

For smaller pipes isolation is provided by two globe valves in series with the seal water injected into the pipe between the valves. The valves are oriented such that the seal water wets the stem packing. When the valves are closed for containment isolation, the first isolation point is the valve plug in the valve closest to containment, and the water seal is applied between the valve plug and stem packing. In a number of the smaller pipes, isolation is provided by two diaphragm valves in series, with the seal water injected into the pipe between the valves.

The maximum acceptable leakage across both the seal and stem packing of any gate or globe valve is 10 cc/hr/inch of nominal pipe diameter. However, design capacity of the Isolation Valve Seal Water System is based on the conservative assumption that all isolation valves are leaking at five times the acceptable value, or 50 cc/hr/inch of nominal pipe diameter. In addition, should one of the isolation valves fail to close, flow through the failed valve will be limited by a restricting orifice to a maximum leakage value of 63,200 cc/hr. A water seal at the failed valves is assured by proper slope of the protected line, a loop seal, or by additional valves on the side of the isolation valves away from the containment.

The seal water tank is sized to provide at least a 24-hour supply of seal water under the following adverse circumstances: isolation valves leaking at the design rate of 50 cc/hr/inch plus the failure of the largest containment isolation valve to seat and leaking at the maximum rate of 1000 cc/hr/inch. The seal water tank is sized to satisfy these conditions. Two separate, independent, seismically qualified sources of make-up water (primary water and service water) are provided to ensure that an adequate supply of seal water is available for long term operation. Service water makeup is from two sources, the service water header and from each of the service water booster pumps. This assures a redundant long term supply of water from a source greater than the 1.1Lp design pressure. Based on maximum leakage and flows into the tank from make-up sources, use of the make-up source would be required for only minimal amounts of time each day at very low flows which will not affect other functions of the make-up system.

Seal Water Actuation Criteria

The automatically tripped isolation valves are actuated to the closed position by one of two separate containment isolation signals. The first of these signals is derived in conjunction with automatic safety injection actuation, and trips the majority of the automatic isolation valves. These valves are in the so-called "non-essential" process lines penetrating the containment. This is defined as "Phase A" isolation, and the trip valves are designated by the letter "T". This signal also initiates automatic seal water injection. The second, or "Phase B" containment isolation signal is derived upon actuation of the containment spray system, and trips the automatic isolation valves in the so-called "essential" process lines penetrating the containment. These trip valves are designated by the letter "P".

A manual containment isolation signal or SI signal can be generated from the control room. This signal performs the same functions as the automatically derived "T" signal, i.e., "Phase A" isolation and automatic seal water injection.

The list of valves receiving seal water from the IVSW system, along with pertinent information concerning each valve is provided in Table 1.

Design Evaluation

The Isolation Valve Seal Water System provides an extremely prompt and reliable method of limiting the fission product release from the containment isolation valves in the event of a loss-of-coolant accident.

The employment of the system during a loss-of-coolant accident, while not considered for analysis of the consequences of the accident, provides an additional means of conservatism in ensuring that leakage is minimized. No detrimental effect on any other safeguards system will occur should the seal water system fail to operate.

A single failure description is presented in Table 3. The analysis shows that the failure of any single active component will not prevent fulfilling the design function of the system.

The Isolation Valve Seal Water System can operate and meet its design function without reliance on any other system. Electric power is not required for system operation, although instrument power is required to provide indication in the control room of seal water tank pressure and level. Local instrumentation is also provided as shown in Figure 2. The primary source of N_2 from the plant N_2 supply header is backed up by two independent high pressure N_2 bottles. If there should be a break or failure of the N_2 header, the N_2 blanket pressure is maintained by the tanks and blowdown through the N_2 header is prevented by check valves.

C.I.S. - Containment Isolation Signal
A - Automatic Seal Water Injection
M - Manual Seal Water Injection
FC - Fail Closed
Dia. - Diaphragm Valve
DDV - Double Disc Gate Valve
C.S. - Closed System

Hot - > 200°F
Cold - < 200°F

Table 1

Containment Piping Penetrations

and Valving

RCS - Reactor Coolant System
ACS - Auxiliary Coolant System
WDS - Waste Disposal System
SIS - Safety Injection System
SS - Sampling System
CVCS - Chemical & Volume Control System
VENT - Ventilation System
PPS - Penetration Pressurization System

Pene. No.	Penetration and System	Valve No.	Valve Type	Oper. Type	Posit. Indic. in Cont. Room	Normal Posit.	Posit. During Shutdown	Posit. After Accident	Posit. on Power Fail.	Cont. Isol. Trip	Seal Water Inj.	Used After Accid.	Fluid G-Gas W-Water	Temp	Notes
1	Pressurizer Relief Tank to Gas Analyzer-RCS	516	Dia.	Air	Yes	Open	Open	Closed	FC	T	A	No	G	Cold	Opened intermittently by automatic analyzer for gas sample.
		553	Dia.	Air	Yes	Open	Open	Closed	FC	T	A	No	G	Cold	
3	Pressurizer Relief Tank Makeup - RCS	519A	Dia.	Air	Yes	Clsd	Closed	Closed	FC	T	A	No	W	Cold	
		519B	Dia.	Air	Yes	Clsd	Closed	Closed	FC	T	A	No	W	Cold	
4	Primary System Vent Header	1786	Dia.	Air	Yes	Clsd	Closed	Closed	FC	T	A	No	G	Cold	
		1787	Dia.	Air	Yes	Clsd	Closed	Closed	FC	T	A	No	G	Cold	
5	Reactor Coolant Drain Tank to Gas Analyzer-WDS	1794	Globe	Air	Yes	Open	Open	Closed	FC	T	A	No	G	Cold	Opened intermittently by automatic analyzer for gas sample.
		1789	Globe	Air	Yes	Open	Open	Closed	FC	T	A	No	G	Cold	
6	Reactor Coolant Drain Tank Pump Discharge Line-WDS	1721	Dia.	Air	Yes	Clsd	Closed	Closed	FC	No	-	No	W	Cold	Isolation valve for reactor coolant drain tank pump suction.
		1722	Dia.	Air	Yes	Clsd	Closed	Closed	FC	T	A	No	W	Cold	

Pene. No.	Penetration and System	Valve No.	Valve Type	Oper. Type	Posit. Indic. in Cont. Room	Normal Posit.	Posit. During Shutdown	Posit. After Accident	Posit. on Power Fail.	Cont. Isol. Trip	Seal Water Inj.	Used After Accid.	Fluid G-Gas W-Water	Temp	Notes
13 14 15	Steam Gen. Blowdown Lines (Sec. Sys.)	1930A* 1930B* 1931A* 1931B* 1932A* 1932B*	Globe	Air	Yes	Open	Closed	Closed	FC	T	A	No	W	Hot	*These 6 valves are all the same.
		1933A° 1933B° 1934A° 1934B° 1935A° 1935B°	Globe	Air	Yes	Clsd**	Closed	Closed	FC	T	A	No	W	Hot	°These 6 valves are all the same. **Opened intermittently for SG samples.
18	Reactor Coolant Pump Cooling Water In - ACS	716B	DDV	Mot.	Yes	Open	Open	Closed	As is	P	A	No	W	Cold	
19	Reactor Coolant Pump Cooling Water Out - ACS (6" line)	730	DDV	Mot.	Yes	Open	Open	Closed	As is	P	A	No	W	Cold	
20	Reactor Coolant Pump Cooling Water Out - ACS (3" line)	FCV-626	Gate	Mot.	Yes	Open	Open	Closed	As is	P	A	No	W	Cold	
		735	Globe	Mot.	Yes	Open	Open	Closed	As is	P	A	No	W	Cold	
23	Letdown Line CVCS	204A	Globe	Air	Yes	Open	Closed	Closed	FC	T	A	No	W	Hot	
		204B	Globe	Air	Yes	Open	Closed	Closed	FC	T	A	No	W	Hot	

Pene. No.	Penetration and System	Valve No.	Valve Type	Oper. Type	Posit. Indic. in Cont. Room	Normal Posit.	Posit. During Shutdown	Posit. After Accident	Posit. on Power Fail.	Cont. Isol. Trip	Seal Water Inj.	Used After Accid.	Fluid G-Gas W-Water	Temp	Notes
24	Charging Line - CVCS	282	Globe	Man.	No	Open	Closed	Closed*	As is	No	M	No*	W	Cold	*May be used for high pressure safety injection.
		202A	Gate	Man.	No	Open	Closed	Closed*	As is	No	M	No	W	Cold	
		309A	Globe	Man.	No	Closed	Closed	Closed*	As is	No	M	No*	W	Cold	
25 26 27	Reactor Coolant Pump Seal Water Supply Lines - CVCS	297A	Needle	Man.	No	Throt.	Open	Closed*	As is	No	M	Yes*	W	Cold	*Line is isolated after pump is shutdown.
		297B	Needle	Man.	No	Throt.	Open	Closed*	As is	No	M	Yes*	W	Cold	
		297C	Needle	Man.	No	Throt.	Open	Closed*	As is	No	M	Yes*	W	Cold	
		293A	Globe	Man.	No	Open	Open	Closed*	As is	No	M	Yes*	W	Cold	
		293C	Globe	Man.	No	Closed	Closed	Closed	As is	No	M	Yes*	W	Cold	
		295A	Globe	Man.	No	Closed	Closed	Closed	As is	No	M	Yes*	W	Cold	
		295	Gate	Man.	No	Closed	Closed	Closed	As is	No	M	Yes*	W	Cold	
28	Reactor Coolant Pump Seal Water Return Line - CVCS	381	DDV	Mot.	Yes	Open	Open	Closed	As is	P	A	No	W	Cold	
29 30 31	Reactor Coolant System Sample Lines - SS	956A 956B 956C 956D 956E 956F	Globe	Air	Yes	Closed	Closed	Closed	FC	T	A	No	W	Hot	
60	Accumulator Sample Line	956G	Globe	Air	Yes	Closed	Closed	Closed	FC	T	A	No	W	Cold	
		956H	Globe	Air	Yes	Closed	Closed	Closed	FC	T	A	No	W	Cold	

Pene. No.	Penetration and System	Valve No.	Valve Type	Oper. Type	Posit. Indic. in Cont. Room	Normal Posit.	Posit. During Shutdown	Posit. After Accident	Posit. on Power Fail.	Cont. Isol. Trip	Seal Water Inj.	Used After Accid.	Fluid G-Gas W-Water	Temp	Notes
48	Safety Injection Test Line - SIS	895V 898W	Globe Globe	Man. Man.	No No	L.C. L.C.	Closed Closed	Closed Closed	As is As is	No No	A A	No No	W W	Cold Cold	
43	Safety Injection Line to Hot Legs	869	DDV	Mot.	Yes	Closed	Open	Open	As is	No	M	Yes	W	Cold	
62 63 64	Boron Injection Lines	870A 870B	DDV DDV	Mot. Mot.	Yes Yes	Closed Closed	Closed Closed	Open Open	As is As is	No No	M M	Yes Yes	W W	Cold Cold	Valves opened on safety injection signal.
44	Containment Spray Header - SIS	891A	DDV	Man.	No	Open	Open	Open*	As is	No	M	Yes	W	Cold	*Closed by operator when post-accident recirculation is initiated.
45	Containment Spray Header - SIS	891B	DDV	Man.	No	Open	Open	Open*	As is	No	M	Yes	W	Cold	*Closed by operator wh post-accident recirculation is initiated.
61	Containment Sump Pumps Discharge	1723 1728	Dia. Dia.	Air Air	Yes Yes	Closed Closed	Closed Closed	Closed Closed	FC FC	T T	A A	No No	W W	Cold Cold	

Table 2

Isolation Valve Seal Water Tank

Material	ASTM A-240
Design Pressure, psig	150
Design Temperature, °F	200
Operating Pressure, psig	50-100
Operating Temperature, °F	Ambient
Code	ASME UPV (Sect. VIII)

Table 3

Single Failure Analysis - Isolation Valve Seal Water System

Component		Malfunction	Comments
A.	Automatically Operated Valves (Open on Phase A Containment Isolation Signal)		
	1) Isolation valve for automatic injection headers	Fails to Open	Two Provided. Operation of one required.
B.	Instrumentation		
	1) Level Transmitter	Fails	Local level indicator at tank also provided.
	2) Pressure Transmitter	Fails	Local pressure indicator at tank also provided.
	3) Pressure Regulator	Fails to Open	Automatic backup supply from N_2 tanks through separate regulator. N_2 header manually cross connected to separate regulator.
C.	N_2 Supply	Loss of Main Header	Backup supply from N_2 tanks through separate regulator. N_2 tanks manually cross connected with N_2 header pressure regulator.
D.	Isolation Valve Supplied by Automatic Seal Water Injection	Fails to Close	Restricting orifice limits flow. System capacity is designed for the largest isolation valve failing to close with no loss of system function.

PRESENT ISOLATION WATER SYSTEM DIAGRAM

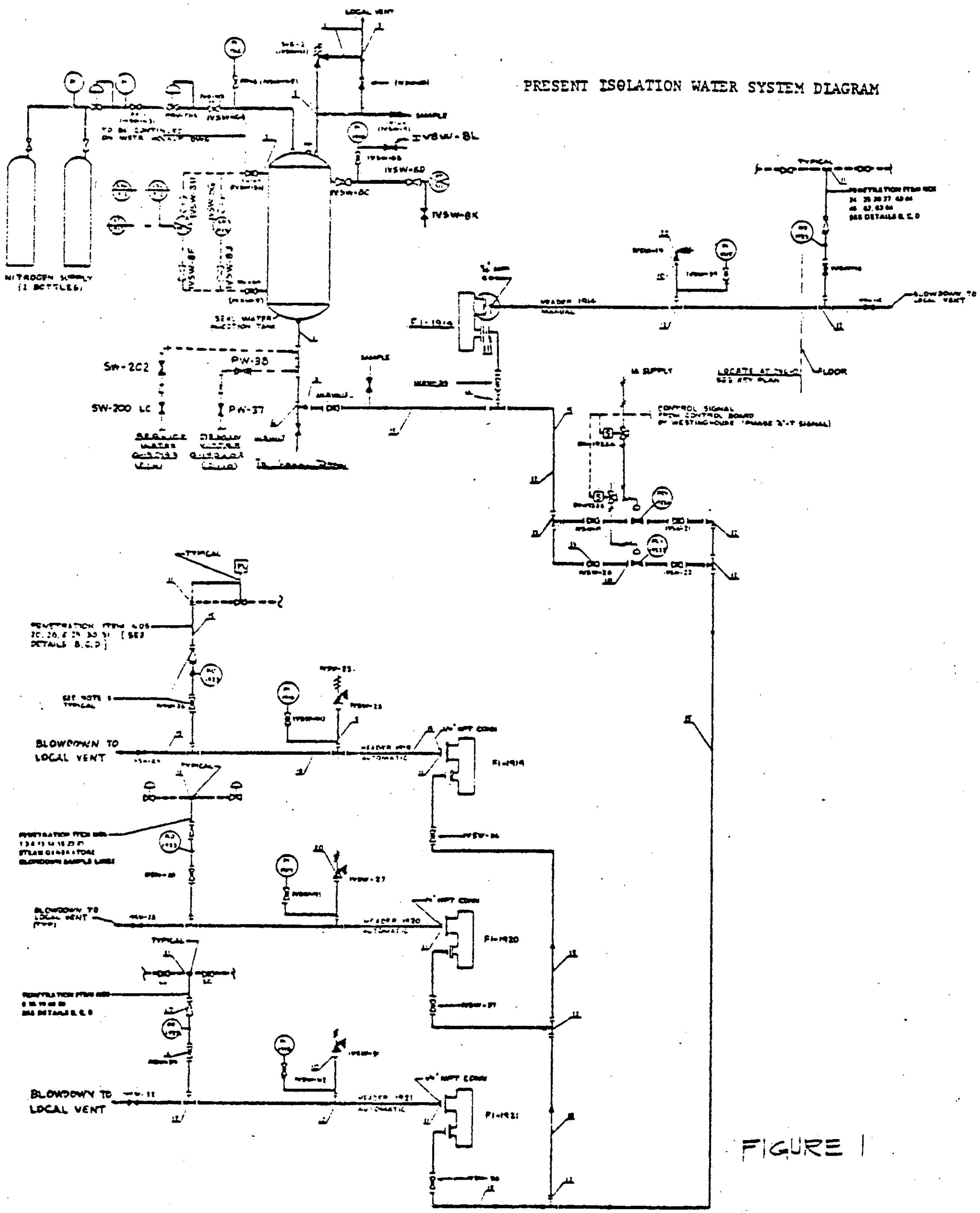

FIGURE 1

MODIFIED ISOLATION VALVE SEAL WATER SYSTEM

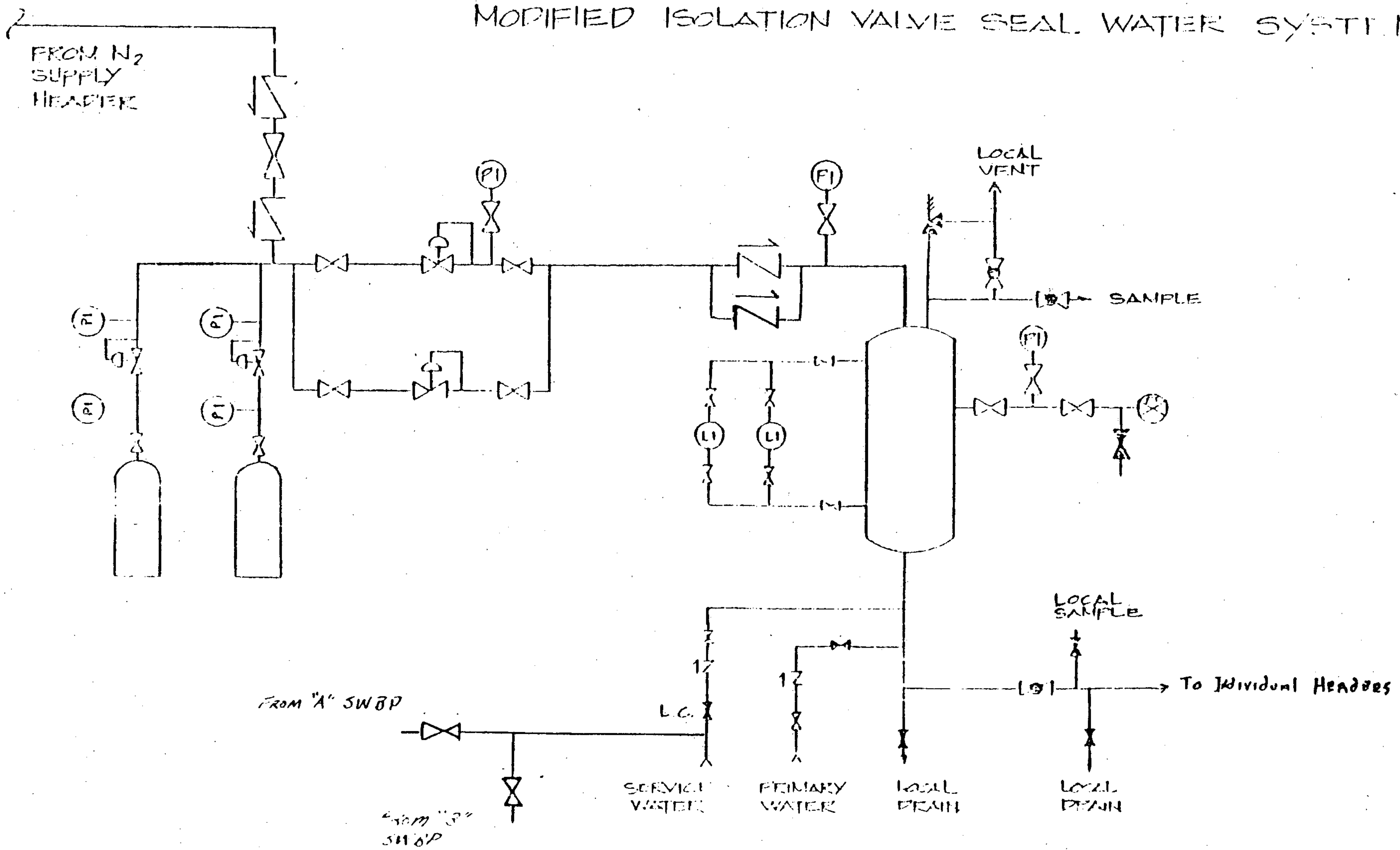

FIGURE 2