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SUBJECT: Forwards comments on NRC 810727 draft evaluation of SEP Topic VI-4, "Containment Isolation Sys." Two oversize drawings encl. Aperture cards are available in PDR.

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December 30, 1981

Director of Nuclear Reactor Regulation
ATTN: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: SEP Topic VI-4, Containment Isolation System
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Crutchfield:

Your letter dated July 27, 1981 forwarded the NRC draft evaluation of SEP Topic VI-4, Containment Isolation System. RGE has reviewed the evaluation and provides the comments found in Attachment A to this letter in response.

The RGE comments define the basis upon which the specific containment isolation provisions at the Ginna Plant are judged to be acceptable. The comments also address two specific issues pointed out in your letter, the location of both isolation valves outside containment and use of a check valve as an isolation valve outside containment. Our understanding is that these comments will be used as input to the integrated safety assessment for the Ginna Plant.

Very truly yours,

John E. Maier

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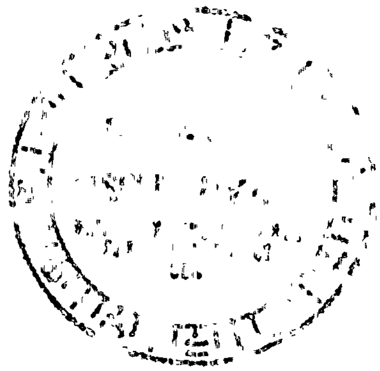

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ATTACHMENT A

Mr. Dennis M. Crutchfield's letter dated July 27, 1981 forwarded the NRC Staff draft evaluation report of SEP Topic VI-4, Containment Isolation System. The draft evaluation compared our facility, as described in the FSAR, with the General Design Criteria of Appendix A to 10CFR Part 50. Our comments on the draft evaluation are presented below.

The specific criteria which were applied to the Ginna containment isolation system design are given in FSAR sections 1.3 and 5.2. The FSAR criteria are based upon the proposed Atomic Industrial Forum versions of the criteria issued for comment by the Atomic Energy Commission on July 10, 1967. These criteria cover overall containment capability, containment leakage, materials, valving, and testing. The governing criterion was that the structure be designed to withstand the initial effects of gross equipment failures including reactor coolant pipe guillotine breaks and to retain for as long as required the functional capability of the containment to avoid undue risk to the health and safety of the public. The criteria which were applied to containment and containment isolation are numbers 10, 49, 50, 53, 54, 55, 56, and 57.

The current criteria give specific isolation arrangements which are now used to provide redundant isolation and protection of the public. The design used at Ginna also called for redundant isolation but differs in specific applications from the current prescriptions.

No bases are given for the prescriptions of GDC 55, 56 or 57. For example, no basis is provided for the requirement that check valves not be used as isolation valves outside containment. It is true that check valves will seal more tightly with a higher differential pressure across the seat. Thus, check valves should perhaps be the first of two isolation valves where the redundant barriers are both provided in the form of valves. This will assure the best seat seal. Valves outside the containment will function at least as well as those inside containment where an adverse accident environment may exist. For valves inside containment to be effective in isolating the accident environment, the pipe between the valve and the containment wall must remain intact. Valves outside containment are also effective only if the pipe between the containment wall and the valve remains intact. In either case, there is no mechanistic effect from a LOCA which would damage the pipe, however, piping outside the containment is inherently better protected from pipe whip, jet impingement, or

high temperature or caustic environments which may exist following an accident.

Section III.4.2.2 of WASH 1400 gives failure rates of valves including motor operated valves, air operated valves and check valves. Check valves have the lowest failure rate and are approximately one order of magnitude better than motor operated valves, and a factor of 3 better than air operated valves. The valves are periodically tested in the post accident configuration. Thus check valves along with other types of valves provide acceptable isolation outside containment.

The most likely cause of containment leakage following an accident is valve leakage caused by valves failing to close when actuated or failing to seat tightly. Passive, closed mechanical systems or pipes represent relatively insignificant leakage paths as demonstrated by periodic testing of containment isolation systems. No significant leaks, other than through valves, caps or flanges have been observed during containment testing of fluid systems at Ginna. Therefore, location of isolation valves outside containment does not represent a significant increased risk of leakage. The valves may be less susceptible to leakage outside containment following a LOCA because they are accessible for repair.

The NRC draft SEP evaluation compared the FSAR configuration with current GDC configurations and judged them acceptable because they meet current configuration requirements, judged them acceptable on some other defined basis as permitted by the GDCs, or described changes to the configurations which would meet the prescriptions of the current GDCs.

The NRC draft evaluation referenced drawings from the FSAR for specific containment penetrations. Some of these drawings do not represent the current plant configuration. Enclosed is Table 3.6-1, Containment Isolation Valves, Amendment 42 to the Ginna license, which was submitted and approved in response to the NRC request for TMI Lessons Learned Technical Specifications. This table lists all the containment penetrations and isolation valves. One change has been made to the plant since this table was submitted. Penetration 318 (35 on the NRC list) for the dead weight tester has been decommissioned and is now capped and tagged close to the containment wall both inside and outside containment. This table has been modified to include the normal, shutdown and post-accident valve positions for all manual and power operated valves.

Also enclosed with this attachment are individual fluid penetration drawings. Most of them have been taken from our Periodic Test procedures series (PT 23). For ease of correlation, each of the drawings has been labeled with the number used in the NRC draft evaluation as well as the penetration number assigned at Ginna. Some of the penetrations do not have a corresponding PT drawing because Type C testing is not required of all penetrations. In such cases, a piping flow drawing depicts the penetration configuration.

All of the containment penetrations are addressed individually below. These discussions provide a basis upon which the containment isolation configurations have been judged acceptable by RGE. The NRC reference number is given in parentheses behind the plant penetration designation. System flow diagrams are also referenced for some penetrations. Most of the referenced flow diagrams were provided by an RGE letter dated September 22, 1981. Drawings 33013-521 and 33013-530 are included with this letter. The discussions below describe only the isolation provisions which we considered in our evaluation although most lines penetrating containment have additional manual valves which could be used to isolate the lines. These manual valves are shown on the referenced drawings.

All of the automatic air operated containment isolation valves described below fail in the closed position. A loss of either vital DC control power or instrument air will cause the valves to close. Motor operated valves fail "as is" upon loss of AC power. All of the motor operated valves are powered from motor control centers on diesel backed buses. A loss of offsite power will not cause the valves to remain open.

All automatic containment isolation valves except the purge valves have a maximum closure time of 60 seconds as shown on Technical Specification Table 3.6-1. The purge valves must close in 5 seconds or less. Most automatic valves will close substantially sooner than the required 60 seconds.

A containment isolation signal to automatic valves is generated by redundant and independent sensors. Containment isolation signals are generated by manual actuation or automatic safety injection which results from two out of three containment high pressure, two out of three low pressurizer pressure, or two out of three low steam line pressure in either loop. Containment ventilation isolation is actuated by the same signals and by the following additional signals; manual safety injection, manual containment spray and either high air particulate or gas radioactivity.

Penetration 29 (12), the fuel transfer tube, was judged acceptable in the draft evaluation. This penetration, is similar to the containment personnel hatch and the equipment hatch because it is sealed by a double gasketed resilient seal flange. It is leak tested in accordance with the requirements for Type B testing of Appendix J to 10 CFR 50. A manual valve outside containment provides an additional closure feature for this penetration although it is not required for containment isolation.

Penetration 100 (7) (33013-433), the charging line, was judged acceptable by the NRC because it is a closed safety grade system having a post accident function. While it is desirable to have charging remain functional after an accident it is not required to meet accident analysis assumptions and therefore does not have a required post accident function. The system is closed outside containment and the positive displacement charging pumps act as a barrier to limit the portion of the system which may be

exposed to containment pressure if check valve 370B inside containment fails. The system operates at a pressure (2250 psi) significantly greater than the peak containment pressure so that pipe leaks will be easily detected during normal operation and scheduled surveillance. Therefore check valve 370B inside containment and the seismic category 1 closed system outside containment provide acceptable containment isolation even if the system flow need not be maintained to mitigate an accident.

Penetrations 101 and 113 (17) (33013-425 and 432), the two safety injection penetrations, were judged acceptable. These lines are closed systems having a post accident function which are fluid filled and in operation following a safety injection signal to mitigate accidents. Penetration 110 (16), shown on the same flow and PT drawings, is for the safety injection test line. Isolation valve 879 is locked closed and is outside containment. The test line inside containment and out to valve 879 is "in service" following initiation of safety injection and is pressurized by both of the SI pump trains. Pressurization of this line with SI fluid will prevent any of the containment atmosphere from actually reaching the isolation valve. There is no design basis event which would result in a rupture of the Reactor Coolant Pressure Boundary (RCPB) and the SI test line outside containment. The test line is pressurized on a monthly basis to approximately 1500 psi so that flaws which might allow 60 psi containment atmosphere to escape would be detected and repaired. This arrangement and testing provides adequate assurance that containment atmosphere will not leak through this penetration.

Penetration 102 (no NRC evaluation) (33013-433), the alternate charging line, is similar in function and arrangement to the charging line, penetration 100, which was judged acceptable by the NRC evalution. Both of these lines have two check valves inside the containment separating the charging lines from the reactor coolant system. One check valve in each line is inside the missile barrier and one check valve is outside the missile barrier. Each line also has an Air Operated Valve (AOV) inside containment but outside the missile barrier so that LOCAs in the loop compartments will not effect these valves. The AOV in the charging line is normally open; the AOV in the alternate charging line is normally closed. Both fail closed on loss of instrument air which occurs with containment isolation. The closed charging system and positive displacement pumps provide another isolation barrier outside containment. Therefore this penetration has adequate containment isolation capability.

Penetration 103 (no NRC evaluation), the construction fire service water line is no longer in use. A pipe cap inside containment and a locked close isolation valve outside containment form the penetration boundaries. This provides containment isolation equivalent to the current GDC requirements and is therefore acceptable.

Penetrations 105 and 109 (15) (33013-425 and 432), containment spray, is a safeguards system which will be in operation following accidents when containment pressure is high. There are no events which could both cause a rupture of the reactor coolant system and at the same time cause the containment spray line outside containment to be broken. These lines are pressurized by the containment spray pumps. This operation will prevent containment atmosphere from leaking from the containment. These penetrations are judged to be acceptable, similar to the safety injection lines.

Penetrations 106 and 110 (9) (33013-433), reactor coolant pump seal water inlet, are similar to the charging line of penetration 100. It should be noted that each of the RCP seal water inlet lines has two check valves inside containment, not one as shown on the FSAR drawing. These valves are shown on drawing 33013-433. One valve in each line (304A and 304B) is located outside the missile barrier near the containment wall. The other valve in each line is inside the missile barrier. Although not required by accident analyses it is desirable to maintain RCP seal injection flow following containment isolation to maintain the reactor coolant pumps operable in the normal mode. The charging and RCP seal injection system is a closed system outside containment and the positive displacement charging pumps act as a barrier to limit the portion of the system which may be exposed to containment pressure if check valves 304A or 304B inside containment fail. The system operates at a pressure (2250 psi) significantly greater than the peak containment pressure so that pipe leaks will be easily detected during normal operation and scheduled surveillance. Therefore, check valves 304A and 304B inside containment and the seismic category 1 closed system outside containment provide acceptable containment isolation.

Penetration 107 (30) (33013-431), sump A discharge line, has two AOVs, both located outside containment, which are tripped closed on an isolation signal. Current criteria would place one of these valves inside containment and the other outside. There is no postulated event, however, which will both cause a LOCA and damage the normal sump line outside containment. The piping outside containment is periodically subjected to a leakage test during testing of the isolation valves. In addition, if the pumps are operating in the automatic mode and are not being operated manually by the operator, the pumps will be automatically tripped by a containment isolation signal. Following a LOCA the sump will be submerged and the isolation valves will not be exposed to a gas environment. Leakage through the valves will be smaller than that determined under gas testing conditions. Therefore, the existing isolation provisions for this penetration are acceptable.

Penetration 108 (10) (33013-433), RCP seal water return and excess letdown line is isolated from the closed chemical and volume control system outside containment by MOV 313 which receives a containment isolation signal. The single pipe penetration

passes the combined flow from the excess letdown heat exchanger, the RCP number 1 seal bypass lines and the seal water return lines. The excess letdown line is normally not in service and is isolated from the seal water return line inside containment by HCV 123. This air operated valve, even if open, will fail closed soon after containment isolation because instrument air is automatically isolated and the pressure to hold HCV 123 open decays quickly. The RCP number 1 seal bypass lines are also isolated from the seal water return line by normally closed AOV 386 which also will fail closed after a containment isolation. The only remaining line which would not have redundant closed valves after an isolation signal is the small 3/4 inch seal water return line from each RCP. Normal flow through these lines is from the charging pumps. Should MOV 313 fail to close, the volume control tank can accept the seal flow (< 3 gpm) or prevent the release of accident pressure until manual valves 315A and 315C are closed. Only one of these valves is open during operation so only one operator action is required in the event MOV 313 fails. Therefore adequate isolation capability exists with the current design.

Penetrations 111 and 140 (6, 4) (33013-436), the RHR in and RHR out lines, were judged acceptable in the draft evaluation. Additional information concerning testing of the RHR valves was provided in an RGE letter from L. D. White, Jr. to Mr. Dennis R. Ziemann, USNRC dated September 21, 1978.

Penetration 112 (8) (33013-433), letdown to the non-regenerative heat exchanger, was judged in the draft evaluation report to meet the current GDCs. There is a difference between the as-built plant and the FSAR diagram. The orifice isolation valves (AOVs 200A, 200B and 202) do not receive containment isolation, or T, signals but do fail closed on loss of instrument air when the instrument air line is isolated. Further, AOV 427 upstream of the letdown orifices will be closed on low pressurizer level. This valve, however, is not outside the missile barrier and does not qualify as a containment isolation valve. It also fails open on loss of air. AOV 371 and the closed chemical and volume control system outside containment provide adequate containment isolation capability even without the additional protection from the letdown orifice isolation valves.

Penetration 120 (no NRC evaluation) (A-202), nitrogen to accumulators, has one air operated valve outside containment (AOV 846) which receives a containment isolation signal and has a check valve (CV 8623) inside containment. This valve configuration conforms to the current criteria and provides adequate isolation capability.

Penetration 120 (1) (33013-424), pressurizer relief tank gas analyzer line, is 3/8 inch tubing isolated by air operated valve 539. This valve is automatically operated and is approximately 15 inches from the penetration. This location satisfies the guidance of Safety Guide 11 that the isolation valve be as close as practical to the containment. MV 546, a manual valve approxi-

mately 8 inches from the containment, provides redundant isolation capability should it be required. The leakage through MV 546 is periodically tested as is the leakage through AOV 539. The need for additional isolation capability will be evaluated during the integrated assessment.

Penetration 121 (2) (33013-424), nitrogen supply to pressurizer relief tank (PRT), is protected by check valve 528 inside containment and pressure control valve (PCV) 441 outside containment. PCV 441 maintains the downstream pressure at a constant 0.5 psig. If the PRT is ruptured and CV 528 fails and containment pressure is elevated above 0.5 psig, PCV 441 will be closed. Pressure outside the containment upstream of PCV 441 will be 100 psig toward the containment preventing leakage. If the PRT is ruptured, CV 528 fails, and containment pressure is less than 0.5 psig PCV 441 may open in an attempt to raise the downstream piping pressure but 100 psig nitrogen flow toward the containment will prevent leakage. Manual valve 547 near the containment wall can be used in the long term to isolate the nitrogen supply line. Therefore, the isolation provisions for this penetration are acceptable in the current configuration.

Penetration 121 (3) (33013-424), reactor makeup water to PRT, is protected by check valve 529 inside containment and AOV 508 outside containment. The draft evaluation report noted only one apparent difference from current criteria; AOV 508 should close automatically. This valve does close automatically upon receipt of a containment isolation signal. Therefore, this penetration is judged acceptable as presently configured.

Penetrations 121, 203 and 332 (no NRC evaluations), containment pressure sensing transmitter lines, are small (3/8 inch) instrument sensing lines open to the containment. The pressure transmitters form the boundary of a closed system outside containment and are located close to the containment penetration. These closed systems are small, passive systems not subject to damage as a result of a LOCA. The need to incorporate remote manual or excess flow check valves into these lines to bring them into compliance with current criteria will be evaluated during the integrated assessment.

Penetration 123 (21) (33013-431), Reactor Coolant Drain Tank (RCDT) to the gas analyzer, is 3/8 inch tubing and is similar to penetration 120, PRT to the gas analyzer. AOV 1789, receives an isolation signal and is less than 2 feet from the wall. MV 1655 is less than a foot from the wall and will provide redundant isolation capability should it be required. MV 1655 is also periodically checked for leakage. The need for additional isolation capability will be evaluated during the integrated assessment.

Penetration 124 (22 and 23) (33013-435), excess letdown heat exchanger auxiliary coolant supply and return, was found acceptable in the NRC draft evaluation.

Penetrations 124, 203 and 305 (no NRC evaluation), containment post accident air sample lines, are small tubing penetrations which are closed during normal operation by at least 2 boundaries. Each line has two manual valves located close to the containment wall. In addition, each line is fitted with a tubing cap. These lines are closed and would be opened only to take a sample following an accident and then reclosed. This valve arrangement and operating mode meets the intent of Safety Guide 11, Instrument Lines Penetrating Primary Reactor Containment. Therefore, these penetrations should be found acceptable in the current configuration.

Penetrations 125 and 126 (25) (33013-435), component cooling water from the reactor coolant pumps, are protected by remote manual isolation valves MOV 759A and MOV 759B and by the closed auxiliary coolant system outside containment. It is desirable to maintain flow through these lines to facilitate operability of the reactor coolant pumps. Component cooling water cools the reactor coolant pump thermal barrier and protects the number one seal in the event the reactor coolant pumps are operating. The lines are not part of the reactor coolant pressure boundary and are not connected directly to the containment atmosphere. This system arrangement meets the requirements of GDC 57, the applicable design criterion. In addition, the closed system outside containment (operated at a normal pressure greater than containment accident pressure) provides further leak protection.

Penetrations 127 and 128 (24) (33013-435), component cooling water to RCP 1A and RCP 1B, are protected by check valves 750A and 750B inside containment and MOVs 749A and 749B outside containment. The applicable GDC for these lines which are not part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere, is GDC 57. Only the remote manually operated MOVs 749A and 749B are required. In addition, the check valves inside containment and the closed system outside containment (operated at a normal pressure greater than containment accident pressure) provide further leakage protection. Therefore, the isolation capability which has been provided for this penetration exceeds that required by current criteria and the configuration should be found acceptable.

Penetration 129 (18 and 20) (33013-431), is the line for both the RCDT and PRT to the vent header and nitrogen supply to the RCDT. The vent header line contains two AOVs, 1787 and 1786 outside containment which both receive a containment isolation signal. The line outside containment is not subject to damage as a result of the LOCA and therefore both valves should be operable. Both are subjected to periodic leak testing. The nitrogen supply line to the RCDT is similar to the nitrogen supply line to the PRT except that the check valve in the RCDT line is located outside containment. The nitrogen supply is normally closed because the vent header pressure is usually higher than the nitrogen control pressure (0.5 psig). If the RCDT is opened to containment atmosphere and the containment pressure is greater than 0.5 psig the line will remain closed. If the tank is open

to containment atmosphere but the containment pressure is less than 0.5 psig the nitrogen control valve will maintain a flow of nitrogen toward the containment. Manual valve 1793 can be used in the long term to isolate the nitrogen line if necessary. Therefore, the redundant isolation provisions on each of the lines at penetration 129 are adequate to prevent unacceptable leakage and are judged acceptable in the current configuration.

Penetrations 130 and 131 (39 and 40) (33013-435), reactor support cooling lines in and out, are each provided with a single valve, MOV 813 and MOV 814, outside containment which receives a containment isolation signal. The reactor support cooler system is a closed passive system inside containment and the component cooling water system is a closed system outside containment. The CCW system operates at a pressure higher than containment accident pressure. Thus, the closed CCW system and the automatic isolation valves provide redundant protection against leakage and meet the requirements of GDC 57, the applicable design criterion.

Penetration 132 (36) (33013-533), depressurization at power, was found acceptable with one automatic isolation valve inside containment (AOV 7970) and one automatic valve outside containment (AOV 7971).

Penetrations 141 and 142 (5) (33013-425 and 432), containment sump recirculation lines, were found acceptable in the draft evaluation based on the guidance of SRP 6.2.4, item II.3. The valve arrangements for these penetrations are not the same as the diagram contained in the FSAR. One pair of valves is inside containment (MOVs 851A and B) and one pair of valves is outside containment (MOVs 850A and B), however, this arrangement is still acceptable based on SRP 6.2.4.

Penetration 143 (19) (33013-431), reactor coolant drain tank discharge, is isolated by series AOVs outside containment which are tripped closed on an isolation signal. Current criteria would place one of these valves inside containment. There is no postulated event, however, which will both cause a LOCA and damage the RCDT line outside containment. The piping outside containment is periodically subjected to a leakage test during testing of the isolation valves. Following a LOCA, the RCDT will be submerged and the isolation valves will not be subject to a gas environment. Leakage through the valves during an accident will be smaller than that determined under gas testing conditions. Therefore, the existing isolation provisions for this penetration are acceptable.

Penetrations 201 and 209 (41 and 42) (33013-529), service water to reactor compartment cooling units A and B, are provided with manual isolation valves outside containment on both the inlet and discharge piping of the coolers. The coolers and piping inside containment form a closed system and are protected throughout their length from missiles. Thus, the only deviation from the current criteria of GDC 57, the applicable criterion, is

that the isolation valve is not remotely operable. The service water system operates at a pressure higher than the peak containment pressure so that any leakage from the cooling system will be into the containment, not from the containment. A radiation monitor is provided on the service water discharge from the containment to alert the operator to abnormalities. The isolation valves are located in the intermediate building only a short distance from the control room. Entrance to this area does not require protective clothing or entry through a controlled area. The isolation provisions for these lines are acceptable for continued operation. The need for remote manual operators on the valves will be further evaluated during the integrated assessment.

Penetrations 202, 210 and 304 (no NRC evaluation), hydrogen recombiner penetrations, each contain hydrogen and oxygen lines which normally are isolated by at least one closed manual valve and one closed solenoid valve. All of these valves are outside containment, however, there is no event which could both cause a LOCA and damage these lines outside containment. All of the recombiner lines carry flow only into the containment. The isolation valves will be open only when the recombiner is in operation and thus contaminants will be prevented from leaving the containment by the higher pressure gas systems outside containment. These arrangements are judged acceptable because of the redundant protection provided and the low probability of damage to systems both inside and outside containment by the same event.

Penetrations 204 and 300 (37 and 38) (33013-533), purge supply and exhaust are provided with automatically operated valves, one inside containment and one outside containment. These penetrations were judged acceptable in the NRC draft evaluation.

Penetrations 205, 206 (top), and 207 (top) (11) (33013-422), sample lines from the reactor coolant system loops and the pressurizer, are 3/8 inch instrument lines which are provided with one automatic isolation valve outside containment. The lines also have an additional manual valve outside containment and an AOV inside the missile barrier in containment which will fail closed when the instrument air to containment is automatically isolated. The need for additional automatic isolation provisions will be evaluated during the integrated assessment.

Penetrations 206 (bottom) and 207 (bottom) (29) (33013-422), steam generator sample lines, were judged acceptable in the NRC draft evaluation.

Penetrations 301 and 303 (44 and 45), auxiliary steam supply and condensate return, serve the closed system heaters inside containment. The entire system inside the containment is outside the missile barrier. Therefore, GDC 57 applies to these penetrations. The manual valves outside containment (6151 and 6175) are locked closed during operation. This configuration meets the current criterion and is acceptable.

Penetration 305 (14) (33013-533), containment air sample out, is isolated by AOV 1597 outside containment. This valve is close to the containment wall (approximately 2 feet) even though it is not the first valve after the wall. Manual valve 1596 is between the wall and AOV 1597 and can also serve to isolate this line should AOV 1597 fail to close when required. Both of these valves are leak tested along with the piping between the containment and AOV 1597. The need for additional automatically actuated valves will be evaluated during the integrated assessment.

Penetration 305 (13) (33013-533), containment air sample inlet, was judged acceptable in the draft evaluation based upon check valve 1599 inside containment and automatic AOV 1598 outside containment.

Penetration 307 (no NRC evaluation), fire service water, serves a line which was upgraded in 1980 to meet fire protection requirements. Isolation of this line is accomplished by check valve 9229 inside containment and automatic AOV 9227 outside containment. These isolation provisions conform to current criteria. We have noted, however, that in some scenarios fire may cause spurious closure of AOV 9227 while the line may be in use to suppress a fire inside containment. Because AOV 9227 is closed during operation and would be opened only in the event of fire, a containment isolation signal is unnecessary. It is desireable to remove the existing isolation signal from this valve. This will be addressed in separate correspondence.

Penetrations 308, 311, 312, 315, 316, 319, 320, and 323 (31 and 32) (33013-529), service water to fan coolers, are similar to penetrations 201 and 209. The fan coolers are provided with manual isolation valves outside containment on both the inlet and discharge piping of the coolers. The coolers and piping inside containment form a closed system and are protected throughout their length from missiles. Thus, the only deviation from the current criteria of GDC 57, the applicable criterion, is that the isolation valve is not remotely operable. The service water system operates at a pressure higher than the peak containment pressure so that any leakage from the cooling system will be into the containment, not from the containment. A radiation monitor is provided on the service water discharge from the containment to alert the operator to abnormalities. The isolation valves are located in the intermediate building only a short distance from the control room. Entrance to this area does not require protective clothing or entry through a controlled area. The isolation provisions for these lines are acceptable for continued operation. The need for remote manual operators on the valves will be further evaluated during the integrated assessment.

Penetrations 309 and 313 (47), leak test depressurization, were judged acceptable in the NRC draft evaluation based upon flanges inside containment and normally closed valves MOV 7444 and MOV 7445 outside containment.

Penetration 310 (bottom) (34) (33013-521), service air, was noted in the NRC draft evaluation as having an exception from the current criteria because of valve location. This penetration has isolation different from that shown on the FSAR drawings. Check valve 7226 inside containment and manual valve 7141, which is locked closed during operation, provide isolation which is in accordance with current criteria.

Penetration 310 (top) (33) (33013-521), instrument air, was judged acceptable in the NRC draft evaluation. There is no manual valve between the containment wall and AOV 5392 as shown in the FSAR drawing, however, the actual arrangement is still in conformance with current criteria.

Penetration 317 (46), leakage test-supply, was judged acceptable in the NRC draft evaluation based upon a flange inside containment and normally closed MOV 7443 outside containment.

Penetrations 321 and 322 (28) (33013-522), steam generator blowdown, was judged acceptable and in accordance with GDC 57 in the NRC draft evaluation.

Penetration 324 (43) (33013-530), demineralized water, has been modified since plant startup and is not configured as shown in the FSAR. Isolation of this penetration is provided by check valve 8419 inside containment and automatic AOV 8418 outside containment. This arrangement provides acceptable isolation and is in conformance with current criteria.

Penetration 332 (48), leak test instrumentation, was judged acceptable in the NRC draft evaluation. The arrangement of this penetration is different from the FSAR figure. A tubing cap has replaced the valve inside the containment. This arrangement still conforms to current criteria and is acceptable.

Penetrations 401, 402, 403, 404 (26 and 27) (33013-534 and 33013-544), main steam and feedwater, were judged to be acceptable and in conformance with GDC 57 in the NRC draft evaluation.

Penetrations 1000 and 2000 (no NRC evaluation), personnel hatch and equipment hatch, are not within the scope of this evaluation and are not governed by GDC 54, 55, 56 or 57. However, these openings are designed with redundant closures which are closed during normal operation and which will prevent the escape of radioactive material. These penetrations are described in FSAR Section 5.1.2.7. These penetrations are similar to current design practices and provide acceptable isolation of the containment.

Manual and Power Operated Valve
Normal, Shutdown and Post-Accident
Position Assuming No Operator Action
O-Open, C-Closed

* - Open for specific purpose for
short period only

TABLE 3.6-1

CONTAINMENT ISOLATION VALVES

PENT. NO.	IDENTIFICATION/DESCRIPTION	PRIMARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)	SECONDARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)
29	Fuel transfer tube	flange	NA	(1)	NA
100	charging line to "B" loop	CV 370B	NA	(2)	NA
101	SI Pump 1B discharge	CV 889B CV 870B	NA NA	(5) (5)	NA NA
102	Alternate charging to "A" cold leg	CV 383B	NA	(2)	NA
103	Construction Fire Service Water	welded flange	NA	MV 5129 CCC	NA
105	Containment Spray Pump 1A	CV 862A	NA	(3)	NA
106	"A" Reactor Coolant Pump (RCP) seal water inlet	CV 304A	NA	(2)	NA
107	Sump A discharge to Waste Holdup Tank	AOV 1728 OOC	60	AOV 1723 OOC	60
108	RCP seal water out and excess letdown to VCT	MOV 313 OOC	60	(4)	NA
109	Containment Spray Pump 1B	CV 862B	NA	(3)	NA
110	"B" RCP seal water inlet	CV 304B	NA	(2)	NA
110	SI test line	MV 879 *CC	NA	(5)	NA
111	RHR to "B" cold leg	MOV 720(20) COC	NA	(6)	NA
112	letdown to Non-regen. Heat exchanger	AOV 371 OOC	60	MV 204A OOO MV 820 C*C (14)(17)	NA
113	SI Pump 1A discharge	CV 889A CV 870A	NA NA	(5) (5)	NA NA

PENT. NO.	IDENTIFICATION/DESCRIPTION	PRIMARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)	SECONDARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)
120	Nitrogen to Accumulators	AOV 846 **C	60	CV 8623	NA
120	Pressurizer Relief Tank (PRT) to Gas Analyzer (GA)	AOV 539 **C	60	MV 546(7) 000	NA
121	Nitrogen to PRT	CV 528	NA	MV 547(8) 000	NA
121	Reactor Makeup water to PRT	CV 529	NA	AOV 508 **C	60
121	Cont. Press. transmitter PT-945 (10)	PT 945	NA	MV 1819A 000	NA
121	Cont. Press. transmitter PT-946 (10)	PT 946	NA	MV 1819B 000	NA
123	Reactor Coolant Drain Tank (RCDT) to GA	AOV 1789 **C	60	MV 1655(7)000	NA
124	Excess letdown supply and return to heat exchanger	AOV 745 OOC CV 743	60 NA	(11) (11)	NA NA
124	Post Accident air sample "C" fan	MV 1569 CC* MV 1572 CC*	NA NA	MV 1571 CC* MV 1574 CC*	NA NA
125	Component Cooling Water (CCW) from 1B RCP	MOV 759B 000	NA	(12)	NA
126	CCW from 1A RCP	MOV 759A 000	NA	(12)	NA
127	CCW to 1A RCP	CV 750A	NA	MOV 749A 000	60
128	CCW to 1B RCP	CV 750B	NA	MOV 749B 000	60
129	RCDT & PRT to Vent Header	AOV 1787 OOC CV 1713	 NA	AOV 1786 OOC	60
130	CCW to reactor support cooling	MOV 813 OOC	60	(19)	NA
131	CCW to reactor support cooling	MOV 814 OOC	60	(19)	NA
132	Depressurization at power	AOV 7970 *CC	60	AOV 7971 *CC	60
140	RHR pump suction from "A" Hot leg	MOV 701(20) COC	NA	(6)	NA
141	RHR-#1 pump suction from Sump B	MOV 850A(13) CCO	NA	MOV 851A(13) CCO	NA
142	RHR-#2 pump suction from Sump B	MOV 850B(13) CCO	NA	MOV 851B(13) CCO	NA
143	RCDT pump suction	AOV 1721 OOC	60	AOV 1003A **C AOV 1003B **C	60 60

PENT. NO.	IDENTIFICATION/DESCRIPTION	PRIMARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)	SECONDARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)
201	Reactor Compart. cooling Unit A & B	MV 4757(16) OOO	NA	(11)	NA
		MV 4636(16) OOO	NA	(11)	NA
202	"B" Hydrogen recombiner (pilot & main)	MV 1076B CCC	NA	SOV IV-3B CCC	NA Normally Closed
		MV 1084B CCC	NA	SOV IV-5B CCC	NA Normally Closed
203	Contain. Press. transmitter PT-947 & 948	PT 947	NA	MV 1819C OOO	NA
		PT 948	NA	MV 1819D OOO	NA
203	Post accident air sample to "B" fan	MV 1563 CCC	NA	MV 1565 CCC	NA
		MV 1566 CCC	NA	MV 1568 CCC	NA
204	Purge Supply Duct	AOV 5870 *OC	5	AOV 5869 *OC	5
205	Hot leg loop sample	AOV 966C **C	60	MV 956D(14) OOO	NA
206	Przr. liquid space sample	AOV 966B **C	60	MV 956E(14) OOO	NA
206	"A" S/G sample	AOV 5735 **C	60	MV 5733(7) OOO	NA
207	Przr. Steam space sample	AOV 966A **C	60	MV 956F OOO	NA
207	"B" S/G sample	AOV 5736 **C	60	MV 5734(7) OOO	NA
209	Reactor Compart. cooling Units A & B	MV 4758(16) OOO	NA	(11)	NA
		MV 4635(16) OOO	NA	(11)	NA
210	Oxygen makeup to A & B recombiners	MV 1080A CCC	NA	SOV IV-2A CCC	NA Normally Closed
				SOV IV-2B CCC	NA Normally Closed
300	Purge Exhaust Duct	AOV 5878 *OC	5	AOV 5879 *OC	5
301	Aux. steam supply to containment	MV 6151 COC	NA	MV 6165(15) COC	NA
303	Aux. steam condensate return	MV 6175 COC	NA	MV 6152(15) COC	NA
304	"A" Hydrogen recombiner (pilot and main)	MV 1084A CCC	NA	SOV IV-5A CCC	NA Normally Closed
		MV 1076A CCC	NA	SOV IV-3A CCC	NA Normally Closed
305	Radiation Monitors R-11, R-12 & R-10A Auto Inlet Isol.	AOV 1597 OOC	60	MV 1596 OOO	NA
305	R-11, R-12 & R-10A Outlet	CV 1599	NA	AOV 1598 OOC	60
305	Post Accident air sample (containment)	MV 1554 CCC	NA	MV 1556 CCC	NA
		MV 1557 CCC	NA	MV 1559 CCC	NA
		MV 1560 CCC	NA	MV 1562 CCC	NA

PENT. NO.	IDENTIFICATION/DESCRIPTION	PRIMARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)	SECONDARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)
307	Fire Service Water (18)	CV 9227	NA	AOV 9229 CCC	60
308	Service Water to "A" fan cooler	MV 4627(16) 000	NA	(11)	NA
309	leakage test depressurization	flange	NA	MOV 7445 CCC	NA Normally Closed
310	Service Air to Contain.	CV 7226	NA	MV7141 C*C	NA
310	Instrument Air to Contain.	CV 5393	NA	AOV 5392 OOC	60
311	Service Water from "B" fan cooler	MV 4630(16) 000	NA	(11)	NA
312	Service Water to "D" fan cooler	MV 4642(16) 000	NA	(11)	NA
313	leakage test depressurization	flange	NA	MOV 7444 CCC	NA Normally Closed
315	Service Water from "C" fan cooler	MV 4643(16) 000	NA	(11)	NA
316	Service Water to "B" fan cooler	MV 4628(16) 000	NA	(11)	NA
317	leakage test supply	flange	NA	MOV 7443 CCC	NA Normally Closed
318	Dead weight tester	tubing cap	NA	Capped	NA
319	Service Water from "A" fan cooler	MV 4629(16) 000	NA	(11)	NA
320	Service water to "C" fan cooler	MV 4641(16) 000	NA	(11)	NA
321	A S/G Blowdown	AOV 5738 OOC	60	MV 5701(7) 000	NA
322	B S/G Blowdown	AOV 5737 OOC	60	MV 5702(7) 000	NA
323	Service Water from "D" fan cooler	MV 4644(16) 000	NA	(11)	NA
324	Demineralized water to Containment	CV 8419	NA	AOV 8418 COC	60
332	Cont. Press. Trans. PT-944, 949 & 950	PT 944	NA	MV 1819G 000	NA
		PT 949	NA	MV 1819F 000	NA
		PT 950	NA	MV 1819E 000	NA
332	Leakage test instrumentation lines	Cap	NA	MV 7448 CCC	NA
		Cap	NA	MV 7452 CCC	NA
		Cap	NA	MV 7456 CCC	NA
401	Main steam from A S/G	NA**	NA	NA	NA
402	Main steam from B S/G	NA**	NA	NA	NA

PENT. NO.	IDENTIFICATION/DESCRIPTION	PRIMARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)	SECONDARY ISOLATION BOUNDARY	MAXIMUM ISOLATION TIME *(SEC)
403	Feedwater line to A S/G		NA**	NA	NA
404	Feedwater line to B S/G		NA**	NA	NA
1000	Personnel Hatch	NA	NA	NA	NA
2000	Equipment Hatch	NA	NA	NA	NA

*The maximum isolation time does not include diesel start time.
**The MSIVs and feedwater isolation valves are not considered to be containment isolation valves. The containment boundary is the steam generator secondary side and tubes.

MV - Manual Valve
MOV - Motor Operated Valve
AOV - Air Operated Valve
CV - Check Valve
SOV - Solenoid Operated Valve

NOTES

(1) The end of the fuel transfer tube inside containment is closed by a double-gasketed blind flange, to prevent leakage of spent fuel pit water into the containment during plant operation. This flange also serves as protection against leakage from the containment following a loss of coolant accident. The space between these gaskets can also be pressurized by the penetration test system. (FSAR 5.2.2 pg. 5.2.2-3)

(2) Incoming lines connected to closed systems outside containment are provided with at least one check valve or normally closed isolation valve located inside containment. (FSAR 5.2.2 pg 5.2.2-2)

(3) The Containment Spray System is a closed system outside containment provided with a single containment isolation valve (FSAR Table 5.2.2-1 and Figure 5.2.2-8).

(4) The single remotely controlled, motor operated containment isolation valve is normally open. The seal water return line is not directly connected to the Reactor Coolant System. A second automatic isolation barrier is provided by the closed system consisting of the volume control tank and connecting piping.

(5) The Safety Injection system is a closed system outside containment provided with a single containment isolation valve (FSAR Table 5.2.2-1 and Figure 5.2.2-9). Connections of the test line with other lines inside containment are all missile protected and upstream of check valves connecting to the RCS. The SI system is in operation following a LOCA and pressurized to a pressure higher than that in containment.

(6) The RHR system is a closed system outside containment provided with one normally closed, missile protected containment isolation valve inside containment. In addition, a second normally closed valve is provided inside the missile barrier (FSAR Table 5.2.2-1 and Figure 5.2.2-2, see also ANSI-N271-1976).

(7) Normally operating outgoing lines not connected to the Reactor Coolant System and not protected against missiles throughout their length inside containment are provided with at least one automatically operated trip valve or one remotely operated stop valve located outside containment. Manual isolation valves in series with the trip or remote operated valves are also provided outside the containment (FSAR 5.2.2 pg. 5.2.2-1a).

(8) See FSAR Table 5.2.2-1 and Figure 5.2.2-1.

(9) Incoming lines connected to open systems outside the containment are provided with a check valve located inside containment, and a remote operated valve or check valve and remote operated valve located outside containment. (FSAR 5.2.2 pg. 5.2.2-2)

(10) The pressure transmitter provides a boundary.

(11) Normally operating incoming and outgoing lines which are connected to closed systems inside containment and protected against missiles throughout their length, are provided with at least one manual isolation valve outside containment (FSAR 5.2.2 pg. 5.2.2-2).

(12) The single remotely controlled containment isolation valve is normally open and motor operated. The cooling water return line is not directly connected to the reactor coolant system and, should remain open while the coolant pump is running. A second automatic isolation barrier is provided by the component cooling water loop, a closed system. (FSAR 5.2.2 pg. 5.2.2-1a)

(13) See FSAR Table 5.2.2-1 and Figure 5.2.2-2. Sump lines are in operation and filled with fluid following an accident. Containment leakage testing is not required. The valves are subjected to RHR system hydrostatic test.

(14) Normally operating outgoing lines connected to the Reactor Coolant System are provided with at least one automatically operated trip valve and one manual isolation valve in series located outside the containment. In addition to the isolation valves, each line connected to the Reactor Coolant System is provided with a remote operated root valve located near its connection to the Reactor Coolant System. (FSAR 5.2.2 pg. 5.2.2-1)

(15) See FSAR Table 5.2.2-1 and Figure 5.2.2-17.

(16) The Service Water system operates at a pressure higher than the containment accident pressure and is missile protected inside containment. Therefore, these valves are used for flow control only and need not be leak tested.

(17) A manual valve outside containment in series with an automatic valve is provided for normally operating outgoing RCS lines (FSAR pg. 5.2.2-1).

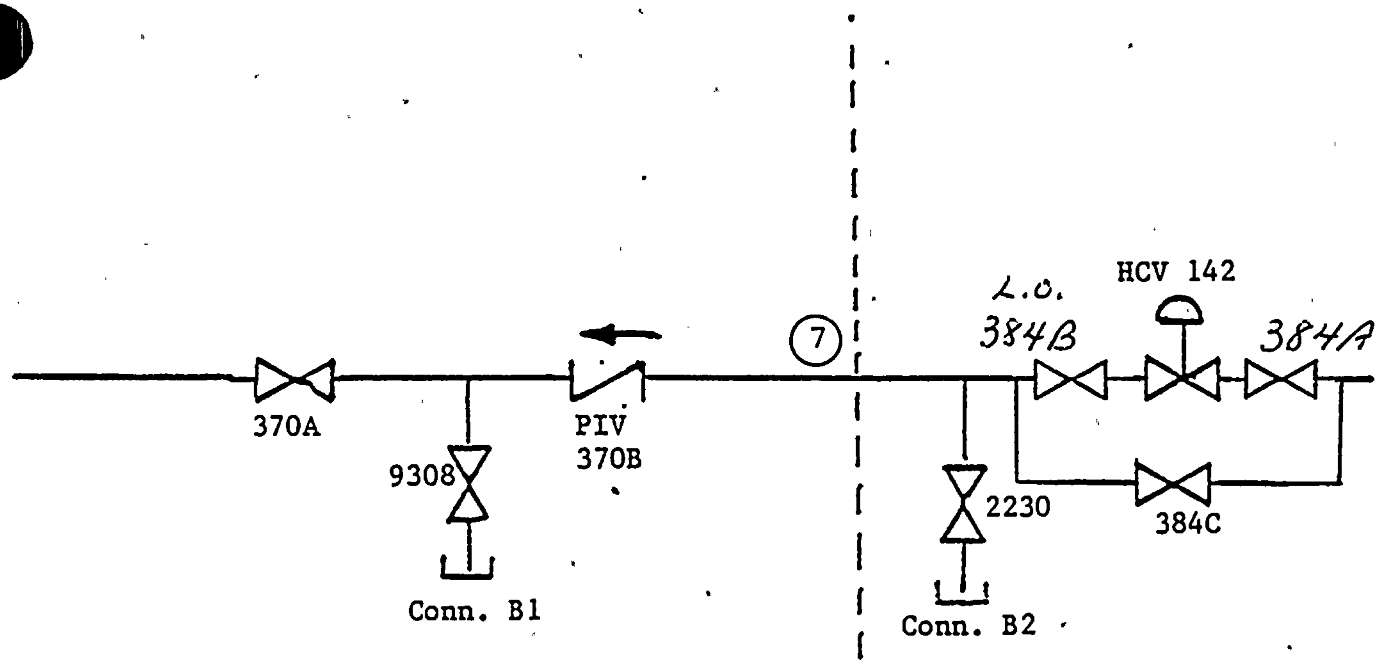
(18) Installation of this penetration and valving is scheduled for 1981.

(19) See FSAR Table 5.2.2-1 and Figure 5.2.2-16.

(20) Containment leakage testing is not required per L. D. White, Jr. letter to Dennis L. Ziemann, USNRC dated September 21, 1978.

PT-23.8 REACTOR COOLANT SYSTEM CHARGING LINE

PENETRATION No. 100



Rotometer Serial # ____________________

PIV 370B

Rotometer Flow Indication ____________________ cc/min.

Air Temperature (t) ____________________ °F

(Rotometer Indication cc/min.) X $\left(\frac{530}{460 + t}\right)^{\frac{1}{2}}$ = cc/min. at 0 psig and 70°F

$\left(\frac{\text{cc/min at 0 psig \& 70°F}}{5.08}\right)$ = cc/min. at 60 psig & 70°F

PIV Leakage ____________________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 200.0 cc/min. @ 60 psig and 70°F.

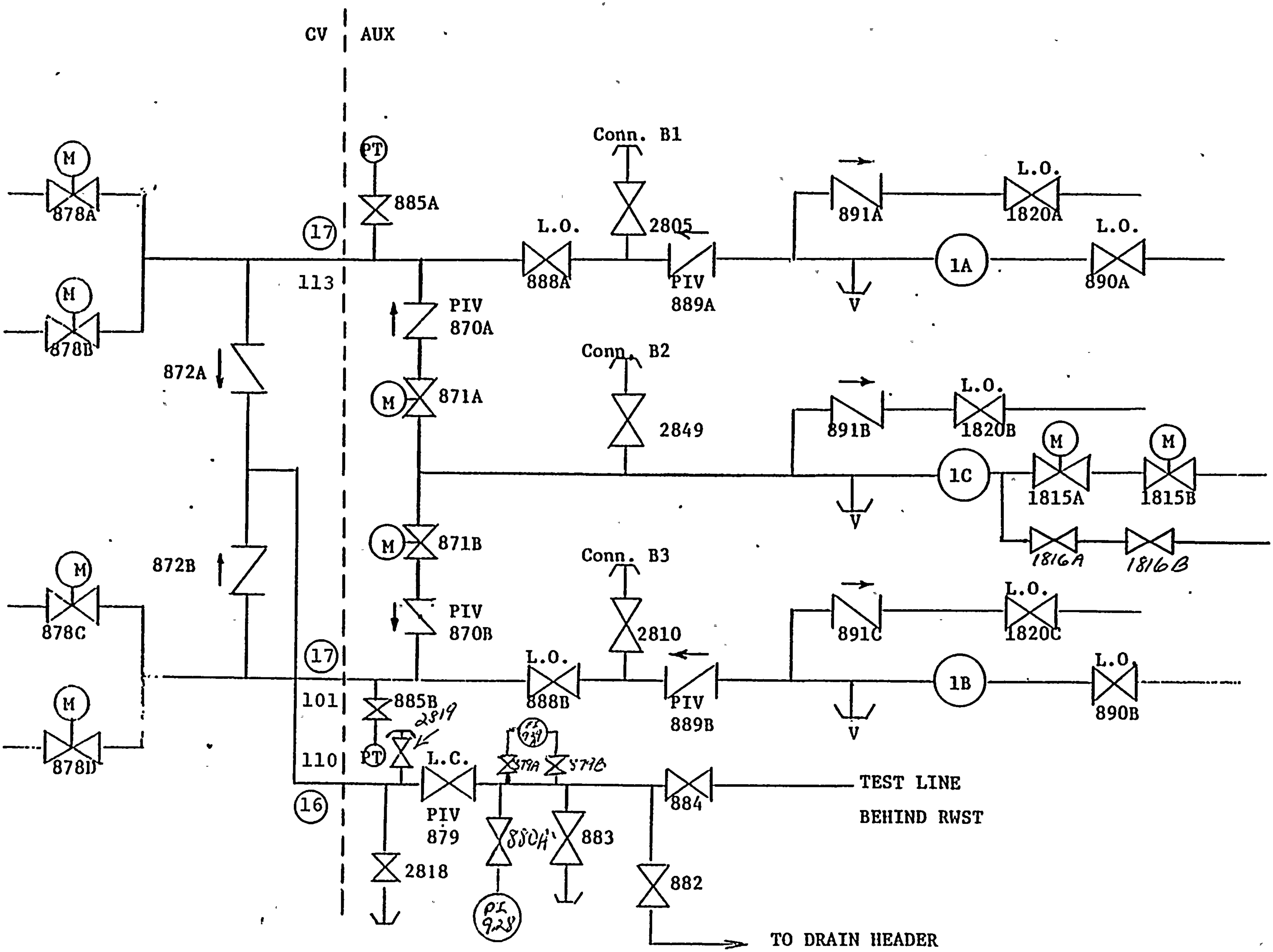
REMARKS:

CALCULATED BY: ______________ DATE: __________

R & T REVIEW: ______________ DATE: __________

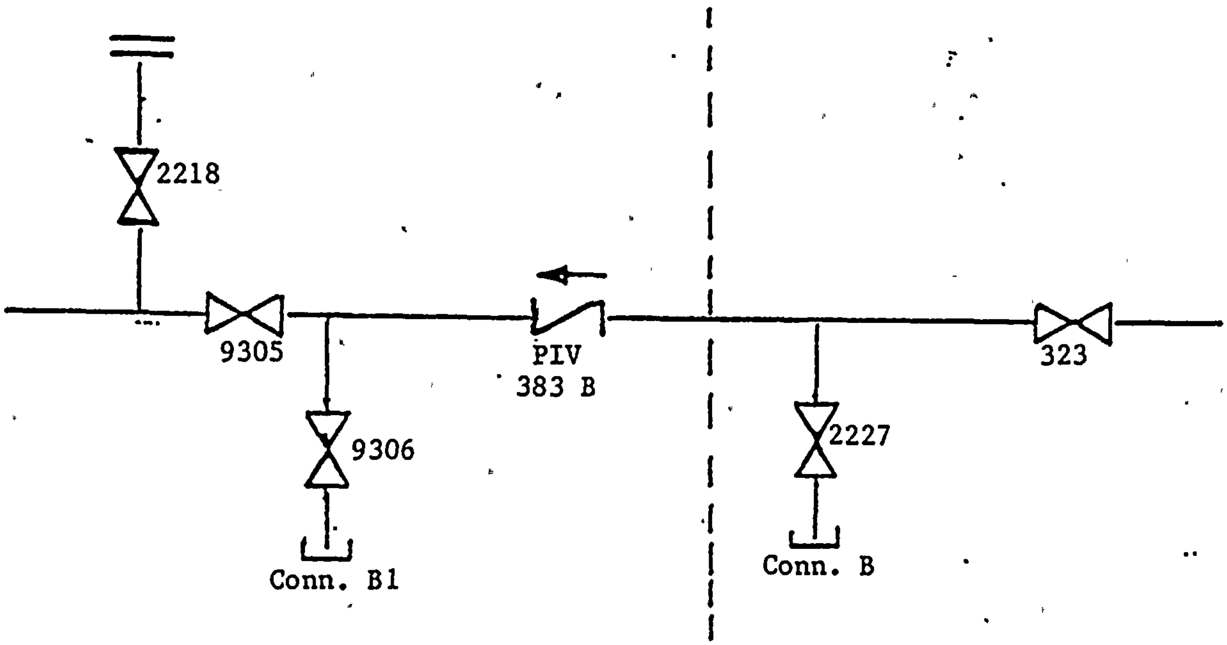
SAFETY INJECTION SYSTEM

PENETRATIONS #101, #1[illegible] BOTTOM) AND #113



ALTERNATE CHARGING LINE

PENETRATION NO. 102



ROTOMETER SERIAL #: ______________________________

PIV 383B

ROTOMETER FLOW INDICATION: ______________________ cc/min.

AIR TEMPERATURE (t): ______________________ °F

$$(\text{Rotometer Indication cc/min}) \times \left(\frac{530}{460 + t}\right)^{\frac{1}{2}} = \text{cc/min at 0 psig and } 70^{\circ}\text{F}$$

$$\frac{(\text{cc/min at 0 psig and } 70^{\circ}\text{F})}{5.08} = \text{cc/min at 60 psig and } 70^{\circ}\text{F}$$

PIV LEAKAGE: ______________________ cc/min. @ 60 psig and 70°F

MAX. LEAKAGE IS 170.33 cc/min @ 60 psig and 70°F

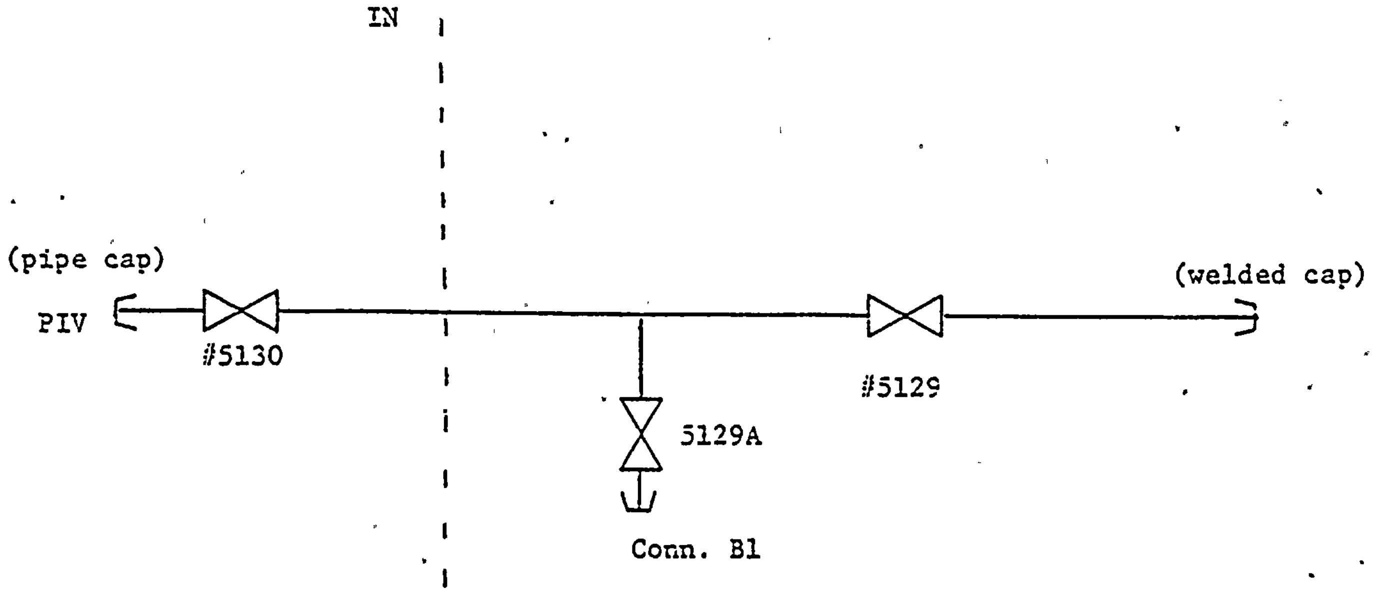
REMARKS:

CALCULATED BY: ______________________ DATE: __________

R & T REVIEW: ______________________ DATE: __________

CONSTRUCTION FIRE SERVICE WATER

PENETRATION NO. 103



Rotameter Serial # ____________________

PRIMARY

Rotameter Flow ______________ cc/min.

Air Temperature (t) ______________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ______________ cc/min. @ 60 psig. and 70°F

Max. Leakage is 10.0 cc/min. @ 60 psig. and 70°F

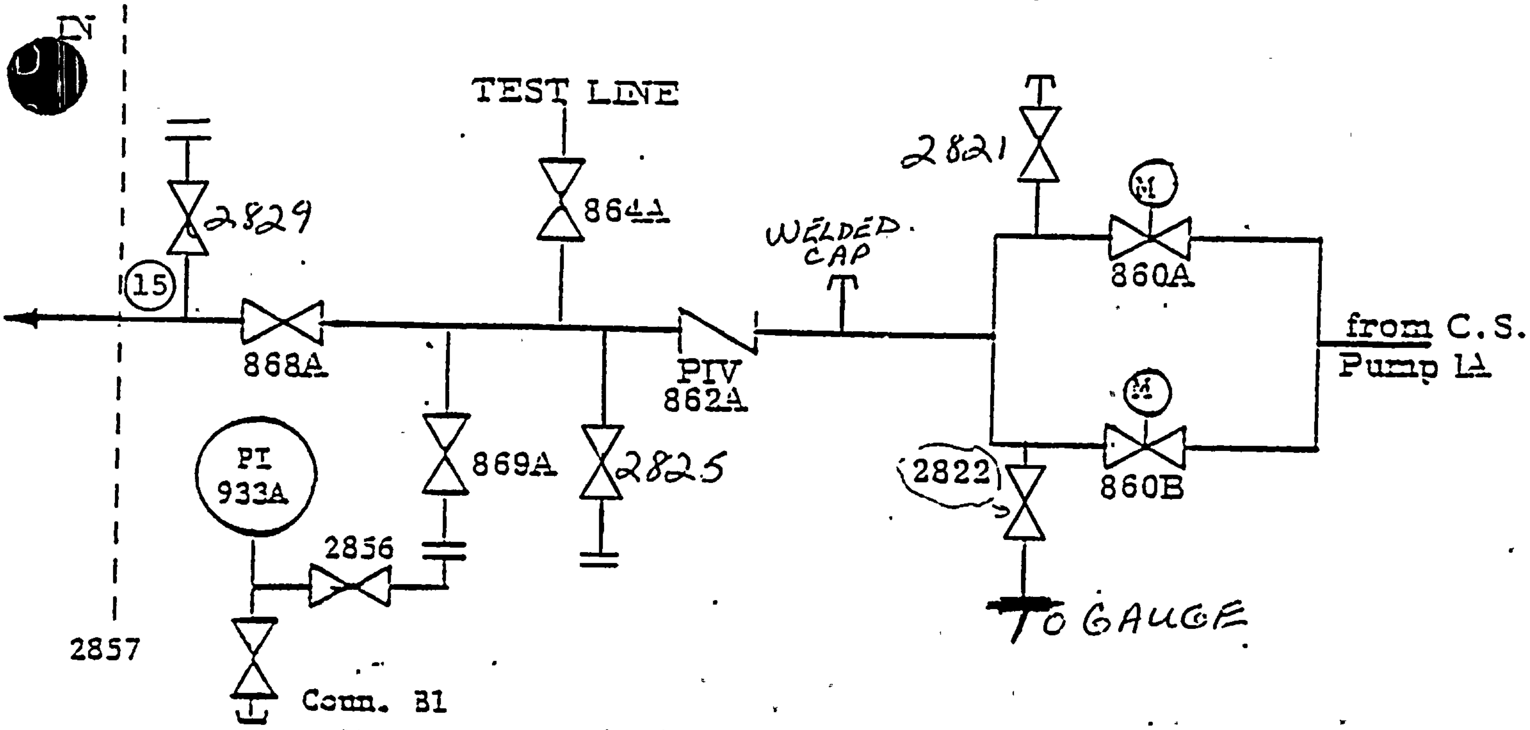
REMARKS:

Calculated by: ____________________ Date: ____________

R & T Review: ____________________ Date: ____________

"A" CONTAINMENT SPRAY HEADER

PENETRATION NO. 105



Rotameter Serial # ____________________

PIV 862A

Rotameter Flow ____________ cc/min.

Air Temperature(t) __________________ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ________________ cc/min. @ 60 psig & 70°F

Max Leakage ___100.00___ cc/min. @ 60 psig & 70°F

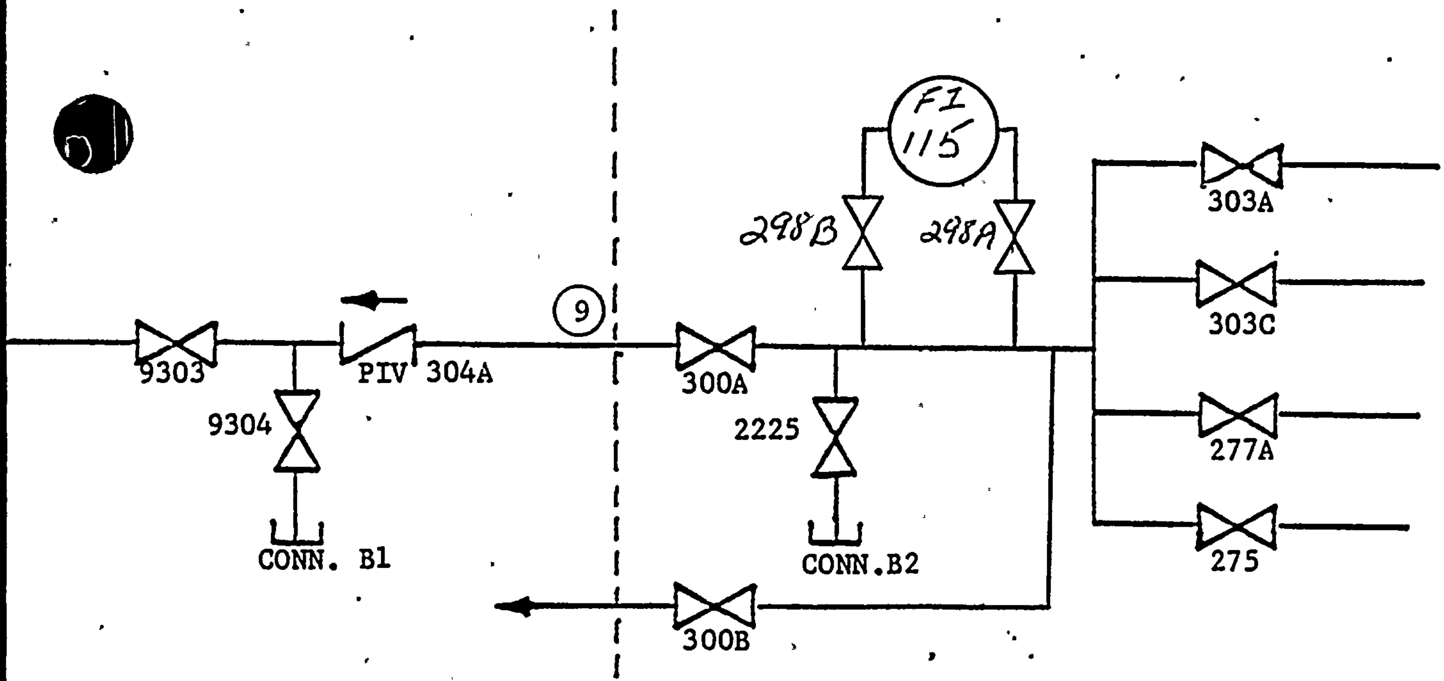
REMARKS:

CALCULATED BY: ____________________ DATE: __________

R&T REVIEW: ____________________ DATE: __________

"A" RCP SEAL WATER LINE

PENETRATION NO. 106



Rotameter Serial # ____________________

Primary

Rotameter Flow Indication ____________________ cc/min.

Air Temperature ____________________ °F=t

(Rotameter Indication cc/min) x $\left(\frac{530}{460 + t}\right)^{1/2}$ = cc/min at 0 psig and 70°F

$\frac{\text{(cc/min at 0 psig \& 70°F)}}{5.08}$ = cc/min at 60 psig & 70°F

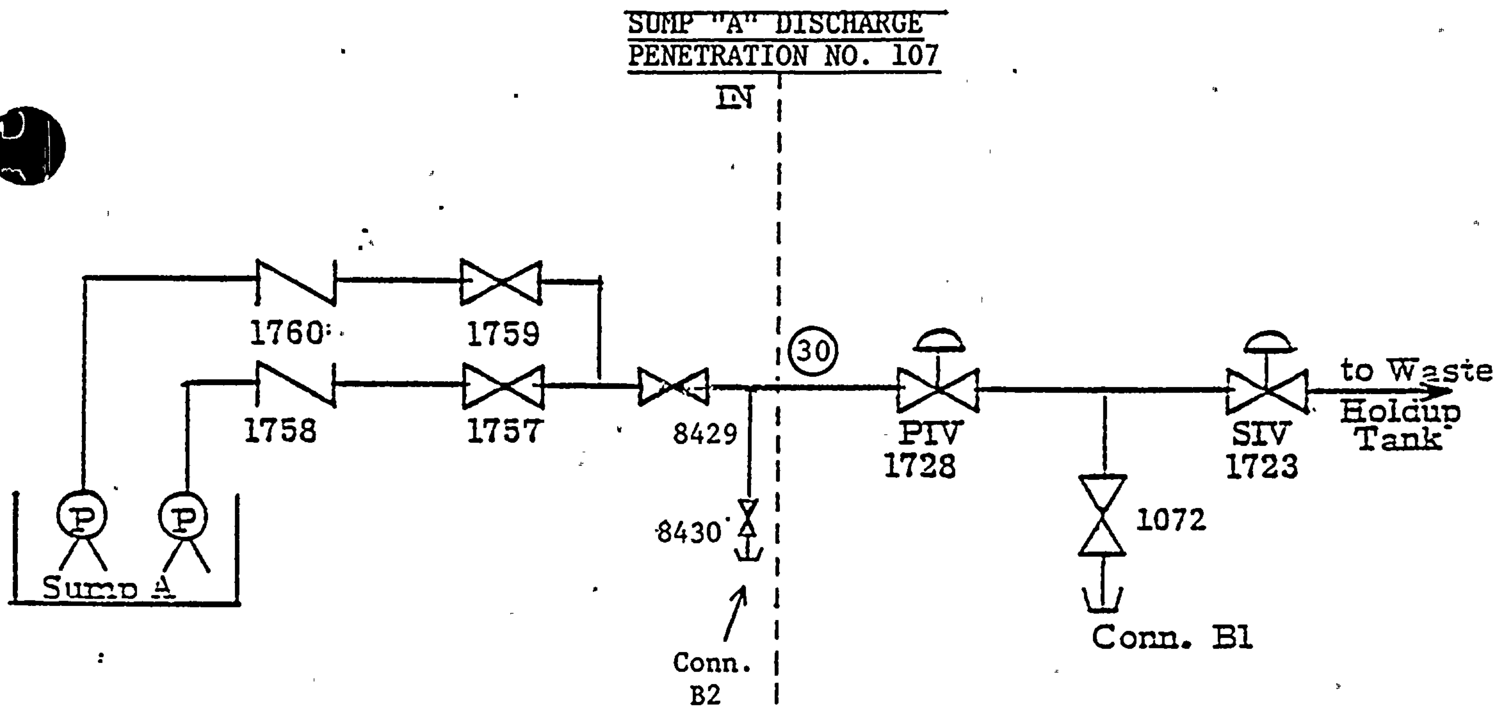
PIV Leakage ____________________ cc/min @ 60 psig & 70°F

Max Leakage is 200.0 cc/min @ 60 psig & 70°F

REMARKS:

CALCULATED BY: ____________________ DATE: __________

R&T REVIEW: ____________________ DATE: __________



Rotameter Serial #_______________

	PIV 1728	SIV 1723
Rotameter Flow	________cc/min.	________cc/min.
Air Temperature (t)	________°F	________°F

cc/min @ 0 psig and 70°F = $(\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$

cc/min @ 60 psig and 70°F = $\frac{(\text{cc/min. @ 0 psig and } 70^\circ\text{F})}{5.08}$

PIV Leakage ________ cc/min. @ 60 psig & 70°F.

Max Leakage is 87.11 cc/min. @ 60 psig & 70°F.

REMARKS:

SIV Leakage ________ cc/min. @ 60 psig & 70°F

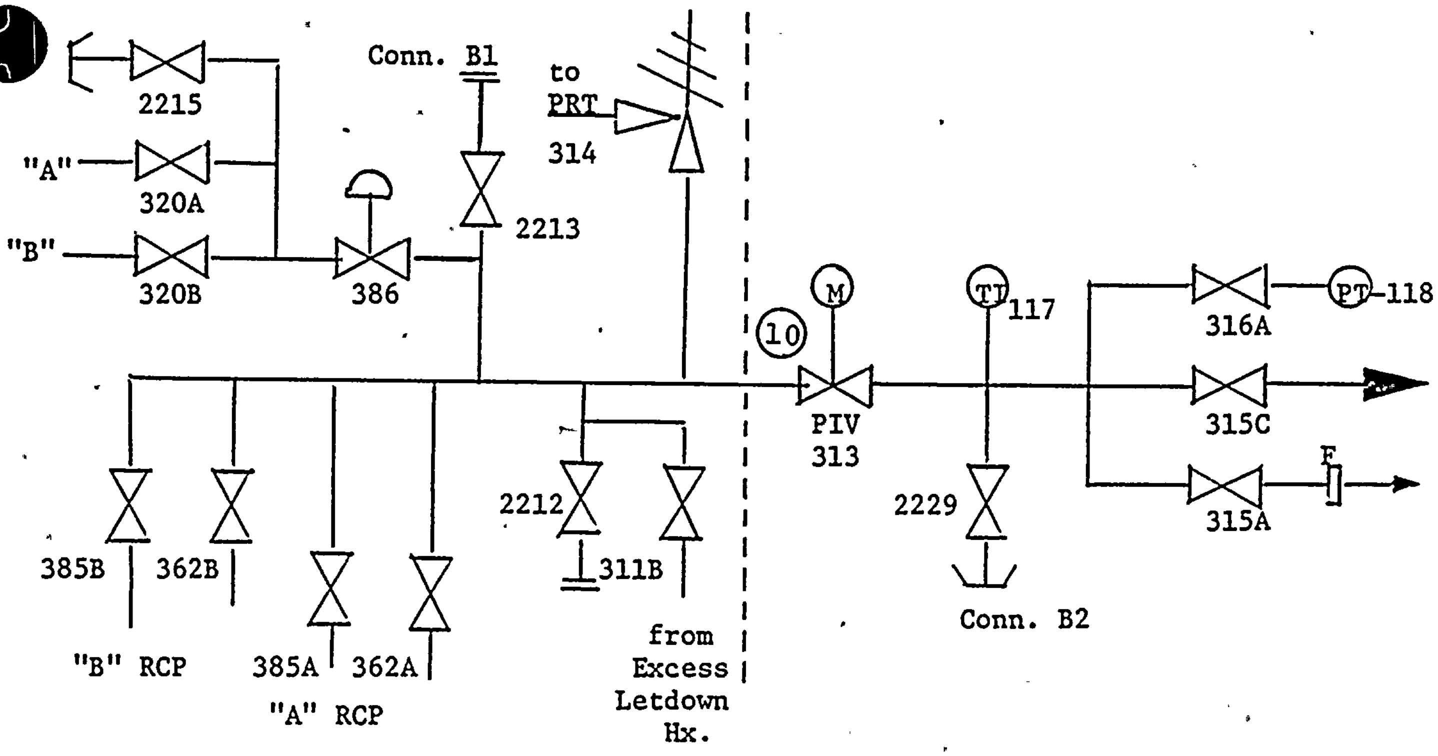
Max. Leakage is 87.11 cc/min. @ 60 psig & 70°F

REMARKS:

CALCULATED BY:________ DATE:________

R & T REVIEW:________ DATE:________

R.C.P. SEAL WATER RETURN & EXCESS LETDOWN
Penetration No. 108



PIV 313

Rotometer Flow Indication ________________ cc/min.

Air Temperature ________________ $^{o}F = t$

(Rotometer Indication cc/min) X $\left(\frac{530}{460 + t}\right)^{1/2}$ = cc/min at 0 psig and $70^{o}F$

$\frac{\text{(cc/min. at 0 psig \& } 70^{o}\text{F)}}{5.08}$ = cc/min at 60 psig & $70^{o}F$

PIV Leakage ________________ cc/min. @ 60 psig and $70^{o}F$.

Max. Leakage is 87.11 cc/min. @ 60 psig and $70^{o}F$.

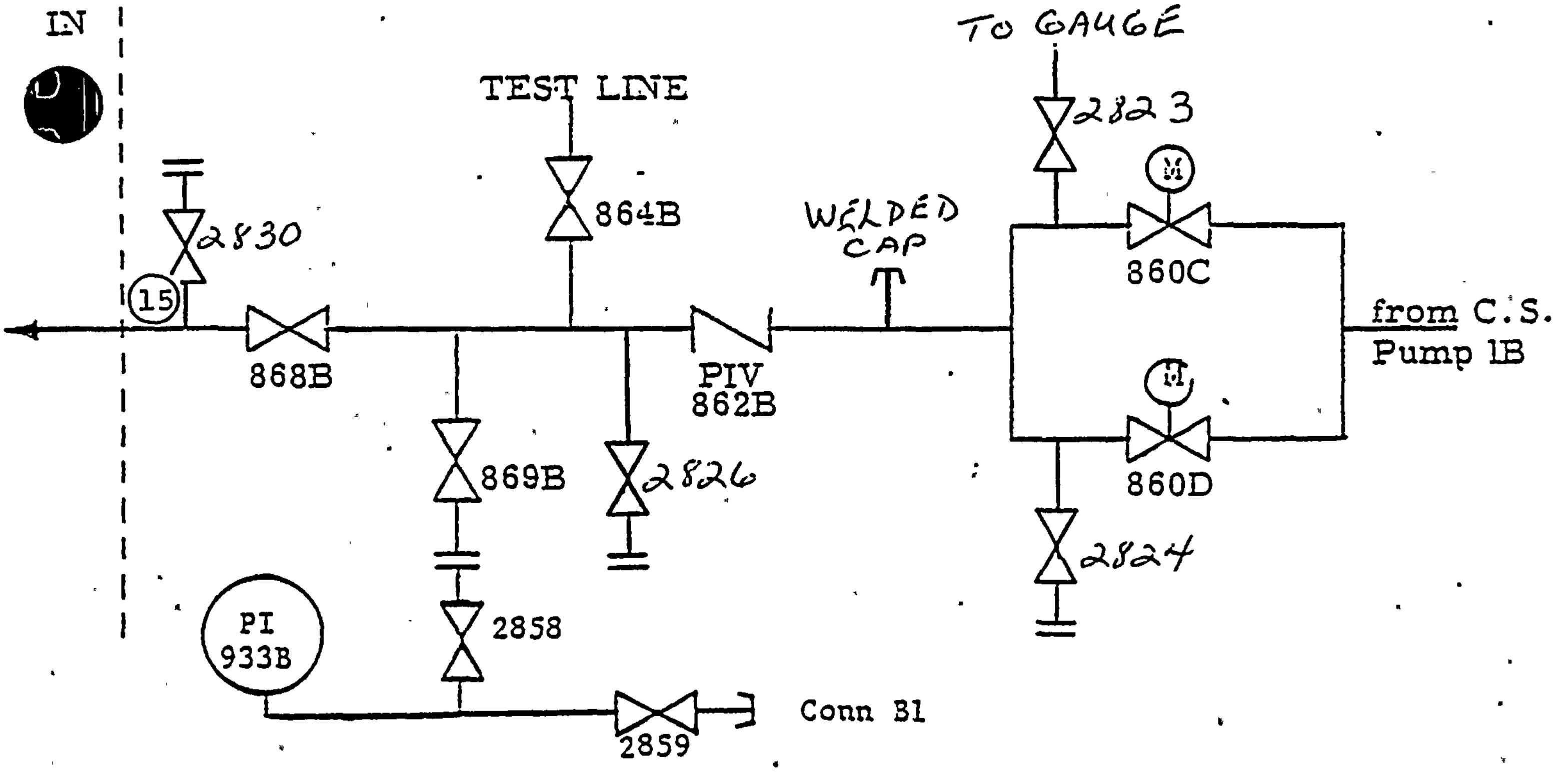
REMARKS:

CALCULATED BY: ________________ DATE: ________

R & T REVIEW: ________________ DATE: ________

"B" CONTAINMENT SPRAY HEADER

PENETRATION NO. 109



Rotameter Serial # ____________

PIV 862B

Rotameter Flow ________ cc/min.

Air Temperature (t) ________ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ________ cc/min. @ 60 psig. and 70°F

Max Leakage 100 cc/min. @ 60 psig. and 70°F

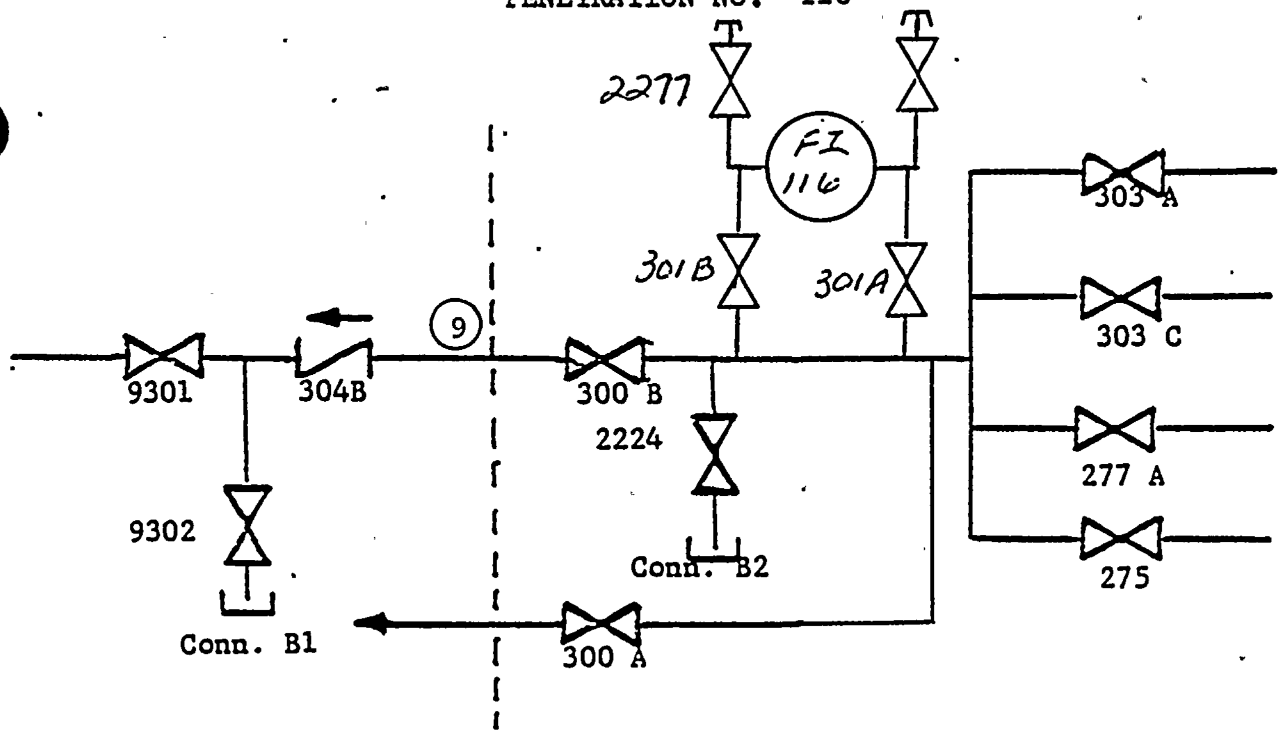
REMARKS:

CALCULATED BY: ____________ DATE: ________

R & T REVIEW: ____________ DATE: ________

"B" RCP SEAL WATER LINE

PENETRATION NO. 110



Rotameter Serial #____________________

PIV-304B

Rotameter Flow Indication____________________cc/min.

Air Temperature____________________°F=t

$$(\text{Rotameter Indication cc/min}) \times \left(\frac{530}{460 + t}\right)^{1/2} = \text{cc/min at 0 psig and 70°F}$$

$$\frac{\text{cc/min. @ 0 psig \& 70°F}}{5.08} = \text{cc/min at 60 psig \& 70°F}$$

PIV Leakage____________________cc/min. @ 60 psig & 70°F

Max Leakage 200.00 cc/min. @ 60 psig & 70°F

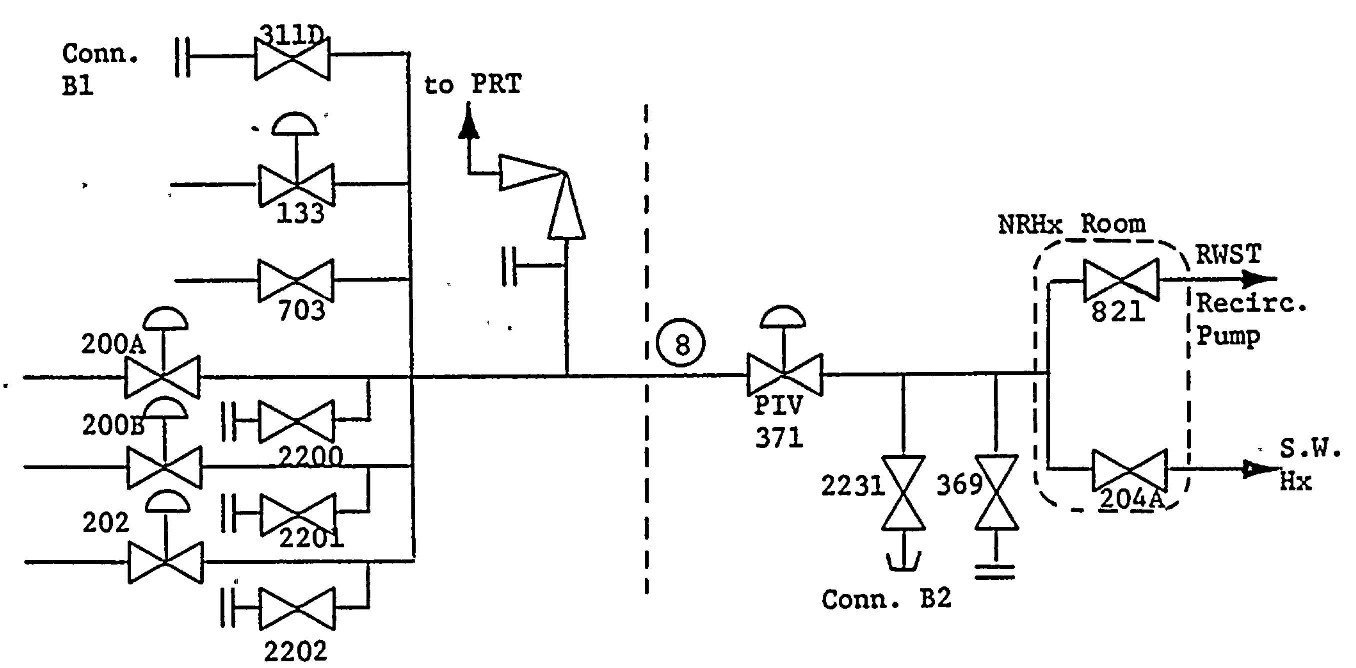
REMARKS:

CALCULATED BY:____________________ DATE:__________

R&T REVIEW:____________________ DATE:__________

PT-23.7 LETDOWN FROM REACTOR COOLANT SYSTEM

PENETRATION NO. 112



ROTAMETER SERIAL # ______________________

Primary

ROTAMETER FLOW INDICATION ______________ cc/min

AIR TEMPERATURE ______________ ^{o}F

(Rotameter Indication cc/min) $\times \left(\frac{530}{460 + t}\right)$ 1/2 = cc/min at 0 psig and 70°F

$\frac{\text{(cc/min at 0 psig \& 70°F)}}{5.08}$ = cc/min at 60 psig & 70°F

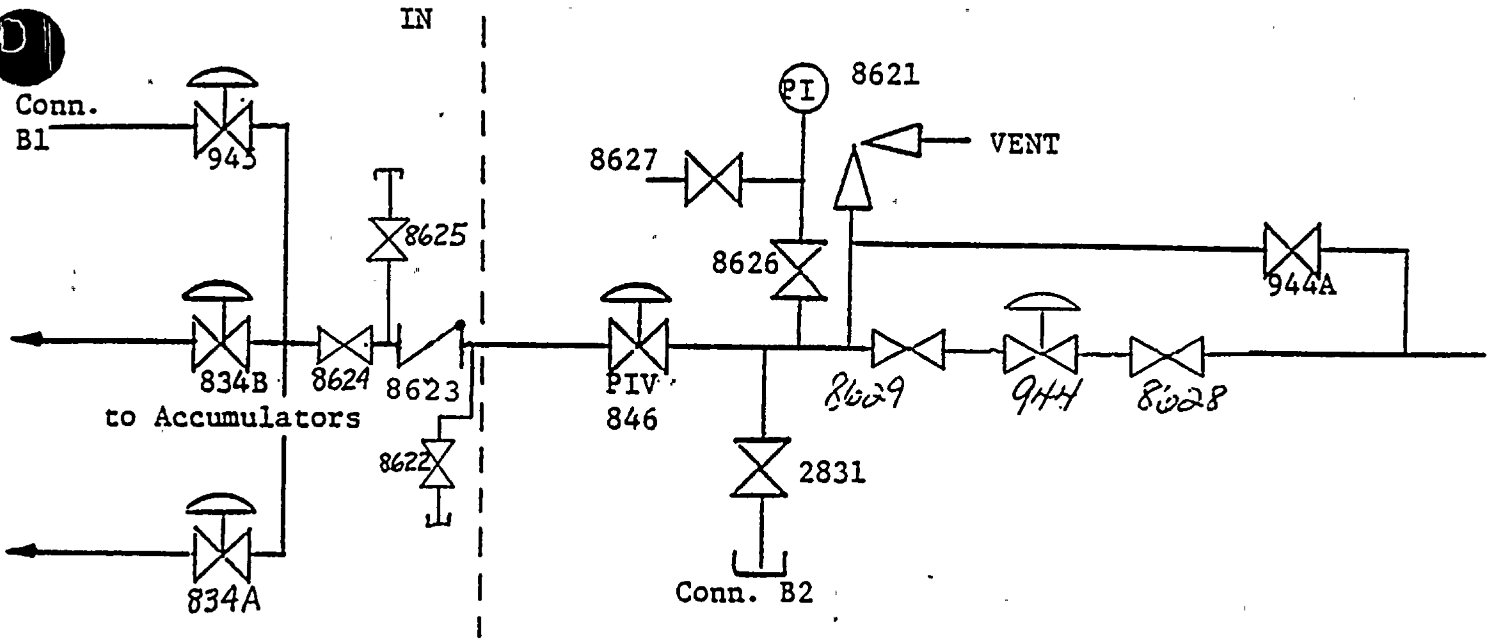
PIV Leakage ______________ cc/min @ 60 psig & 70°F

Max Leakage ____58.07____ cc/min @ 60 psig & 70°F

REMARKS:

CALCULATED BY: ______________ DATE: __________

R&T REVIEW: ______________ DATE: __________



Rotameter Serial # ______________

PIV-846

Rotameter Flow ________cc/min.

Air Temperature (t) ________°F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ________cc/min. @ 60 psig. and 70°F

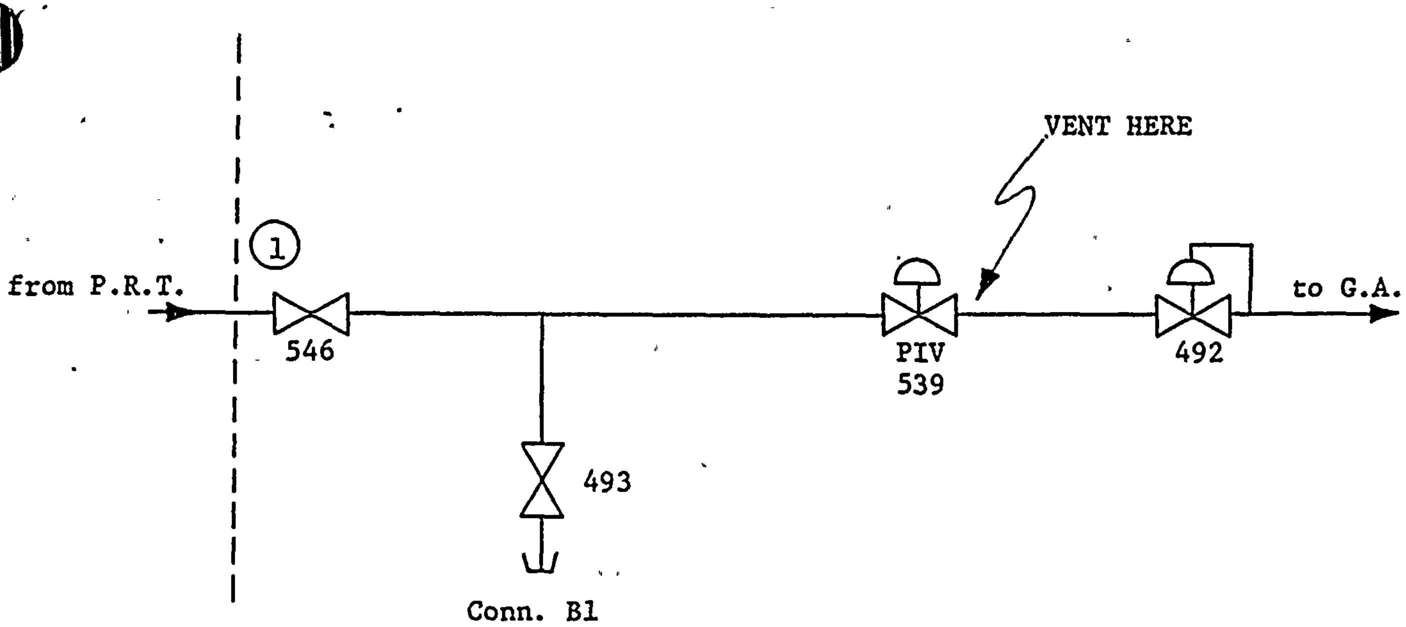
MAX Leakage 29.04 cc/min. @ 60 psig. and 70°F

REMARKS

CALCULATED BY: ______________ DATE: ________

R&T REVIEW: ______________ DATE: ________

PRESSURIZER RELIEF TANK GAS ANALYZER LINE
PENETRATION NO. 120



Rotometer Serial # ____________________

PIV 539

OMETER FLOW INDICATION ____________________ cc/min

AIR TEMPERATURE (t) ____________________ $^{\circ}F$

$$(\text{rotometer indication cc/min}) \times \left(\frac{530}{460 + t}\right)^{1/2} = \text{cc/min at 0 psig and } 70^{\circ}F$$

$$\frac{(\text{cc/min at 0 psig} + 70^{\circ}F)}{5.08} = \text{cc/min at 60 psig} + 70^{\circ}F$$

PIV Leakage ____________________ cc/min @ 60 psig + $70^{\circ}F$.

Max. PIV leakage is 10.89 cc/min @ 60 psig + $70^{\circ}F$.

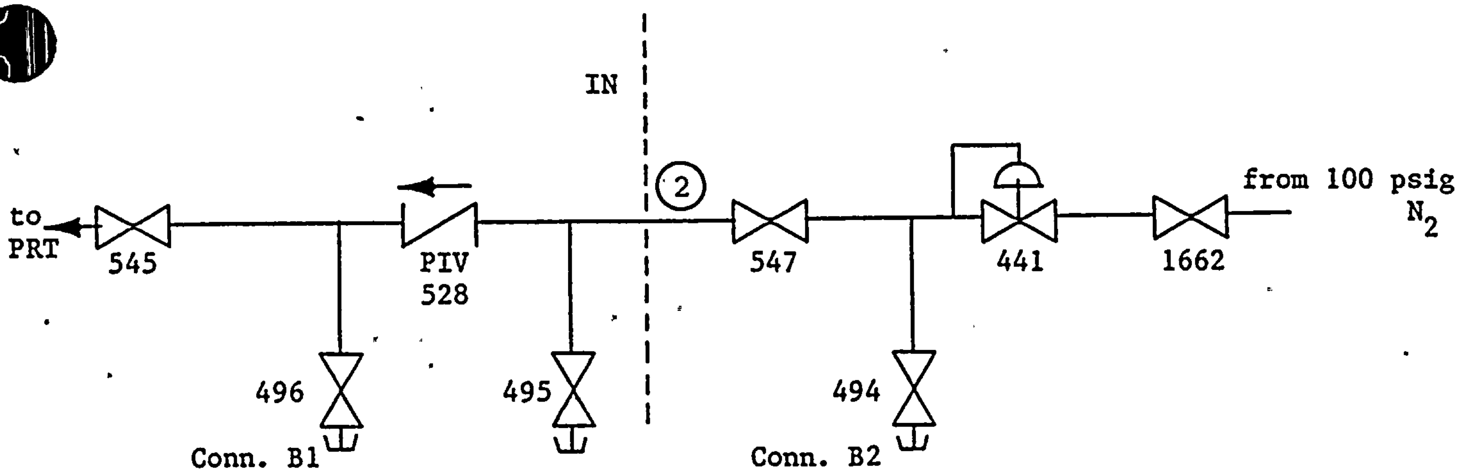
REMARKS:

LCULATED BY: ____________________ DATE: __________

. & T REVIEW: ____________________ DATE: __________

NITROGEN SUPPLY TO PRESSURIZER RELIEF TANK

PENETRATION NO. 121



Rotometer Serial #________________________________

PIV 528

Rotometer Flow Indication ____________________ cc/min

Air Temperature (t) ____________________ °F

(Rotometer Indication cc/min) X $\left(\frac{530}{460 + t}\right)^{1/2}$ = cc/min at 0 psig and 70°F.

$\frac{\text{(cc/min at 0 psig + 70°F)}}{5.08}$ = cc/min at 60 psig + 70°F.

PIV Leakage ____________________________ cc/min @ 60 psig + 70°F.

Max. Leakage is 45.00 cc/min @ 60 psig + 70°F.

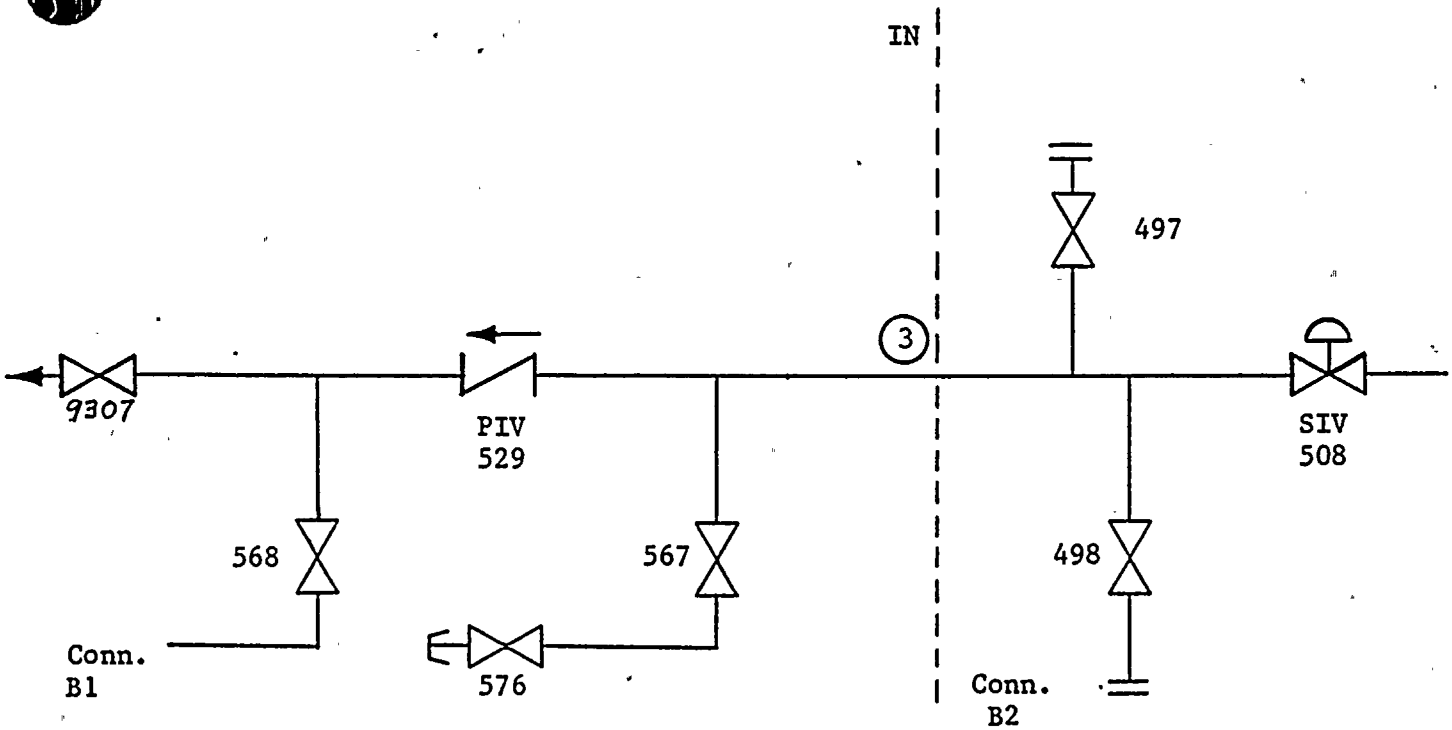
Calculated By: ________________________________ Date: ____________________

R & T Review: ________________________________ Date: ____________________

Remarks:

MAKEUP WATER TO PRESSURIZER RELIEF TANK

PENETRATION NO. 121



Rotometer Serial No. ____________ No. ____________

	PRIMARY	SECONDARY
Rotometer Flow Indication	________ cc/min	________ cc/min.
Air Temperature (t)	________ °F	________ °F

(Rotometer Indication cc/min) $X\left(\frac{530}{460+t}\right)^{1/2}$ = cc/min at 0 psig and 70°F.

$\frac{\text{(cc/min at 0 psig and 70°F)}}{5.08}$ = cc/min at 60 psig and 70°F

PIV Leakage ____________ cc/min @ 60 psig and 70°F

Max. Leakage is 175.0 cc/min @ 60 psig and 70°F

SIV Leakage ____________ cc/min @ 60 psig and 70°F

Max. Leakage is 87.11 cc/min @ 60 psig and 70°F

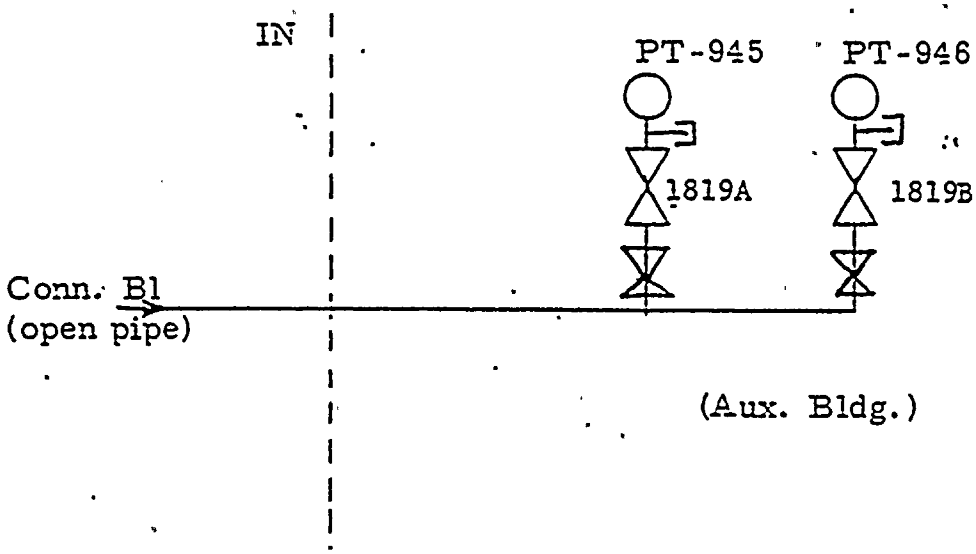
REMARKS:

Calculated By: ____________ Date: ________

R & T Review: ____________ Date: ________

CONTAINMENT PRESSURE SENSING TRANSMITTER

PENETRATION NO. 121



Rotameter Serial #____________________

PRIMARY

Rotameter Flow____________cc/min.

Air Temperature(t)________________°F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage________________cc/min. @ 60 psig & 70°F

Max Leakage 10.89 cc/min. @ 60 psig & 70°F

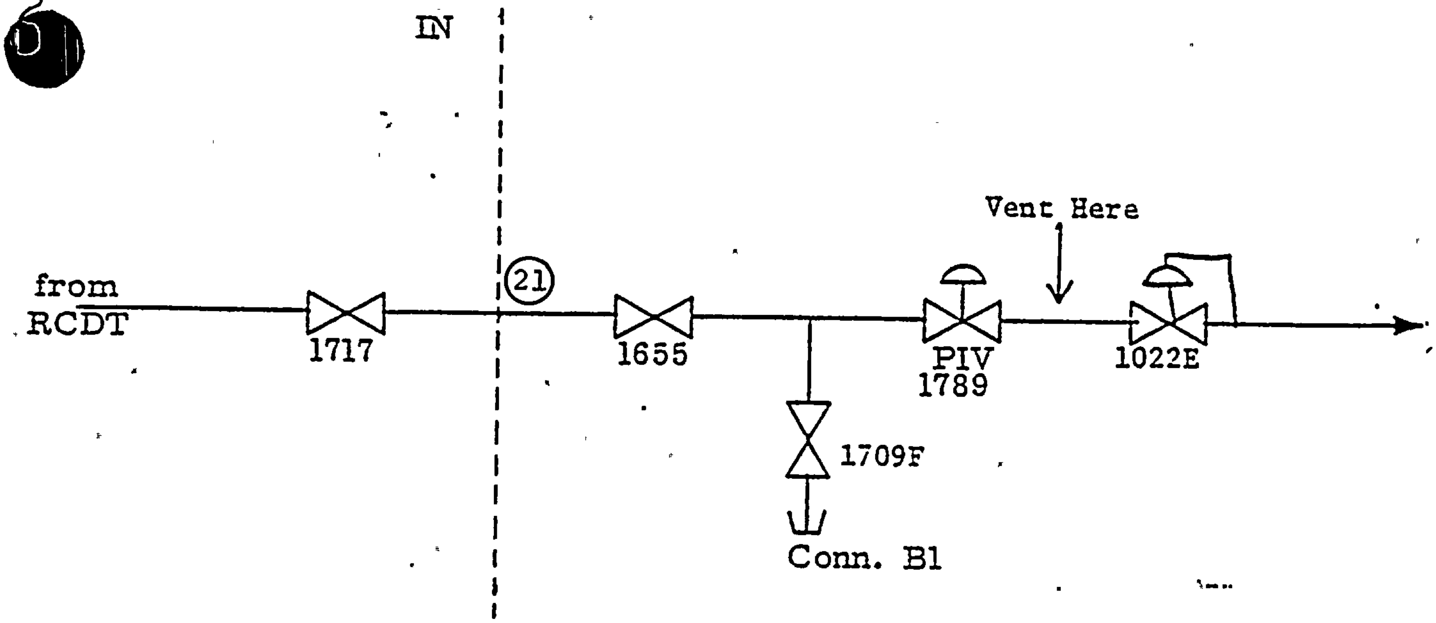
REMARKS:

CALCULATED BY:____________________ DATE:__________

R&T REVIEW:____________________ DATE:__________

R.C.D.T. GAS ANALYZER

PENETRATION NO. 123 (BOTTOM)



Rotameter Serial # ____________________

PIV 1789

Rotameter Flow ____________________ cc/min.

Air Temperature (t) ____________________ ^{o}F

cc/min. @ 0 psig and $70^{o}F$ = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and $70^{o}F$ = $\frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$

PIV Leakage ____________________ cc/min. @ 60 psig and $70^{o}F$.

Max. Leakage is 10.89 cc/min. @ 60 psig and $70^{o}F$.

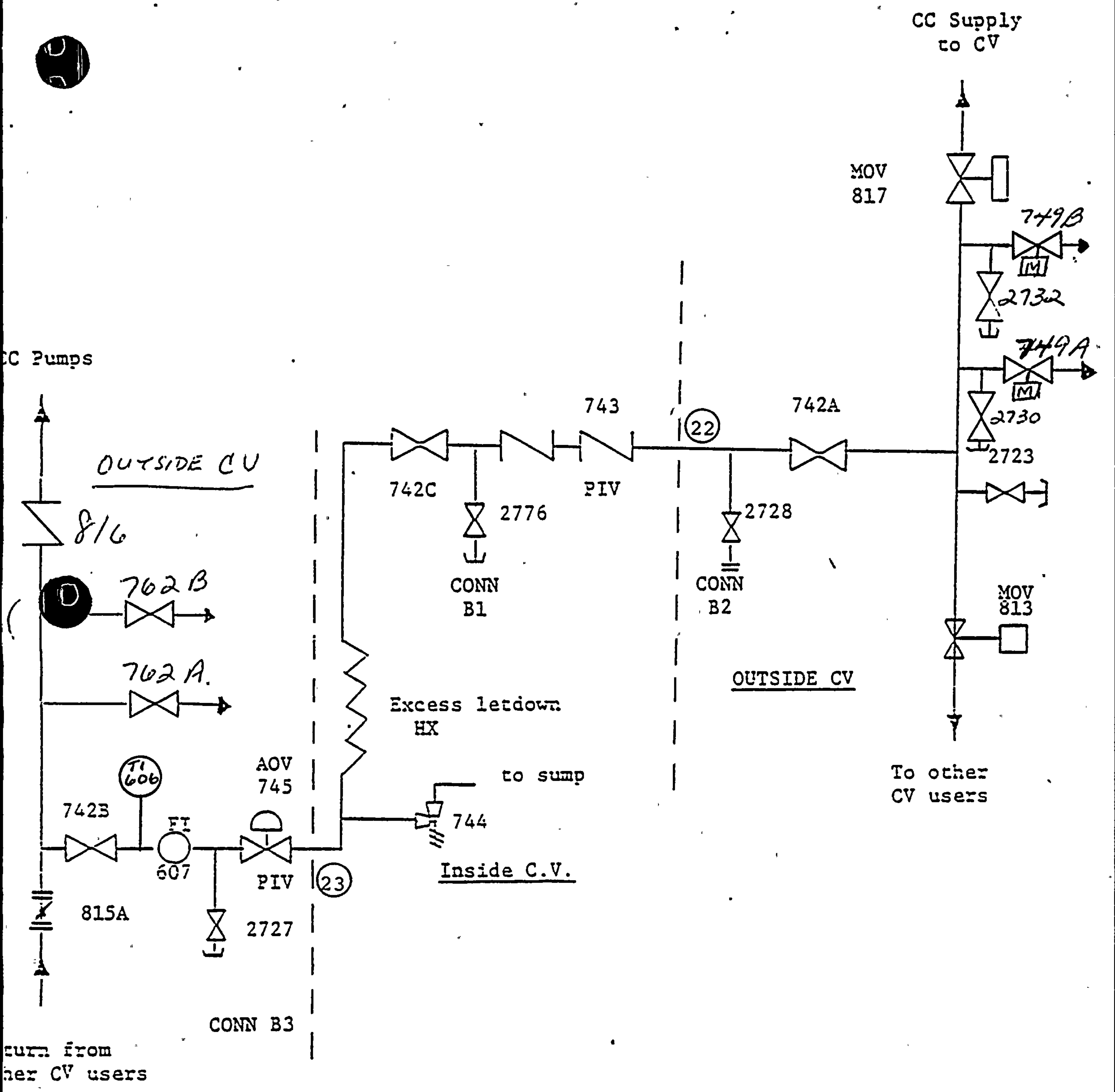
REMARKS:

CALCULATED BY: ____________________ DATE: ____________________

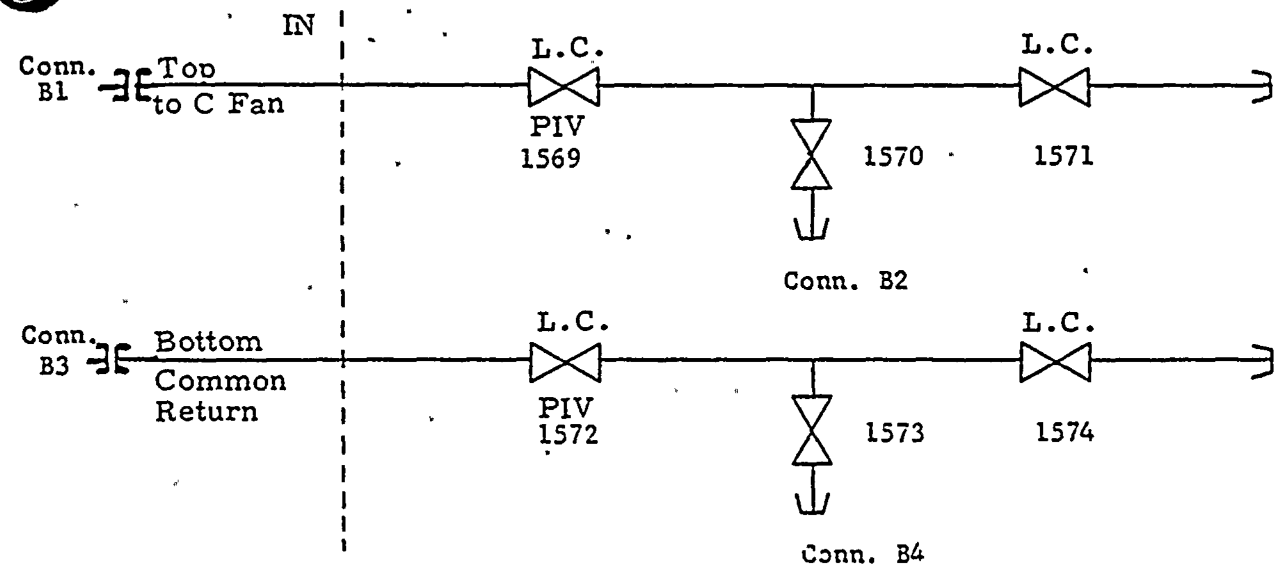
R & T REVIEW: ____________________ DATE: ____________________

AUXILIARY COOLANT SYSTEM-EXCESS LETDOWN HX (SUPPLY & RETURN)

PENETRATION NO. 124



CONTAINMENT POST ACCIDENT AIR SAMPLE (AUX. BLDG.)
PENETRATION NO. 124



TEST #1 (TOP LINE)

Rotameter Serial # ____________

PIV 1569

Rotameter Flow ____________ cc/min.

Air Temperature (t) ____________ ^{o}F

cc/min. @ 0 psig and 70^{o}F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70^{o}F = $\frac{(\text{cc/min. @ 0 psig and } 70^{o}\text{F})}{5.08}$

PIV Leakage ____________ cc/min. @ 60 psig and 70^{o}F.

Max. Leakage is 29.04 cc/min. @ 60 psig and 70^{o}F.

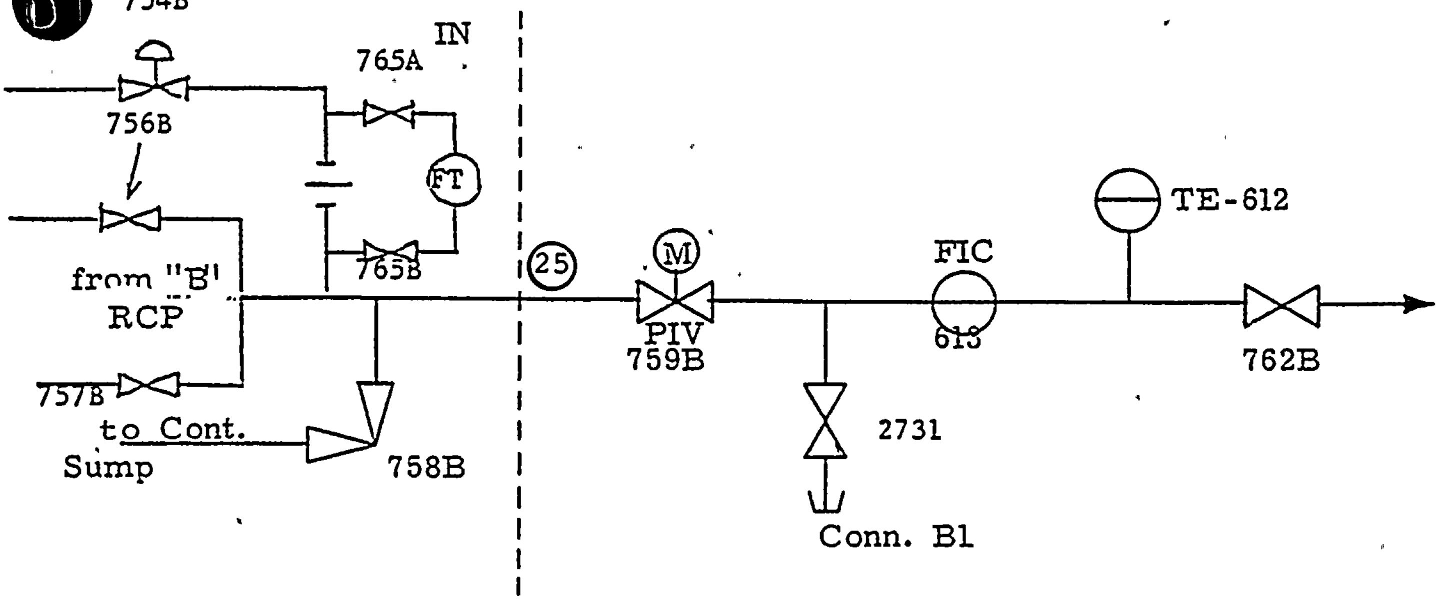
REMARKS:

CALCULATED BY: ____________ DATE: ____________

R & T REVIEW: ____________ DATE: ____________

PT 23.29 AUXILIARY COOLANT SYSTEM FROM "B" REACTOR COOLANT PUMP

PENETRATION NO. 125



Rotameter Serial #____________

	PIV 759B
Rotameter Flow	__________ cc/min.
Air Temperature (t)	__________ °F

$$\text{cc/min. @ 0 psig and } 70^\circ\text{F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^\circ\text{F} = \frac{(\text{cc/min. @ 0 psig and } 70^\circ\text{F})}{5.08}$$

PIV Leakage__________cc/min. @ 60 psig. and 70°F

Max. Leakage is ___116.14___cc/min. @ 60 psig. and 70°F

REMARKS:

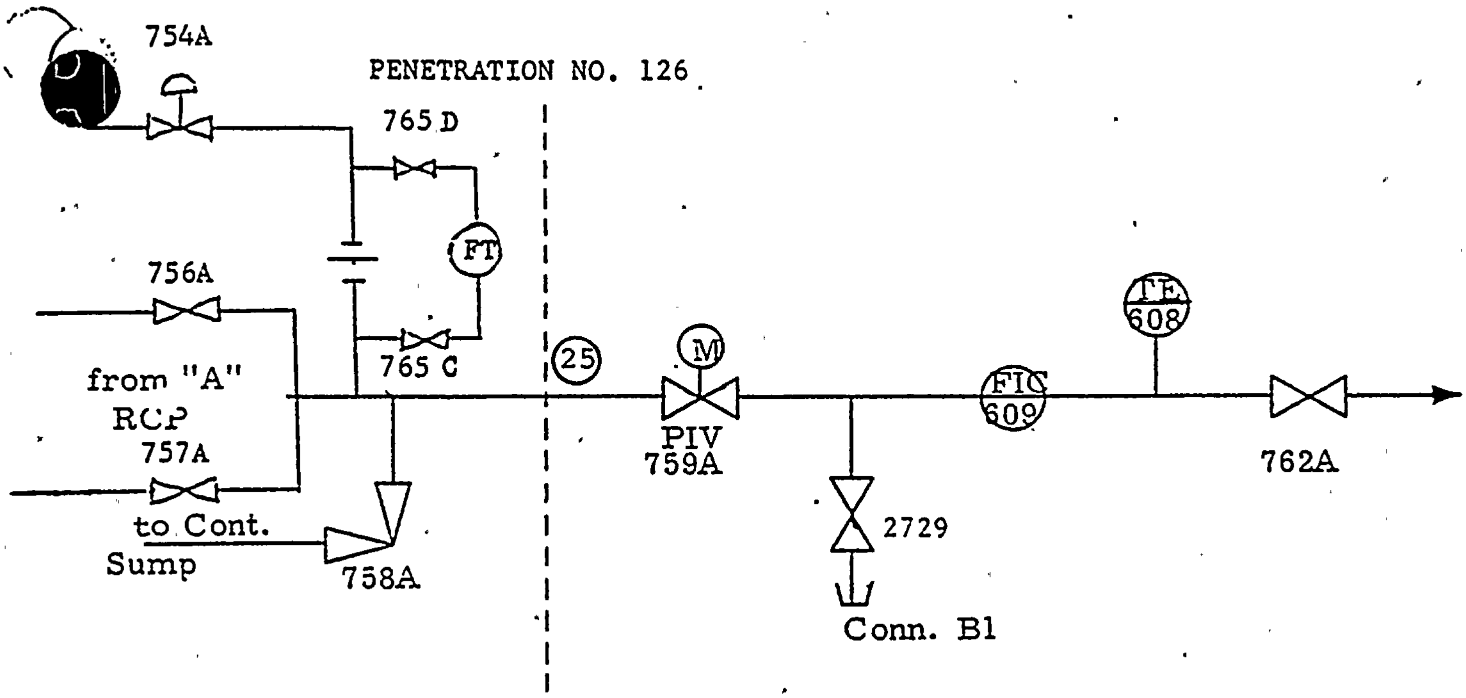
Calculated by:____________

Date:____________

R&T Review:____________

Date:____________

PT 23.28 AUXILIARY COOLANT SYSTEM FROM "A" REACTOR COOLANT PUMP



Rotameter Serial #____________________

	PIV 759A
Rotameter Flow	____________ cc/min.
Air Temperature (t)	____________ °F

cc/min. @ 0 psig and 70°F = $(\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\left(\frac{\text{cc/min. @ 0 psig and } 70^{\circ}\text{F}}{5.08}\right)$

PIV Leakage________________cc/min. @ 60 psig. and 70°F

Max Leakage is ____116.14____cc/min. @ 60 psig. and 70°F

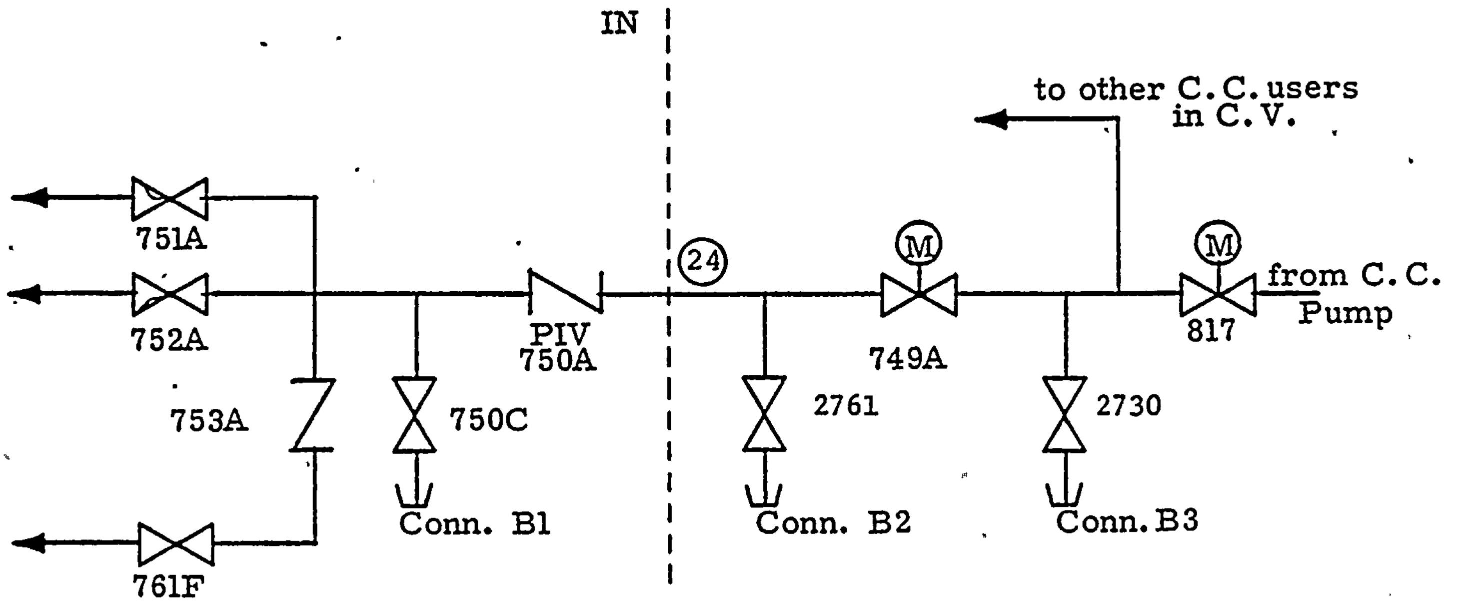
REMARKS:

Calculated by:________________ Date:__________

R.& T. Review:________________ Date:__________

PT 23.26 AUXILIARY COOLANT SYSTEM TO "A" REACTOR COOLANT PUMP

PENETRATION NO. 127



Rotameter Serial # ____________________

PIV 750A

Rotameter Flow ____________ cc/min.

Air Temperature (t) ____________ ^{o}F

$$\text{cc/min. @ 0 psig and } 70^{o}F = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^{o}F = \frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$$

PIV Leakage ____________ cc/min. @ 60 psig and $70^{o}F$

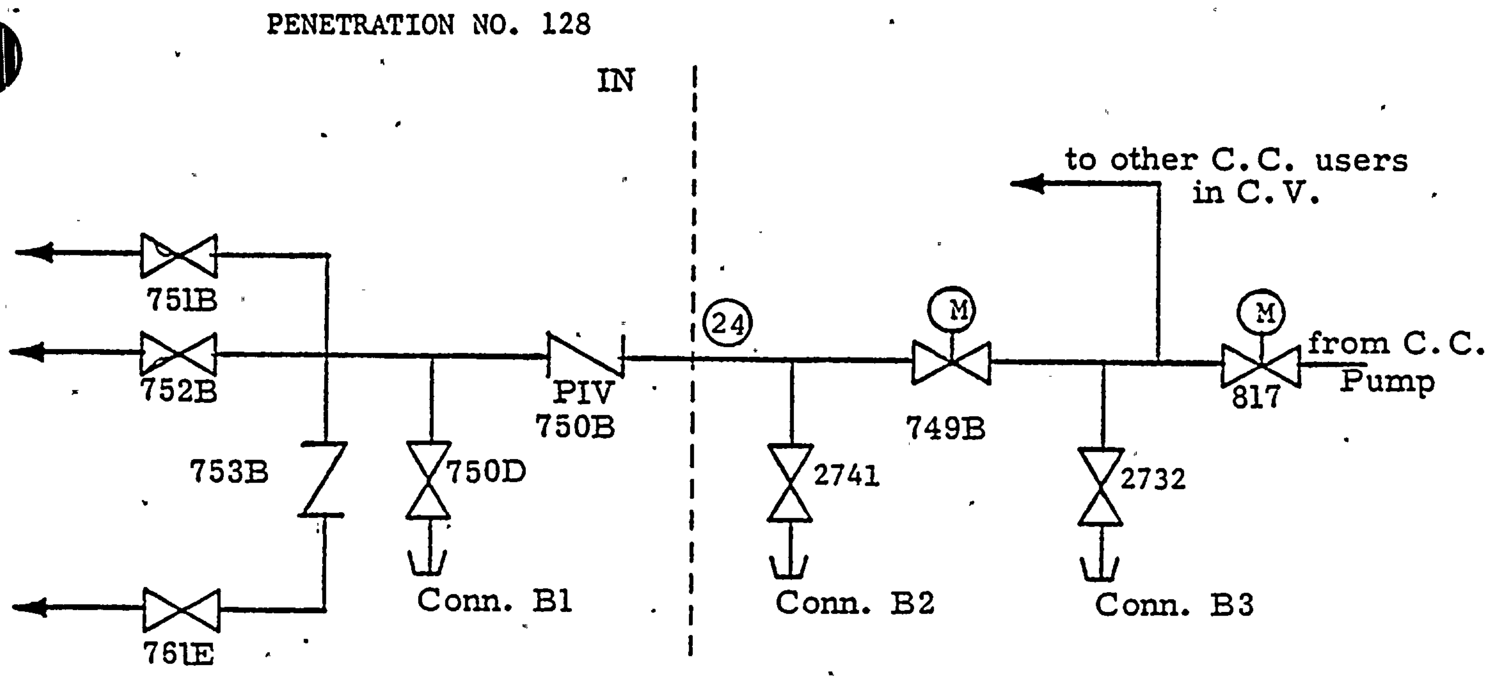
Max. Leakage 230.0 cc/min. @ 60 psig and $70^{o}F$

REMARKS:

CALCULATED BY: ____________________ DATE: ____________

R&T REVIEW: ____________________ DATE: ____________

PT 23.27 AUXILIARY COOLANT SYSTEM TO "B" REACTOR COOLANT PUMP



Rotameter Serial # ________________

PIV 750B

Rotameter Flow __________ cc/min.

Air Temperature (t) __________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage __________ cc/min. @ 60 psig and 70°F

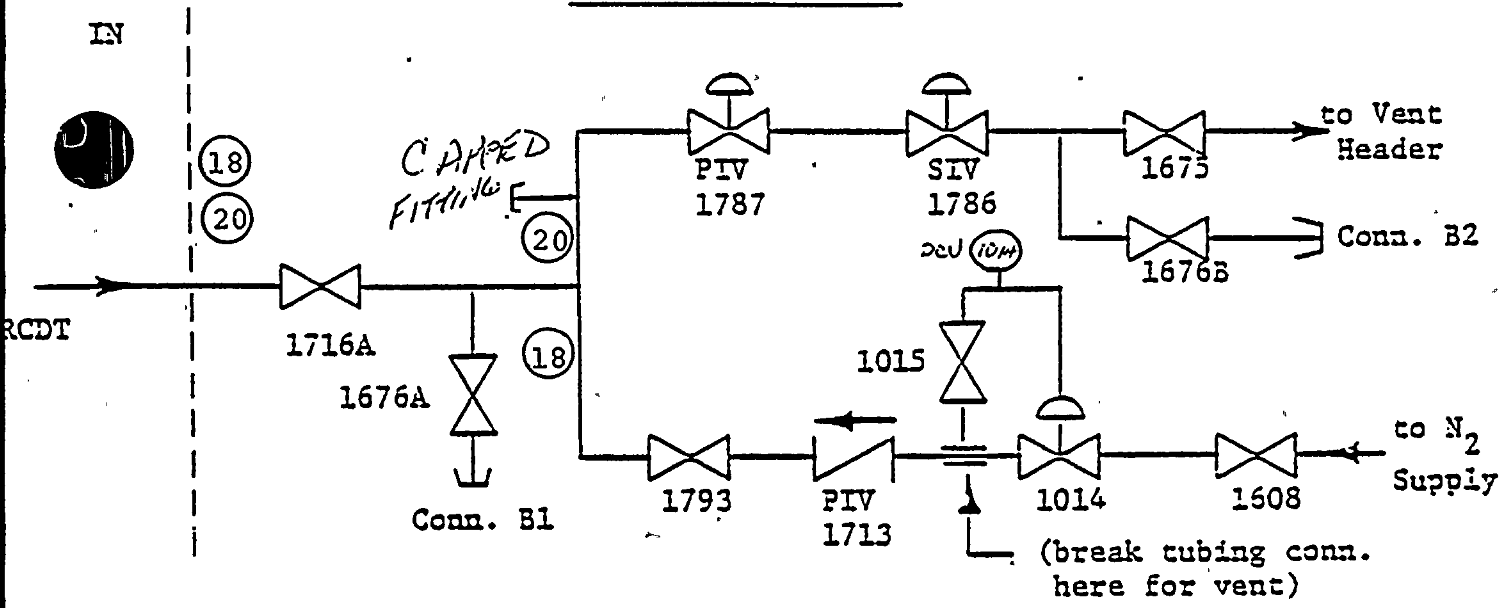
Max. Leakage 230.0 cc/min. @ 60 psig and 70°F

REMARKS:

CALCULATED BY: ____________________ DATE: ______________

R&T REVIEW: ____________________ DATE: ______________

R.C.D.T. GAS HEADER
PENETRATION NO. 129



Rotometer Serial # ____________________

	PIV 1787	SIV 1786	PIV 1713
Rotometer Flow	________ cc/min.	________ cc/min.	________ cc/min.
Air Temperature (t)	________ ^{o}F	________ ^{o}F	________ ^{o}F

cc/min. @ 0 psig and 70^{o}F = (Rotometer Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70oF = $\frac{\text{(cc/min. @ 0 psig and 70oF)}}{5.08}$

PIV Leakage __________ cc/min. @ 60 psig and 70^{o}F, AOV 1787.

Max. Leakage is __29.04__ cc/min. @ 60 psig and 70^{o}F, AOV 1787.

SIV Leakage __________ cc/min. @ 60 psig and 70^{o}F, AOV 1786.

Max. Leakage __29.04__ cc/min. @ 60 psig and 70^{o}F, AOV 1786.

PIV Leakage __________ cc/min. @ 60 psig and 70^{o}F, Check Valve 1713.

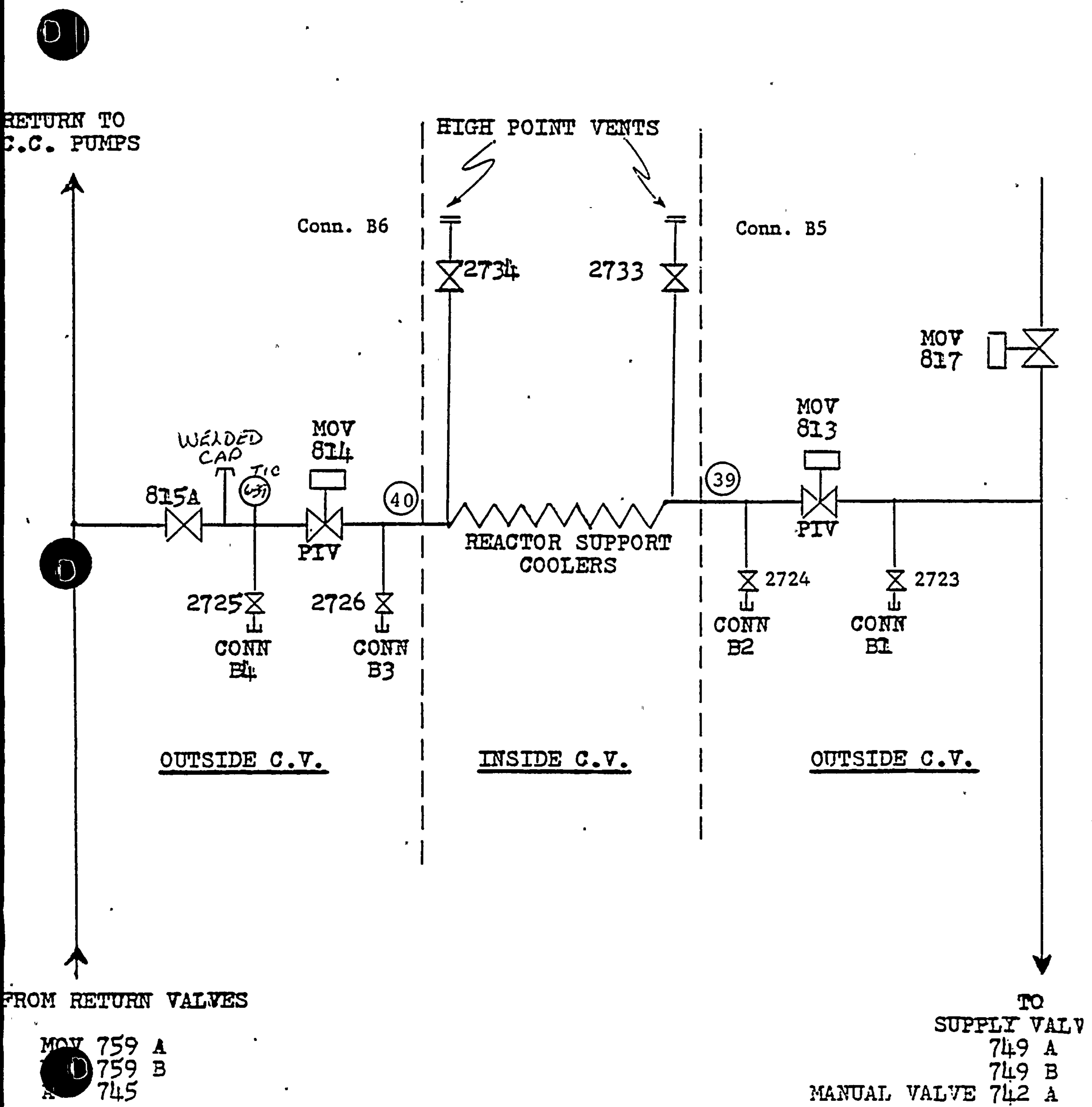
Max. Leakage is __58.00__ cc/min. @ 60 psig and 70^{o}F, Check Valve 1713.

REMARKS:

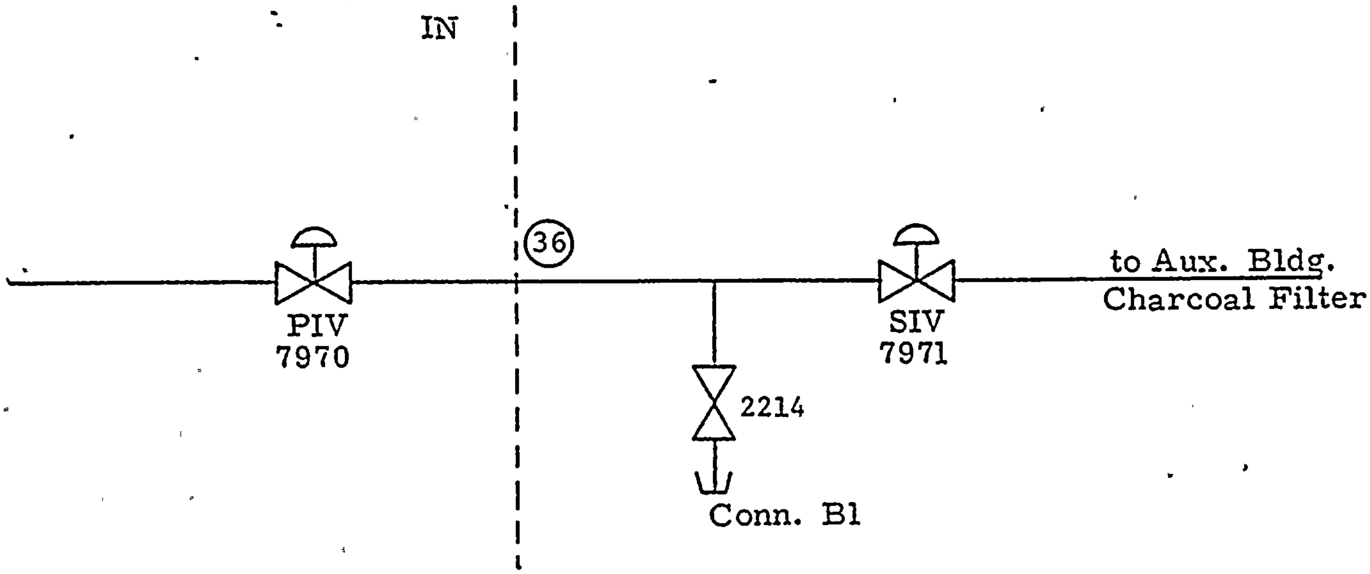
CALCULATED BY: ____________________ DATE: __________

R & T REVIEW: ____________________ DATE: __________

REACTOR SUPPORT COOLING (IN & OUT) PENETRATIONS, NO. 130 & NO. 131:



PT 23.34 DEPRESSURIZATION AT POWER
PENETRATION NO. 132



Rotameter Serial # ____________ # ____________

	PIV 7970	SIV 7971
Rotameter Flow	____________ cc/min.	____________ cc/min.
Air Temperature (t)	____________ °F	____________ °F

cc/min. @ 0 psig and 70°F = $(\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{\frac{1}{2}}$

cc/min. @ 60 psig and 70°F = $\frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$

PIV Leakage ____________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 174.21 cc/min. @ 60 psig and 70°F.

SIV Leakage ____________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 174.21 cc/min. @ 60 psig and 70°F.

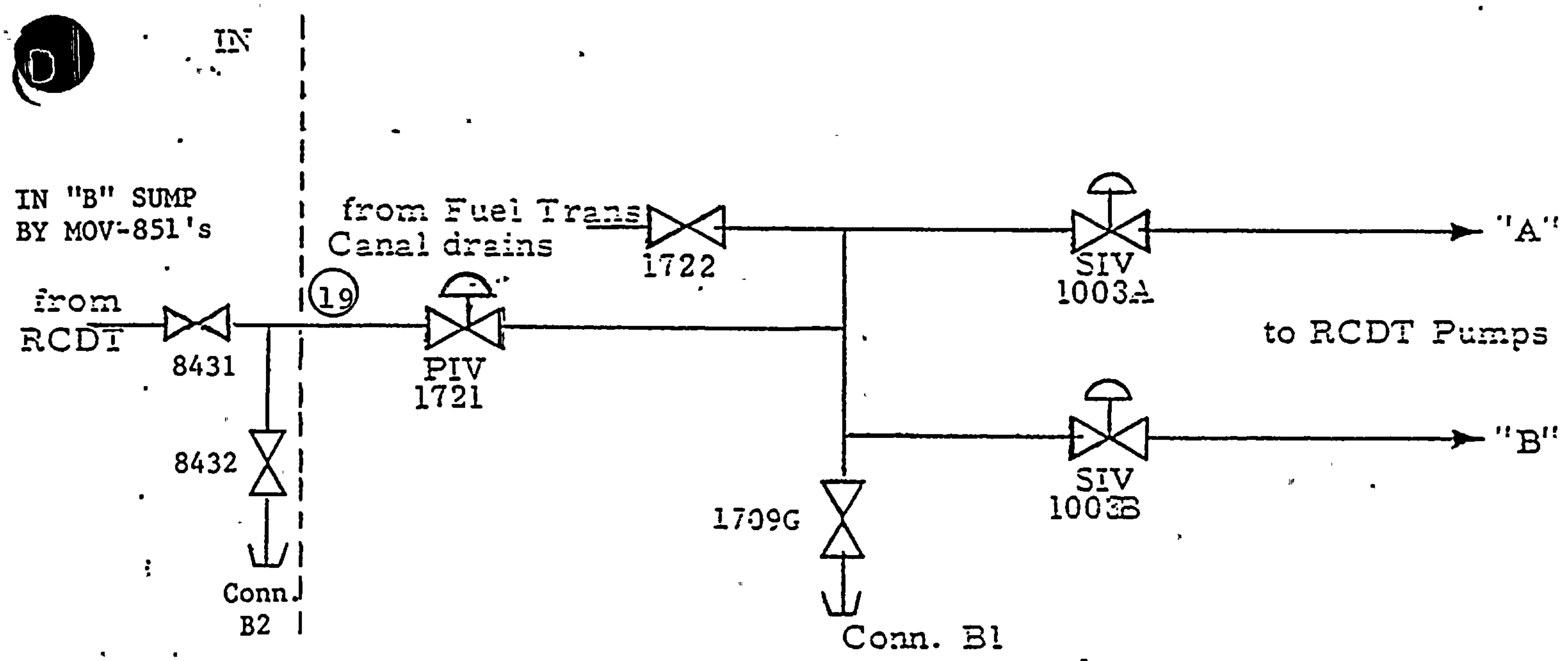
REMARKS:

CALCULATED BY: ____________ DATE: ________

R & T REVIEW: ____________ DATE: ________

R.C.D.T. DISCHARGE

PENETRATION NO. 143



Rotameter Serial # ______________

	PIV-1721	SIV-1003A,B
Rotameter Flow	____________cc/min.	____________cc/min.
Air Temperature (t)	____________°F	____________°F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage.__________cc/min. @ 60 psig & 70°F

MAX Leakage is 116.14 cc/min. @ 60 psig & 70°F

REMARKS:

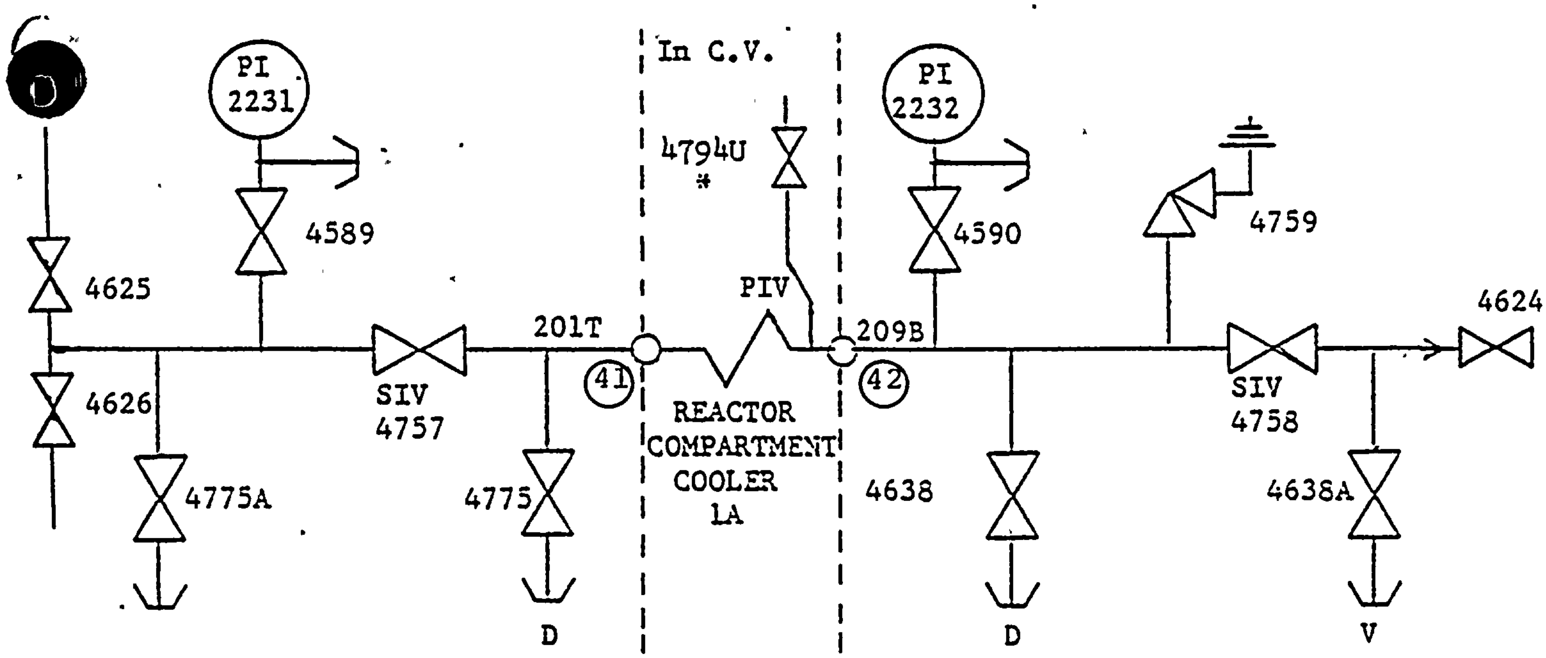
SIV 1003A Leakage __________cc/min. @ 60 psig & 70°F

MAX Leakage is 87.11 cc/min. @ 60 psig & 70°F

REMARKS:

REACTOR COMPARTMENT COOLING "UNIT A"

PENETRATIONS 201 TOP AND 209 BOTTOM



Rotameter Serial # ____________________

*Located in 1D Recirc. Fan Plenum

	SECONDARY 4757	SECONDARY 4758
Rotameter Flow	______________ cc/min.	______________ cc/min.
Air Temperature (t)	______________ °F	______________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig. and 70°F)}}{5.08}$

PIV RCC "A" Hx ______________ cc/min. @ 60 psig and 70°F

SIV Leakage 4757 ____________ cc/min. @ 60 psig and 70°F

SIV Leakage 4758 ____________ cc/min. @ 60 psig and 70°F

REMARKS:

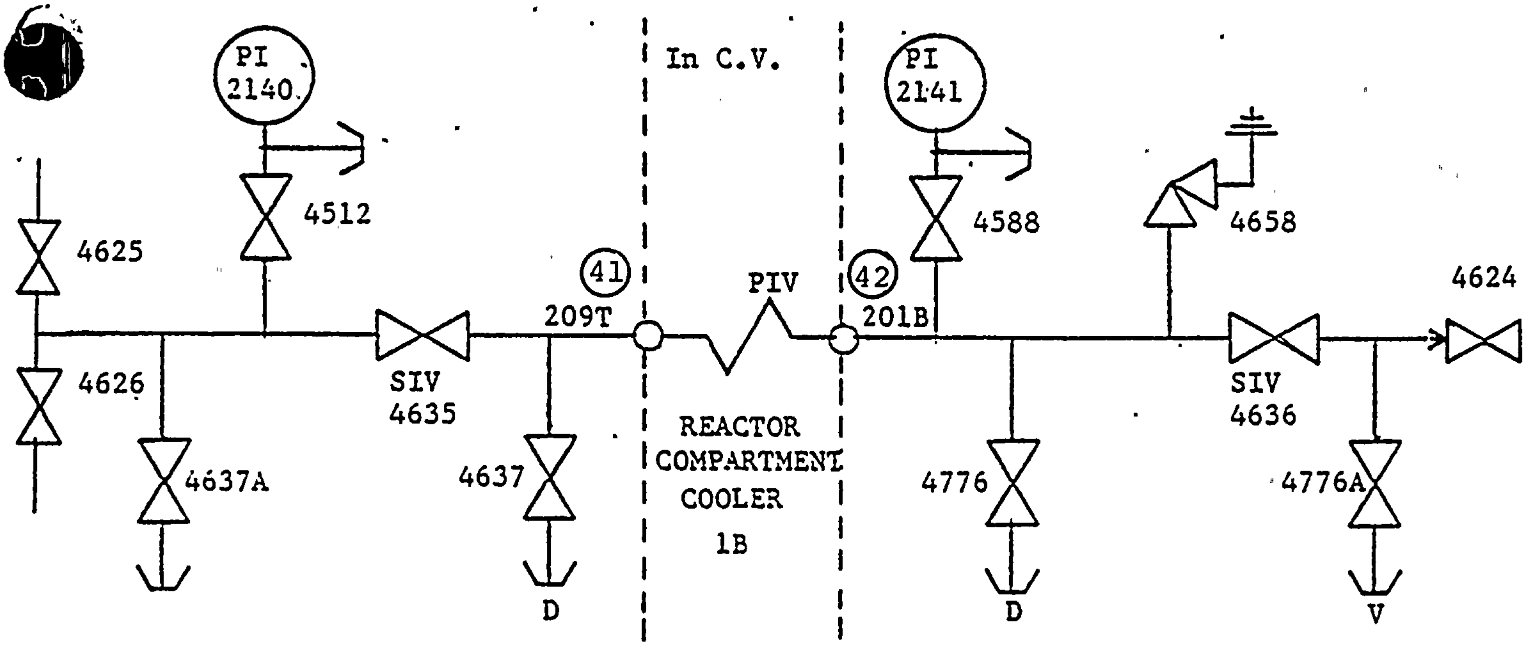
COMPLETED BY: ______________________________

DATE COMPLETED: ______________________________

SHIFT FOREMAN: ______________________________

RESULTS AND TEST REVIEW: ____________________ DATE __________

REACTOR COMPARTMENT COOLING UNIT "B"
PENETRATIONS 209 TOP AND 201 BOTTOM



Rotameter Serial # ______________

	SECONDARY 4635	SECONDARY 4636
Rotameter Flow	______________ cc/min.	______________ cc/min.
Air Temperature (t)	______________ °F	______________ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig. and 70°F})}{5.08}$$

PIV RCC "B" HX ______________ cc/min. @ 60 psig and 70°F

SIV Leakage 4635 ______________ cc/min. @ 60 psig and 70°F

SIV Leakage 4636 ______________ cc/min. @ 60 psig and 70°F

REMARKS:

COMPLETED BY: ______________

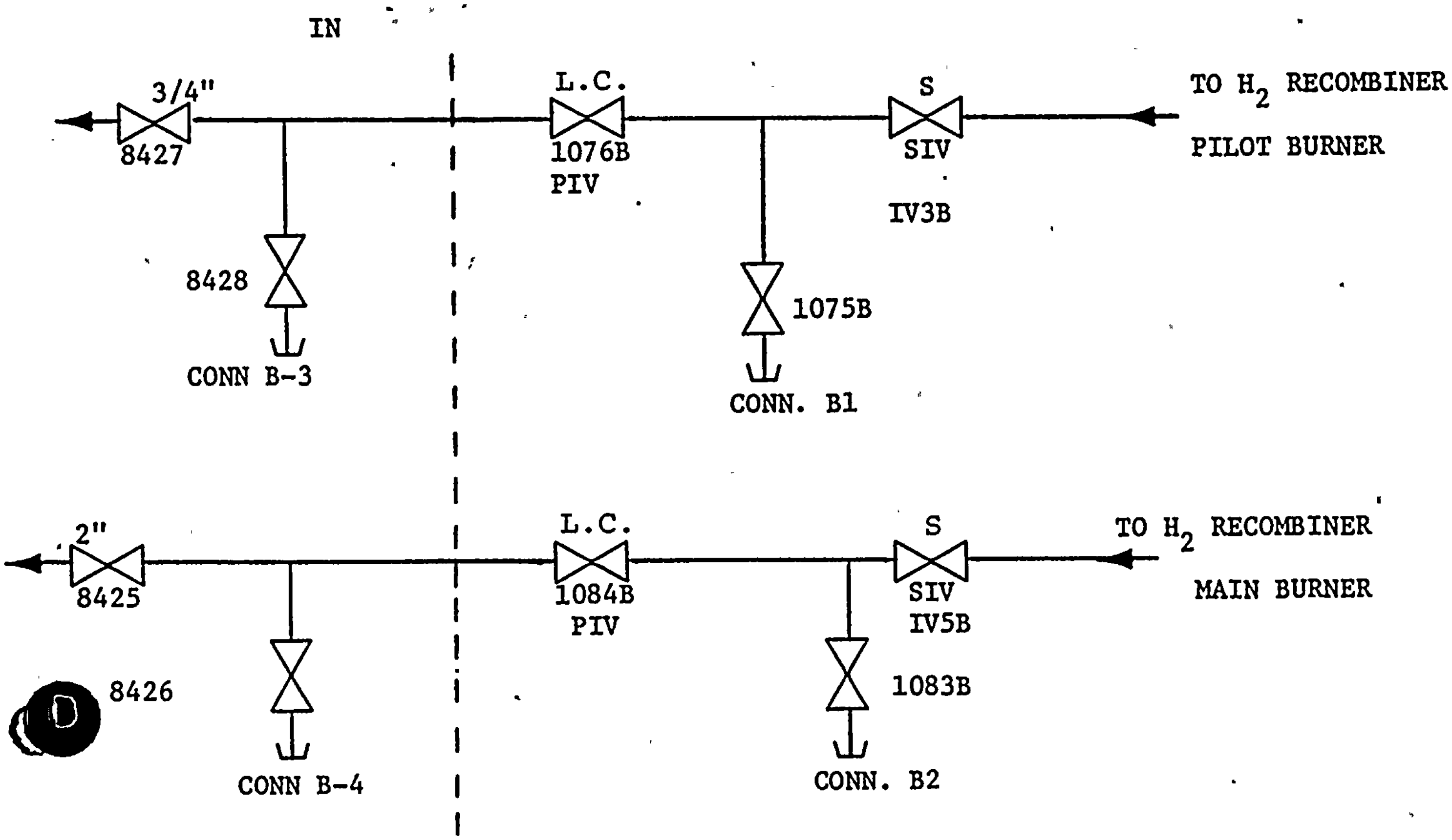
DATE COMPLETED: ______________

SHIFT FOREMAN: ______________

RESULTS AND TEST REVIEW: ______________ DATE ______

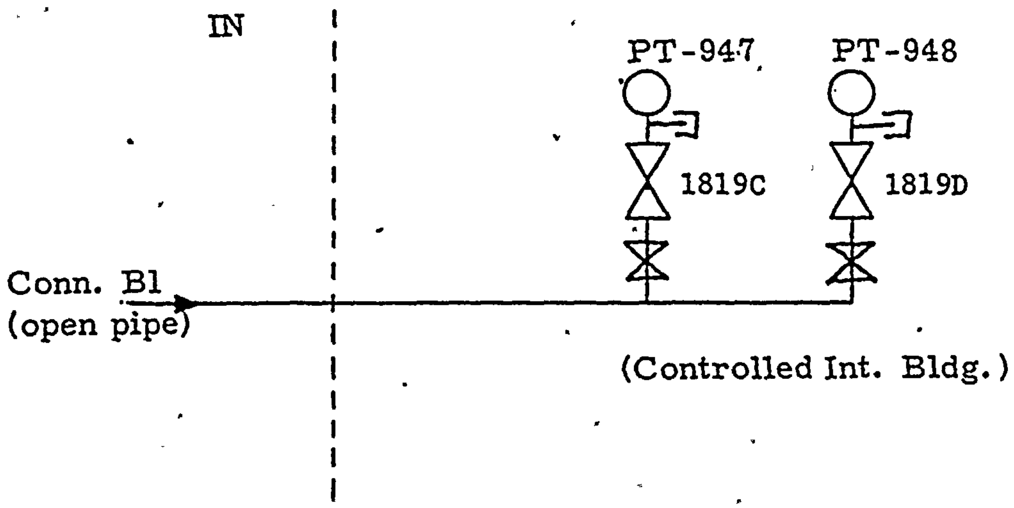
"B" HYDROGEN RECOMBINER (PILOT AND MAIN)

PENETRATION NO. 202



CONTAINMENT PRESSURE SENSING TRANSMITTERS PT-947 & PT-948

PENETRATION NO. 203



Rotameter Serial # ______________________

PRIMARY

Rotameter Flow ______________ cc/min.

Air Temperature(t) ______________________ °F

$$\text{cc/min. @ 0 psig and } 70^\circ\text{F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^\circ\text{F} = \frac{(\text{cc/min. @ 0 psig and } 70^\circ\text{F})}{5.08}$$

PIV Leakage ____________________ cc/min. @ 60 psig & 70°F

Max Leakage ______10.89______ cc/min. @ 60 psig & 70°F

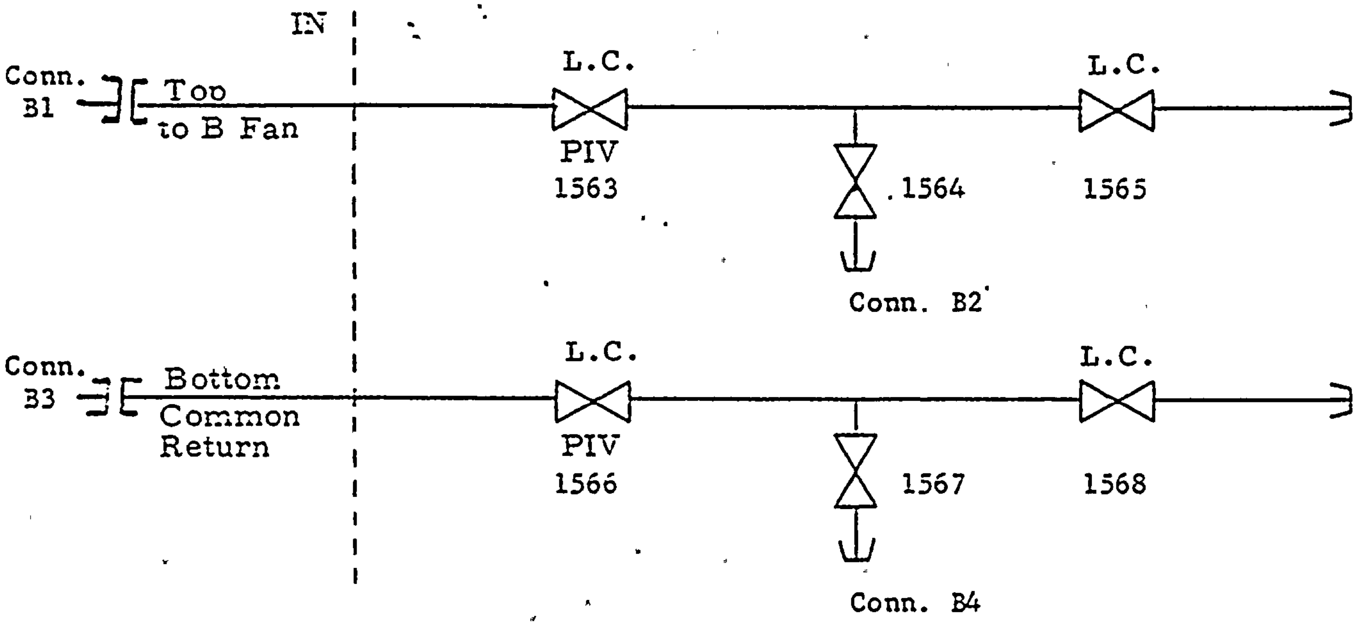
REMARKS:

CALCULATED BY: ________________________ DATE: ____________

R&T REVIEW: ____________________________ DATE: ____________

CONTAINMENT POST ACCIDENT AIR SAMPLE (CONTROLLED INT. BLDG.)

PENETRATION NO. 203



TEST #1 (TOP LINE)

Rotameter Serial #____________

PIV 1563

Rotameter Flow ____________ cc/min.

Air Temperature (t) ____________ ^{o}F

$$\text{cc/min. @ 0 psig and } 70^{o}F = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^{o}F = \frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$$

PIV Leakage ____________ cc/min @ 60 psig & $70^{o}F$

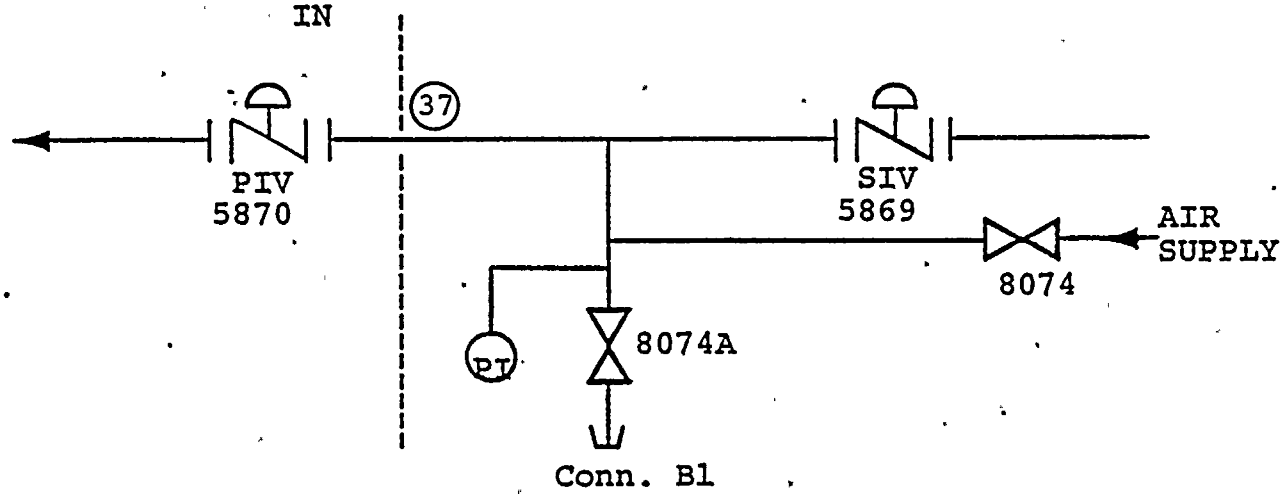
Max. Leakage is 29.04 cc/min @ 60 psig & $70^{o}F$

REMARKS

Calculated By:____________ Date:________

R & T Review:____________ Date:________

PT-23.35 PURGE SUPPLY
PENETRATION NO. 204



P_i = ______ psig T_i = ______ °F $Time_i$ = ______ Hr

P_f = ______ psig T_f = ______ °F $Time_f$ = ______ Hr

V = 103 Ft^3 Δ Time = ______ Hr

$$\rho_1 = \frac{2.7\ (\_\_\_\_\_\_\ \text{psig} + 14.7\ \text{psia})}{\_\_\_\_\_\_\ ^{o}F = 460} = \_\_\_\_\_\_\ \text{lb/ft}^3$$

$$W_1 = 103\ \text{ft}^3\ (\_\_\_\_\_\_\ \text{lb/ft}^3) = \_\_\_\_\_\_\ \text{lb}$$

$$\rho_2 = \frac{2.7\ (\_\_\_\_\_\_\ \text{psig} + 14.7\ \text{psia})}{\_\_\_\_\_\_\ ^{o}F\ \_\ 460} = \_\_\_\_\_\_\ \text{lb/ft}^3$$

$$W_2 = 103\ \text{ft}^3\ (\_\_\_\_\_\_\ \text{lb/ft}^3) = \_\_\_\_\_\_\ \text{lb}$$

$$\frac{\Delta W}{t} = \frac{(\_\_\_\_\_\_) - (\_\_\_\_\_\_)}{(\_\_\_\_\_\_\ \text{Hr})} = \_\_\_\_\_\_\ \text{lb/hr}$$

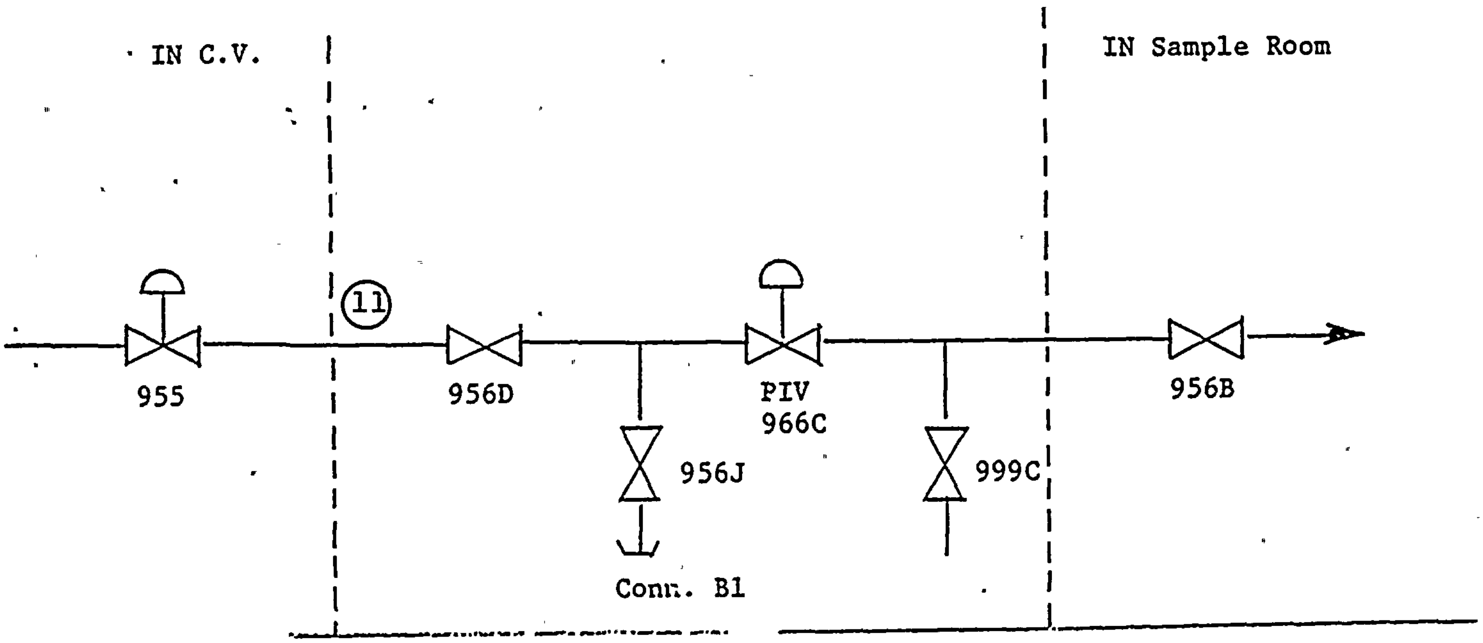
$$\frac{cc}{min} = \frac{471.6\ (\_\_\_\_\_\_\ \text{lb/hr})}{(\_\_\_\_\_\_\ \text{lb/ft}^3)} = \_\_\_\_\_\_\ \text{cc/min leakage}$$

NOTE: Use smallest density calculated (lb/ft^3) in cc/min calculation.

CALCULATED BY: ______________ DATE: __________

REVIEWED BY: ______________ DATE: __________

R.C.S. SAMPLE LOOP B
PENETRATION No. 205



Rotameter Serial # ______________ # ______________

	PIV-AOV 966C	SIV-V 956B
Rotameter Flow	______ cc/min.	______ cc/min.
Air Temperature(t)	______ °F	______ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) x $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ______________ cc/min. @ 60 psig & 70°F

Max Leakage 110.89 cc/min. @ 60 psig & 70°F

SIV Leakage ______________ cc/min. @ 60 psig & 70°F

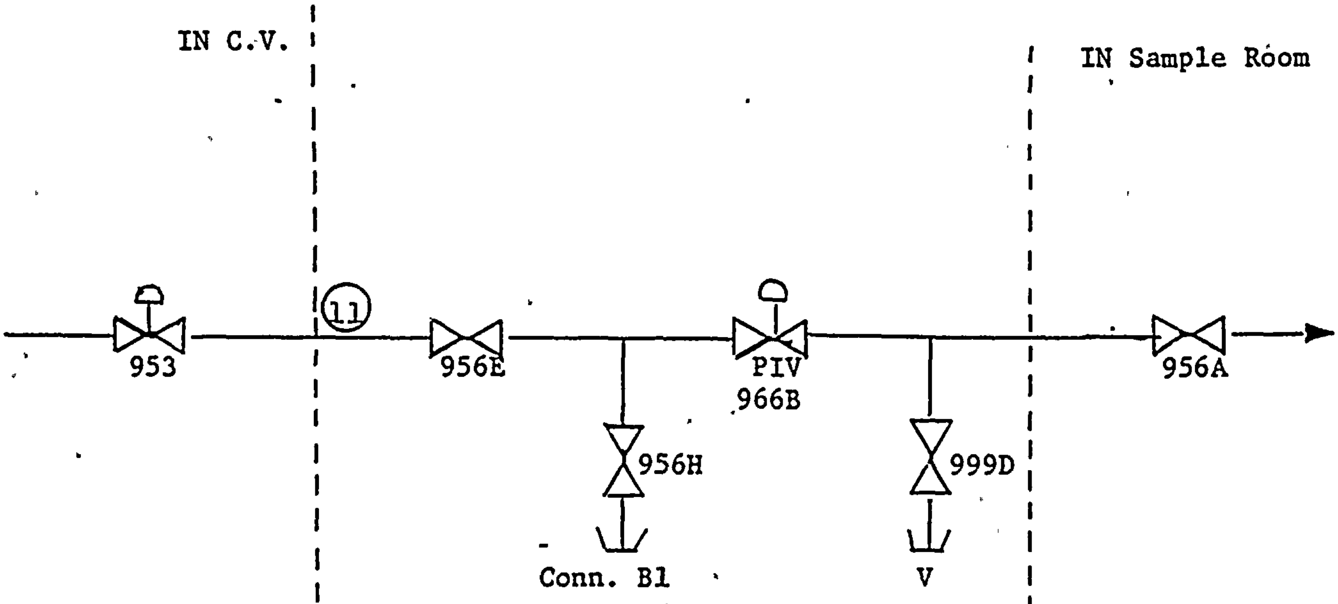
Max Leakage 10.89 cc/min. @ 60 psig & 70°F

CALCULATED BY: ______________ DATE: ______

R&T REVIEW: ______________ DATE: ______

PRESSURIZER LIQUID SPACE SAMPLE

PENETRATION NO. 206 (Top)



Rotameter Serial #______________ #______________

	PIV-AOV 966B	SIV-V 956A
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature(t)	________ °F	________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) $x\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage____________ cc/min. @ 60 psig & 70°F

Max Leakage 110.89 cc/min. @ 60 psig & 70°F

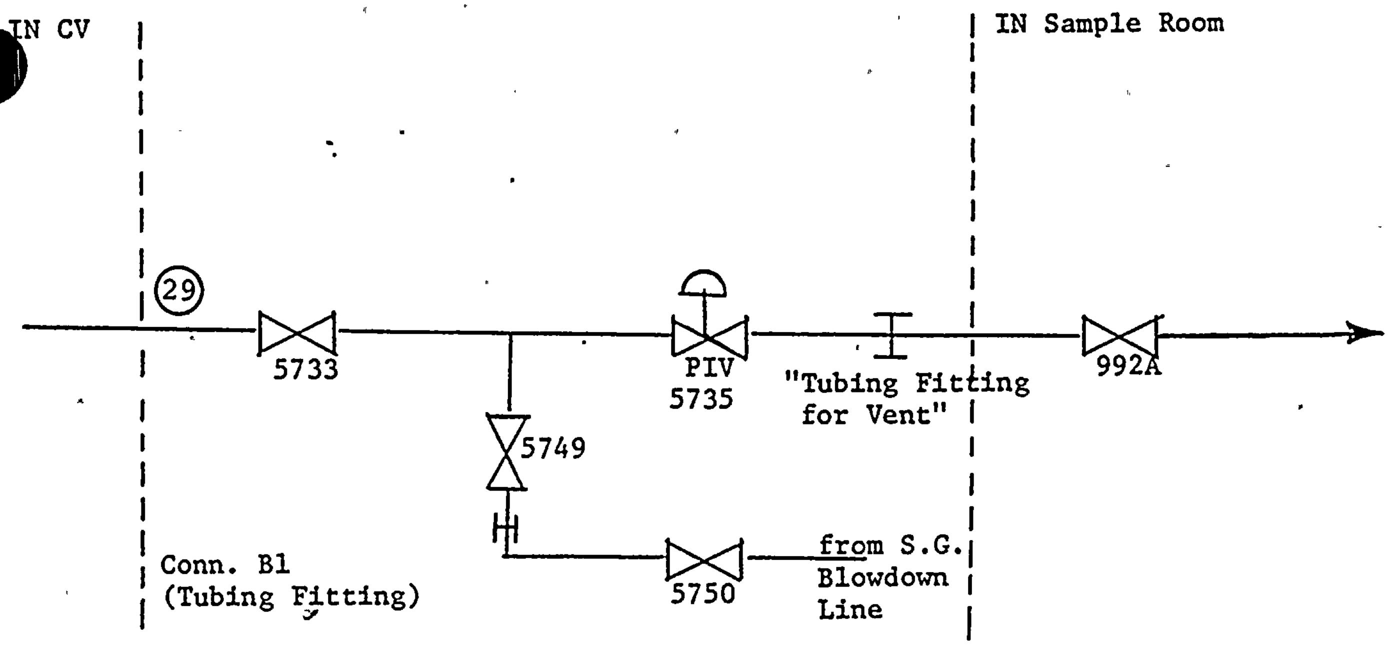
SIV Leakage____________ cc/min. @ 60 psig & 70°F

Max Leakage 10.89 cc/min. @ 60 psig & 70°F

CALCULATED BY:______________ DATE:________

R&T REVIEW:______________ DATE:________

"A" STEAM GENERATOR SAMPLE
PENETRATION NO. 206 (Bottom)



Rotameter Serial # ________________

PIV 5735

Rotameter Flow ________________ cc/min.

Air Temperature (t) ________________ °F

$$\text{cc/min. @ 0 psig and } 70^{\circ}\text{F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^{\circ}\text{F} = \frac{(\text{cc/min. @ 0 psig and } 70^{\circ}\text{F})}{5.08}$$

PIV Leakage __________ cc/min. @ 60 psig & 70°F

Max Leakage 110.89 cc/min. @ 60 psig & 70°F

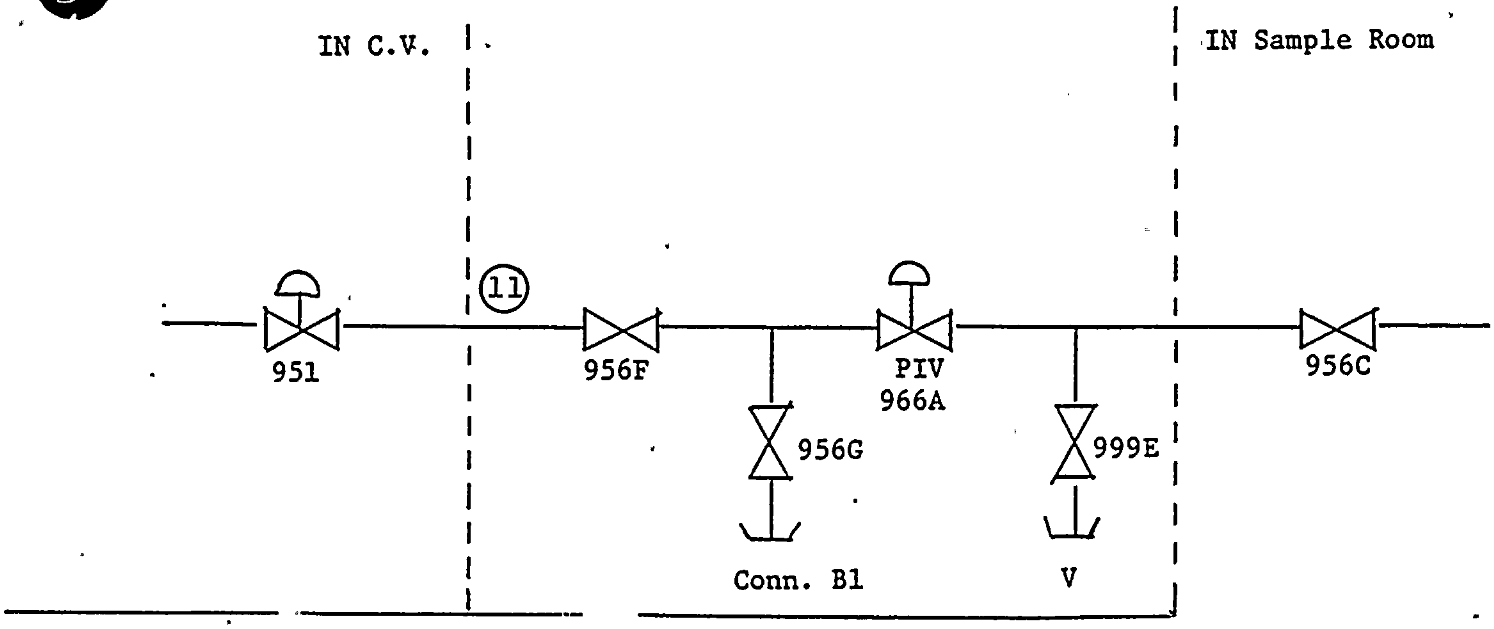
REMARKS:

CALCULATED BY: ________________ DATE: __________

R&T REVIEW: ________________ DATE: __________

PRESSURIZER STEAM SPACE SAMPLE

PENETRATION NO. 207 (TOP)



Rotameter Serial #__________ #__________

	PIV-AOV 966A	SIV-V 956C
Rotameter Flow	______ cc/min.	______ cc/min.
Air Temperature(t)	______ °F	______ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) $x\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage__________cc/min. @ 60 psig & 70°F

Max Leakage 110.89 cc/min. @ 60 psig & 70°F

SIV Leakage__________cc/min. @ 60 psig & 70°F

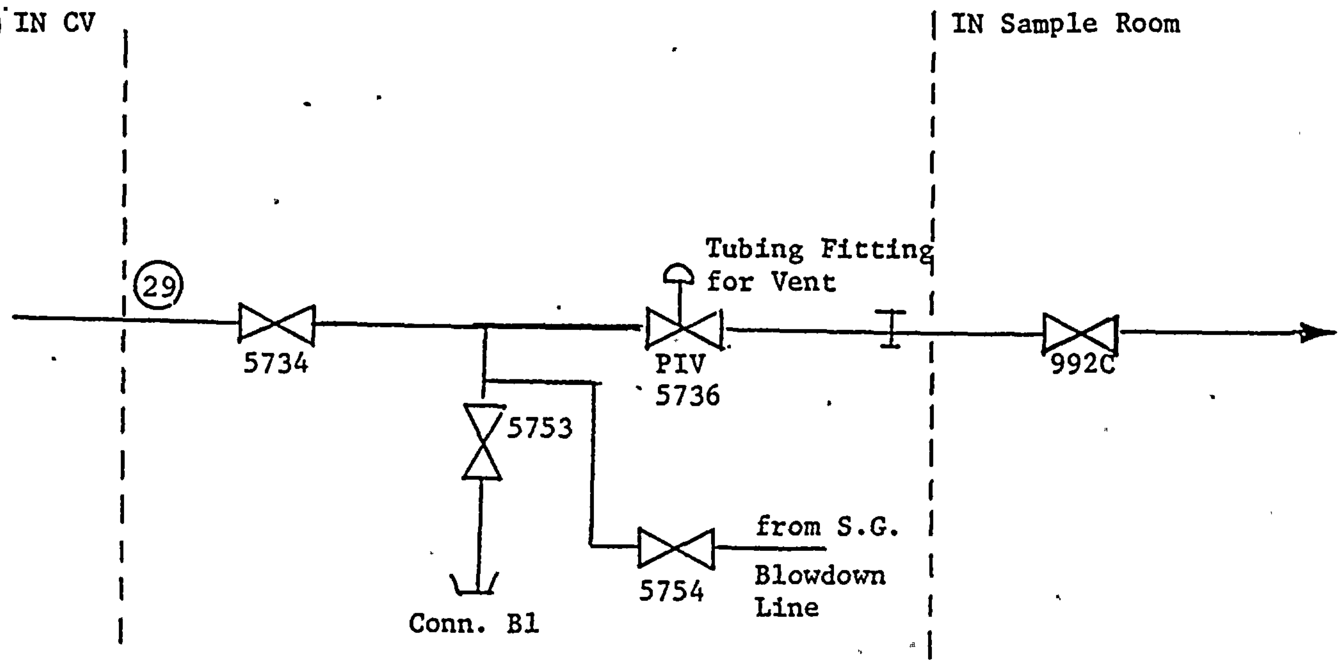
Max Leakage 10.89 cc/min. @ 60 psig & 70°F

CALCULATED BY:__________ DATE:______

R&T REVIEW:__________ DATE:______

"B" STEAM GENERATOR SAMPLE

PENETRATION NO. 207 (Bottom)



Rotameter Serial # ______________________

PIV 5736

Rotameter Flow ________________ cc/min.

Air Temperature (t) ________________ ^{o}F

cc/min. @ 0 psig and 70^{o}F = (Rotameter Flow) x $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70^{o}F = $\frac{\text{(cc/min. @ 0 psig and 70}^{o}\text{F)}}{5.08}$

PIV Leakage ___________ cc/min. @ 60 psig and 70^{o}F

Max Leakage 110.89 cc/min. @ 60 psig & 70^{o}F

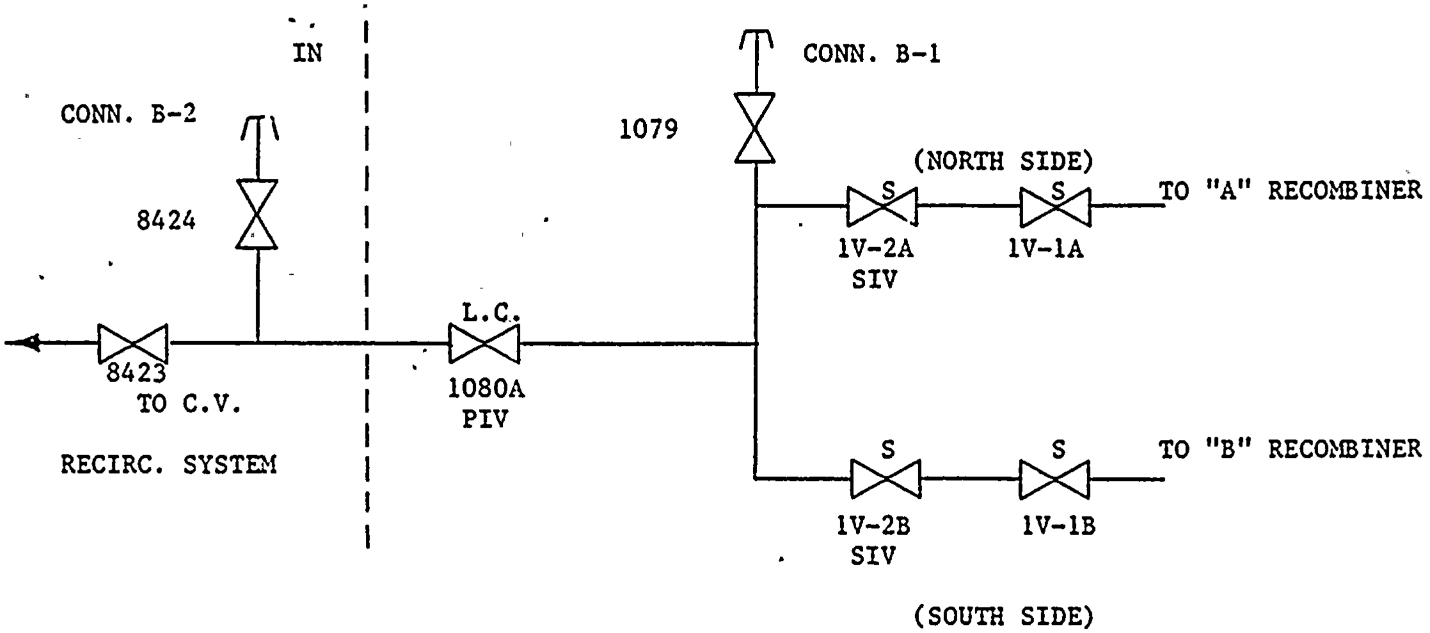
REMARKS:

CALCULATED BY: ____________________ DATE: __________

R&T REVIEW: ____________________ DATE: __________

"A" AND "B" HYDROGEN RECOMBINER OXYGEN MAKEUP

PENETRATION NO. 210



ROTAMETER SERIAL # ______________ # ______________

	PIV 1080A	SIV IV2A, IV2B
ROTAMETER FLOW	______ cc/min	______ cc/min
AIR TEMPERATURE (t)	______ °F	______ °F

$$\text{cc/min @ 0 psig and } 70^\circ\text{F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min @ 60 psig and } 70^\circ\text{F} = \frac{(\text{cc/min @ 0 psig and } 70^\circ\text{F})}{5.08}$$

PIV Leakage __________ cc/min @ 60 psig and 70°F.

Max. Leakage is 58.07 cc/min @ 60 psig and 70°F.

SIV Leakage __________ cc/min @ 60 psig and 70°F.

Max. Leakage is 58.07 cc/min @ 60 psig and 70°F.

SIV Leakage __________ cc/min @ 60 psig and 70°F.

Max. Leakage is 58.07 cc/min @ 60 psig and 70°F.

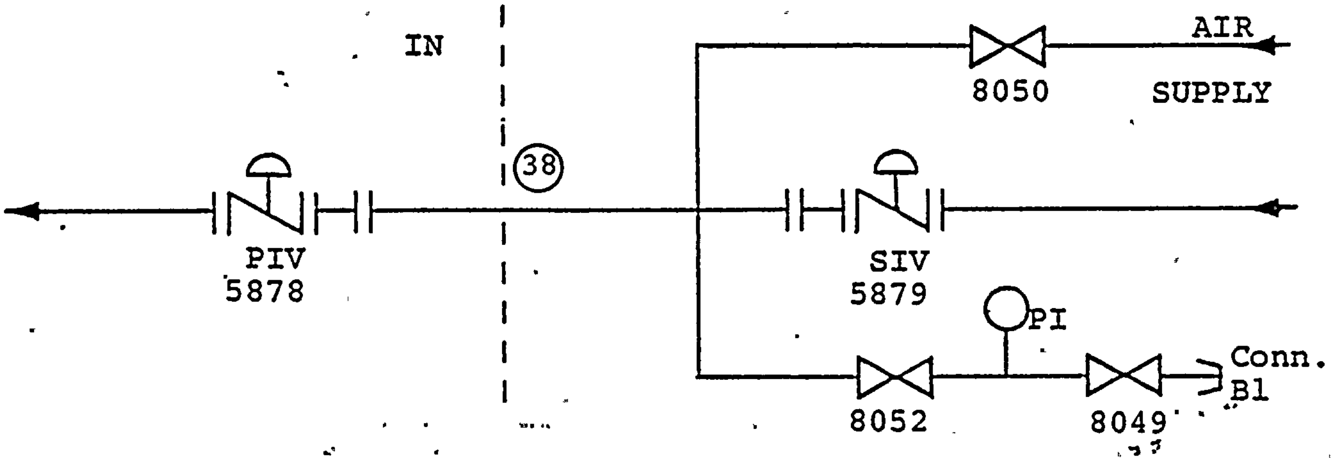
REMARKS:

CALCULATED BY: ______________ DATE: ________

R & T REVIEW: ______________ DATE: ________

PT-23.36 PURGE EXHAUST

PENETRATION NO. 300



P_i = ________psig T_i = ________ °F Time $_i$ = ________ Hr

P_f = ________psig T_f = ________ °F Time $_f$ = ________ Hr

V = 103 ft^3 ΔTime = ________ Hr

ρ_1 = $\dfrac{2.7\ (\underline{\qquad}\ \text{psig} + 14.7\ \text{psia})}{\underline{\qquad}\ {}^{\circ}F + 460}$ = ________ lb/ft^3

W_1 = 103 ft^3 (________ lb/ft^3) = ________ lb

ρ_2 = $\dfrac{2.7\ (\underline{\qquad}\ \text{psig} + 14.7\ \text{psia})}{\underline{\qquad}\ {}^{\circ}F + 460}$ = ________ lb/ft^3

W2 = 103 ft^3 (________ lb/ft^3) = ________ lb

$\dfrac{\Delta W}{t}$ = $\dfrac{(\underline{\qquad}) - (\underline{\qquad})}{(\underline{\qquad}\ \text{Hr})}$ = ________ lb/hr

$\dfrac{cc}{min}$ = $\dfrac{471.6\ (\underline{\qquad}\ lb/hr)}{(\underline{\qquad}\ lb/ft^3)}$ = ________ cc/min leakage

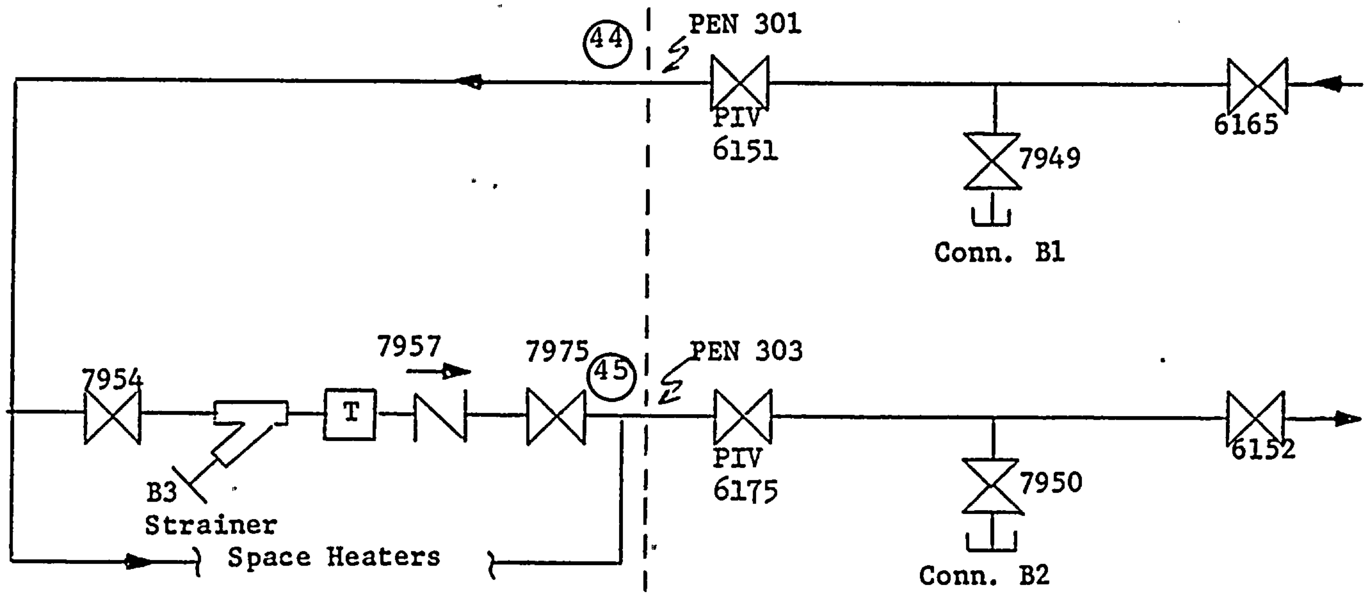
NOTE: Use smallest calculated density (lb/ft^3) in cc/min. calculation.

CALCULATED BY: ____________________ DATE: ____________

REVIEWED BY: ____________________ DATE: ____________

AUXILIARY STEAM SUPPLY AND CONDENSATE RETURN

PENETRATION NO. 301 & 303



TEST #1:

Rotameter Serial # ____________

PIV, MANUAL VALVE 6151

Rotameter Flow ________________ cc/min.
Air Temperature (t) ________________ °F

$$\text{cc/min. @ 60 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ____________ cc/min. @ 60 psig & 70°F
MAX Leakage 58.07 cc/min. @ 60 psig & 70°F

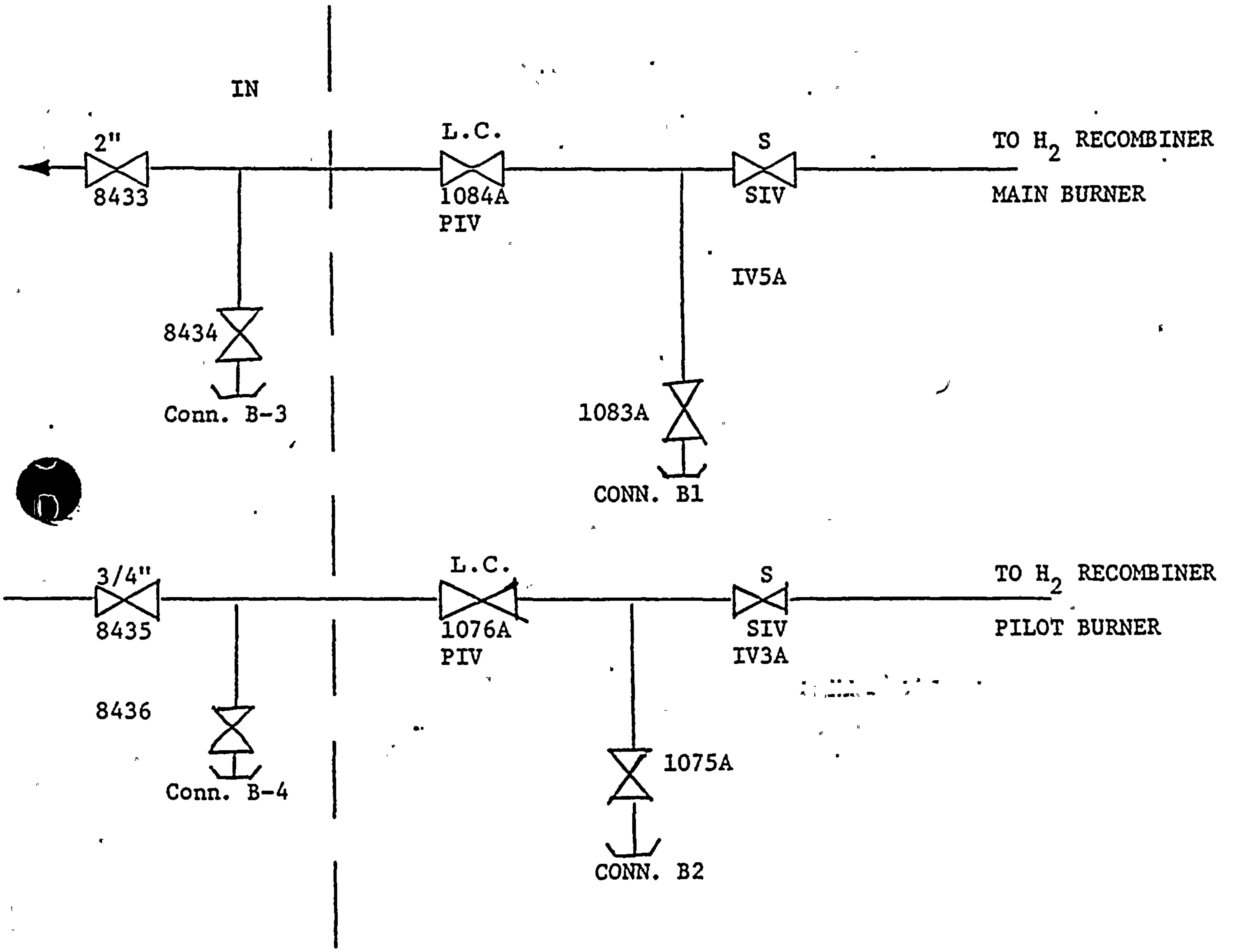
REMARKS:

CALCULATED BY: ____________________ DATE: __________

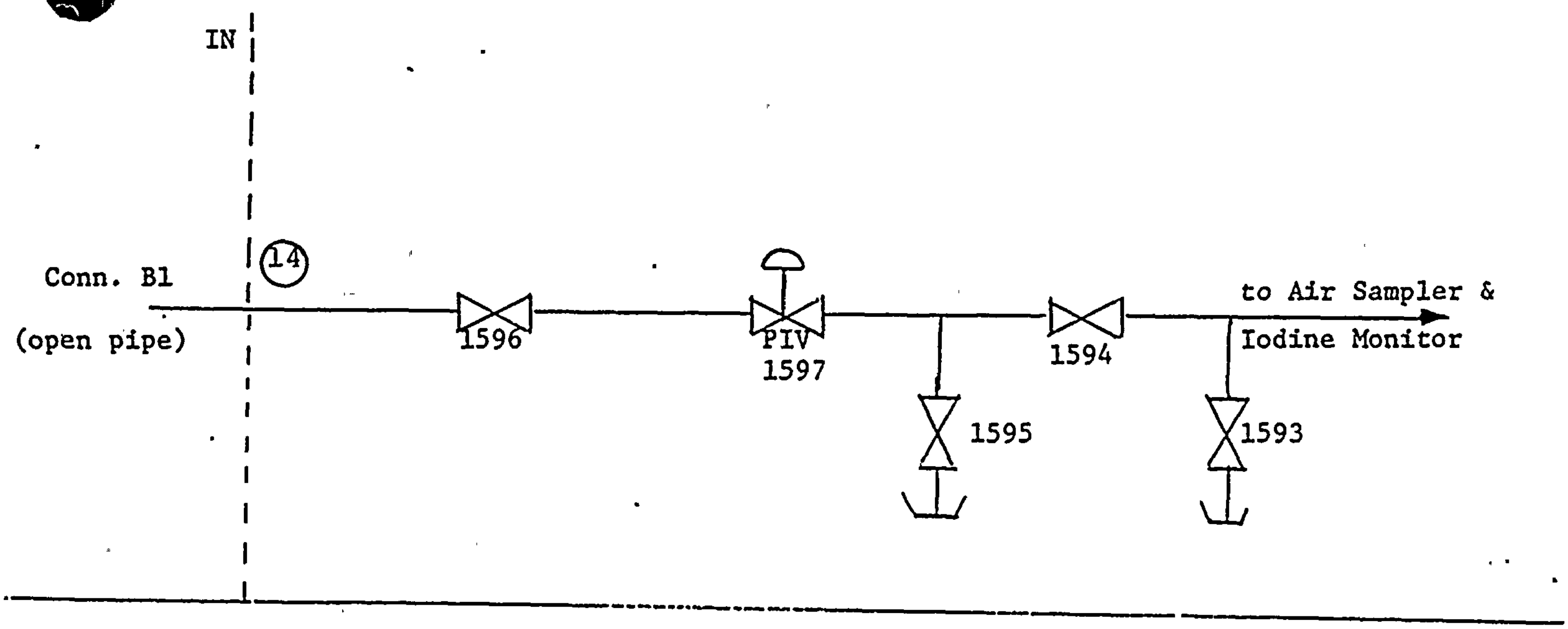
R&T REVIEW: ____________________ DATE: __________

"A" HYDROGEN RECOMBINER (PILOT AND MAIN)

PENETRATION NO. 304



PENETRATION NO. 305 (BOTTOM) CONTAINMENT AIR SAMPLE OUT.



Rotameter Serial # ______________ # ______________

	PIV-AOV 1597	SIV-V 1596
Rotameter Flow	______ cc/min.	______ cc/min.
Air Temperature(t)	______ °F	______ °F

$$\text{cc/min. @ 0 psig and } 70°F = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70°F = \frac{(\text{cc/min. @ 0 psig and } 70°F)}{5.08}$$

PIV Leakage ______________ cc/min. @ 60 psig & 70°F

Max Leakage 29.04 cc/min. @ 60 psig & 70°F

SIV Leakage ______________ cc/min. @ 60 psig & 70°F

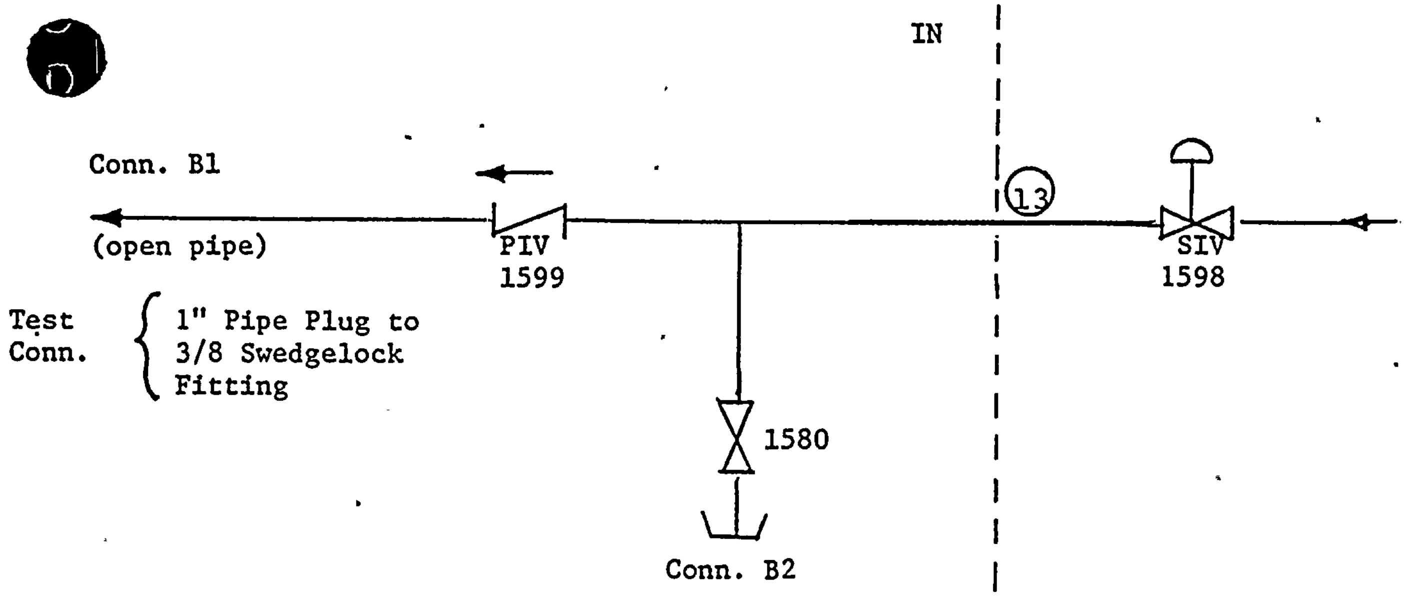
Max Leakage 29.04 cc/min. @ 60 psig & 70°F

CALCULATED BY: ______________ DATE: ______

R&T REVIEW: ______________ DATE: ______

CONTAINMENT AIR SAMPLE INLET

PENETRATION NO. 305 (Top)



Rotameter Serial # ______________________ # ______________________

	PIV 1599	SIV AOV 1598
Rotameter Flow	______________ cc/min.	______________ cc/min
Air Temperature(t)	______________ °F	______________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) x $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ______________ cc/min. @ 60 psig & 70°F

Max Leakage 58.0 cc/min. @ 60 psig & 70°F

SIV Leakage ______________ cc/min. @ 60 psig & 70°F

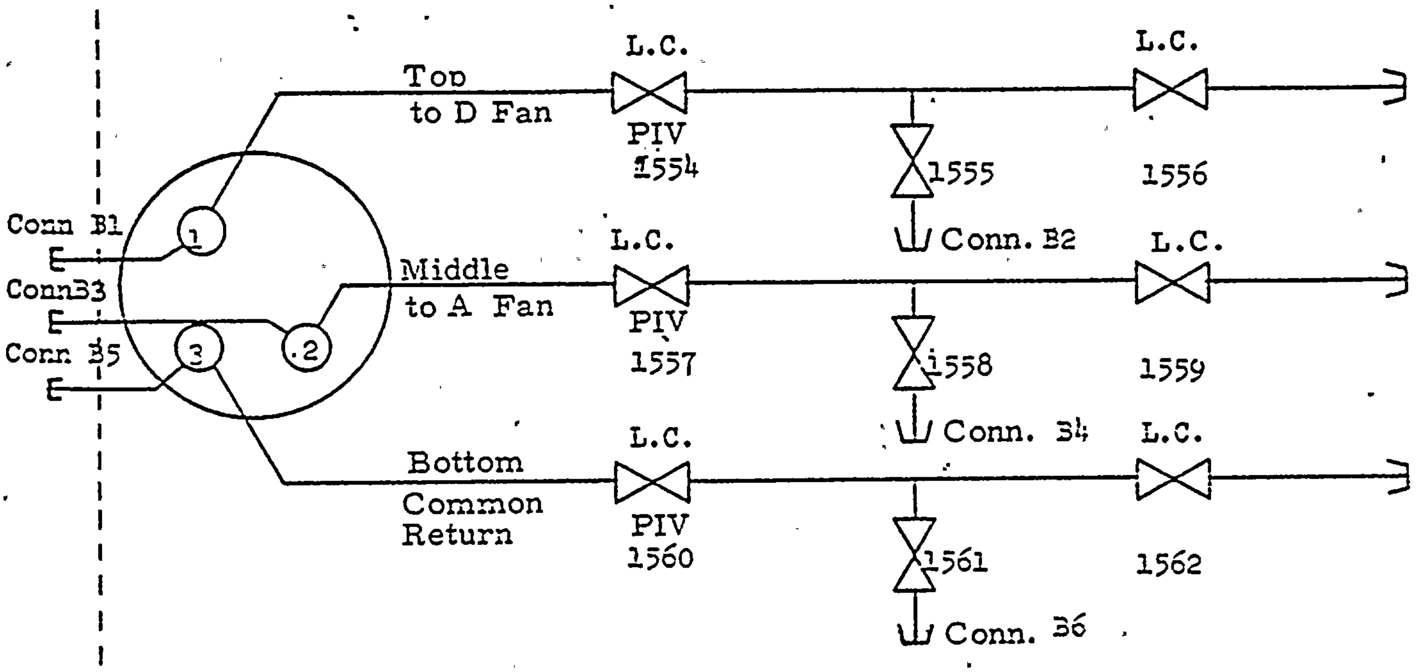
Max Leakage 29.04 cc/min. @ 60 psig & 70°F

CALCULATED BY: ______________ DATE: ________

R&T REVIEW: ______________ DATE: ________

CONTAINMENT POST ACCIDENT AIR SAMPLE (CLEAN INT. BLDG.)

PENETRATION NO. 305



TEST #1 (TOP LINE)

Rotameter Serial # ______________

PIV 1554

Rotameter Flow ______________ cc/min.

Air Temperature (t) ______________ ^{o}F

cc/min. @ 0 psig and $70^{o}F$ = (Rotameter Flow) x $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and $70^{o}F$ = $\frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$

PIV Leakage ______________ cc/min. @ 60 psig and $70^{o}F$

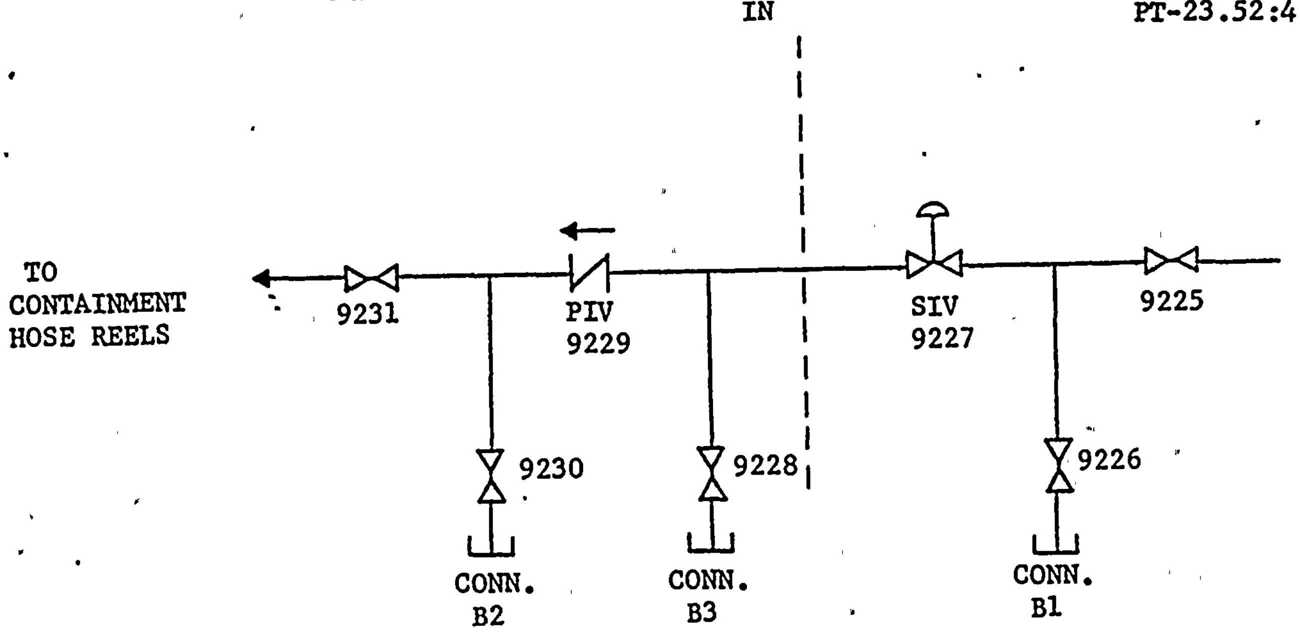
Max. Leakage 29.04 cc/min. @ 60 psig and $70^{o}F$

REMARKS

CALCULATED BY: ______________ DATE: ______________

R&T REVIEW: ______________ DATE: ______________

FIRE SERVICE WATER PENETRATION 307



Rotameter Serial # ______________ # ______________

	PIV-9229	SIV-9227
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature (t)	________ °F	________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) $\times \left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ________ cc/min. @ 60 psig and 70°F.

Max. Leakage 230 cc/min. @ 60 psig and 70°F.

REMARKS:

SIV Leakage ________ cc/min. @ 60 psig and 70°F

Max. Leakage 116.14 cc/min. @ 60 psig and 70°F

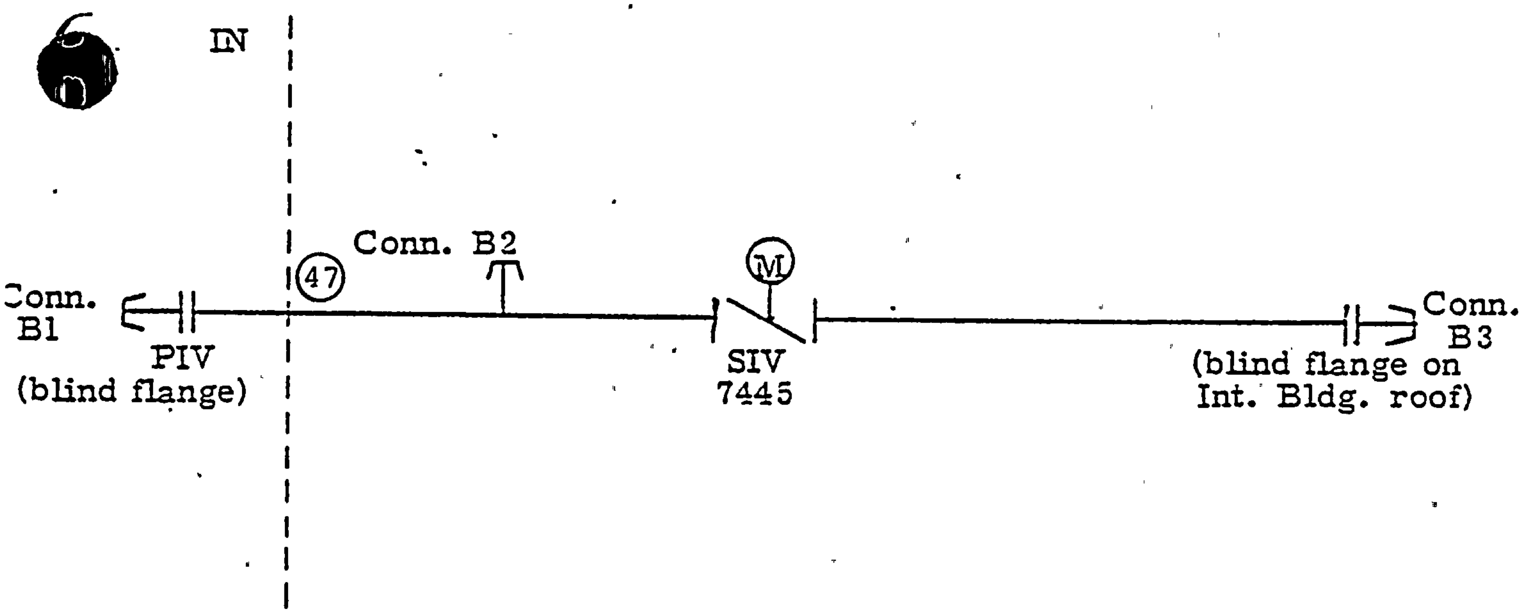
REMARKS:

CALCULATED BY: ______________ DATE: ________

R & T REVIEW: ______________ DATE: ________

PT-23.44 LEAKAGE TEST/DEPRESSURIZATION

PENETRATION NO. 309



Rotameter Serial #____________

	PIV BLIND FLANGE	SIV 7445
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature (t)	________ °F	________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{\frac{1}{2}}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ____________ cc/min. @ 60 psig and 70°F

Max. Leakage 10.00 cc/min @ 60 psig and 70°F

REMARKS:

SIV Leakage ____________ cc/min. @ 60 psig and 70°F

Max. Leakage is 174.21 cc/min. @ 60 psig and 70°F

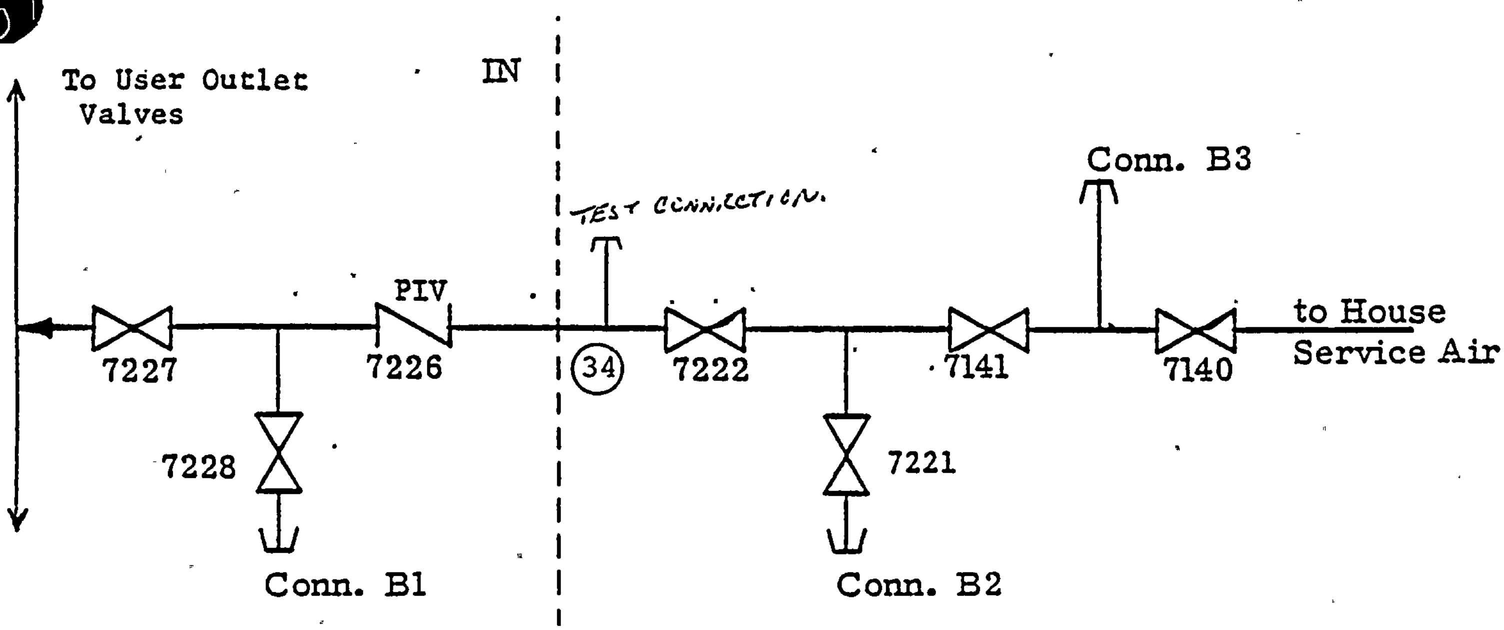
REMARKS:

Calculated by:____________ Date:________

R & T Review:____________ Date:________

PT-23.33 SERVICE AIR

PENETRATION NO. 310 (BOTTOM)



Rotameter Serial # ______________ # ______________

	PIV-V-7226	SIV-V-7141
Rotameter Flow	______ cc/min.	______ cc/min.
Air Temperature (t)	______ °F	______ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F}}{5.08}$$

PIV Leakage ______ cc/min. @ 60 psig and 70°F.

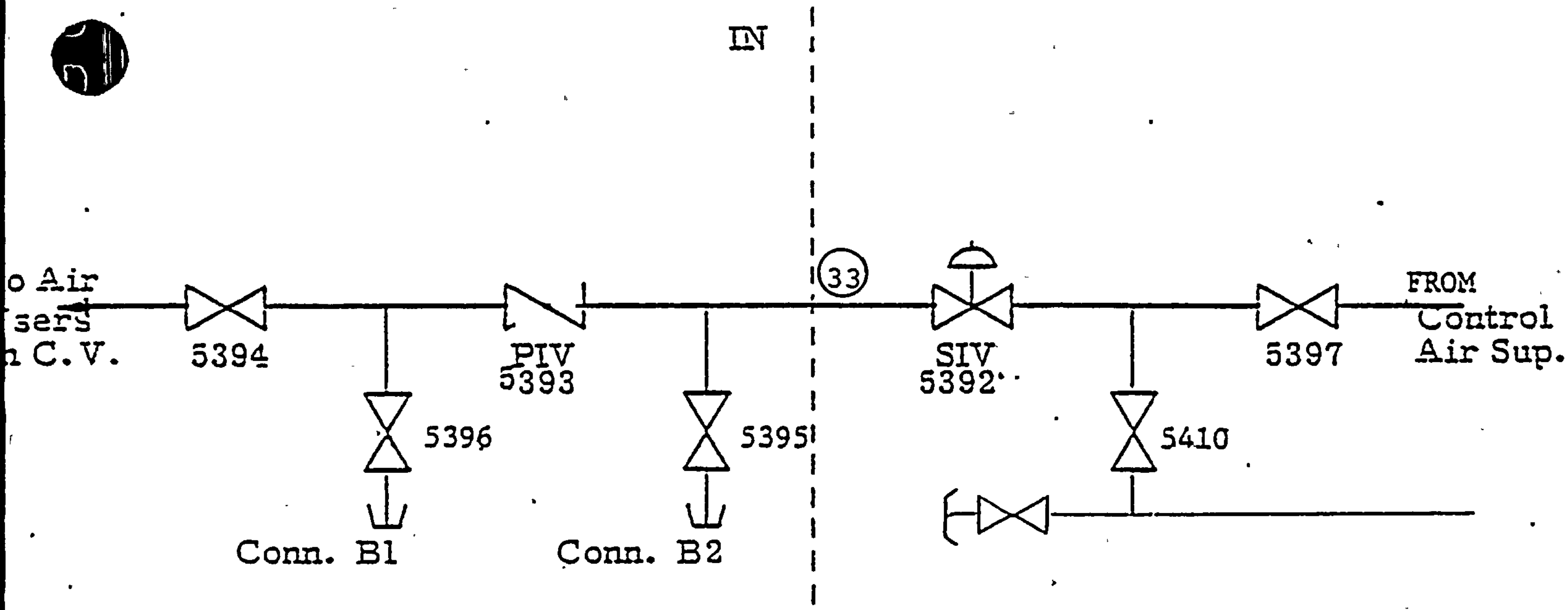
Max. Leakage is 116.0 cc/min. @ 60 psig and 70°F.

SIV Leakage ______ cc/min. @ 60 psig & 70°F.

Max Leakage 58.07 cc/min. @ 60 psig & 70°F.

CALCULATED BY: ______________ DATE: ______

R & T REVIEW: ______________ DATE: ______



Rotameter Serial # ______________ # ______________

	PIV-5393	SIV-5392
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature (t)	________ °F	________ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ________ cc/min. @ 60 psig. and 70°F
MAX Leakage is 116.0 cc/min. @ 60 psig. and 70°F
SIV Leakage ________ cc/min. @ 60 psig. and 70°F
MAX Leakage is 58.07 cc/min. @ 60 psig. and 70°F

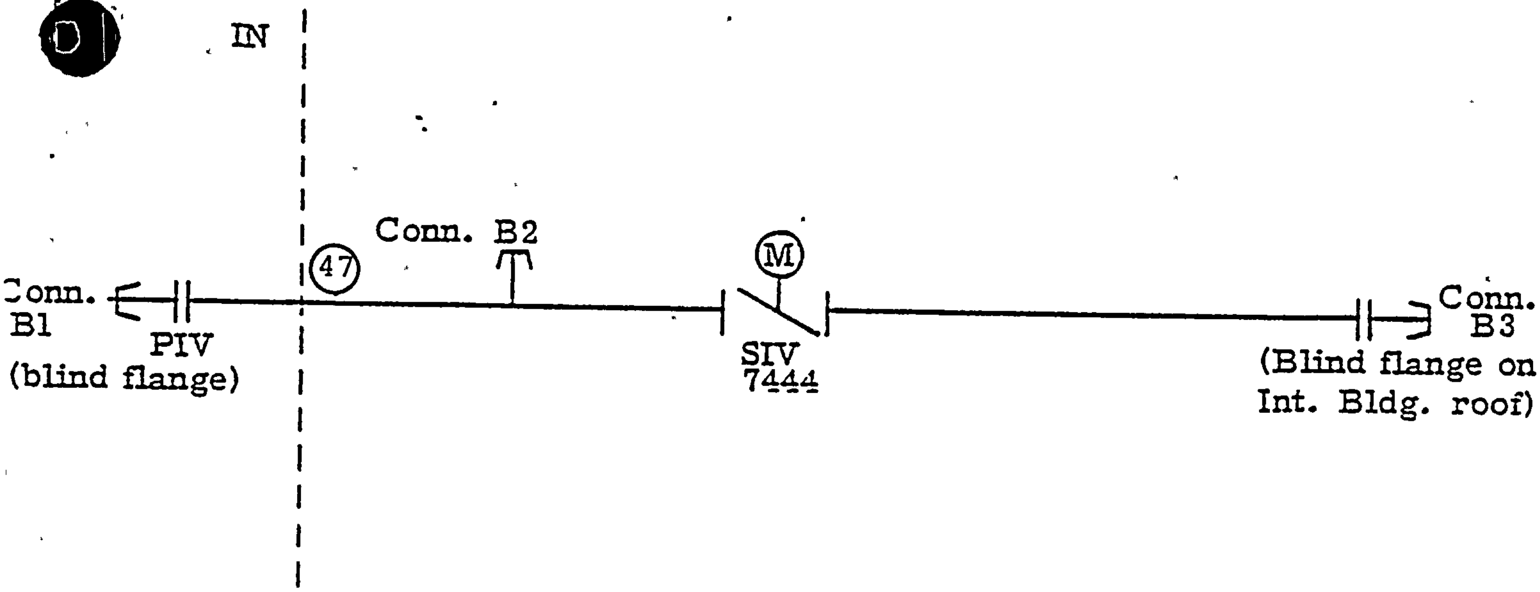
REMARKS:

CALCULATED BY: ______________ DATE: ________

R&T REVIEW: ______________ DATE: ________

LEAKAGE TEST - DEPRESSURIZATION

PENETRATION NO. 313



Rotameter Serial # ____________

	PIV BLIND FLANGE	SIV 7444
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature (t)	________ °F	________ °F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage ________ cc/min. @ 60 psig and 70°F
Max. Leakage 10.00 cc/min. @ 60 psig and 70°F

REMARKS:

SIV Leakge ________ cc/min. @ 60 psig & 70°F
Max. Leakage 174.21 cc/min. @ 60 psig & 70°F

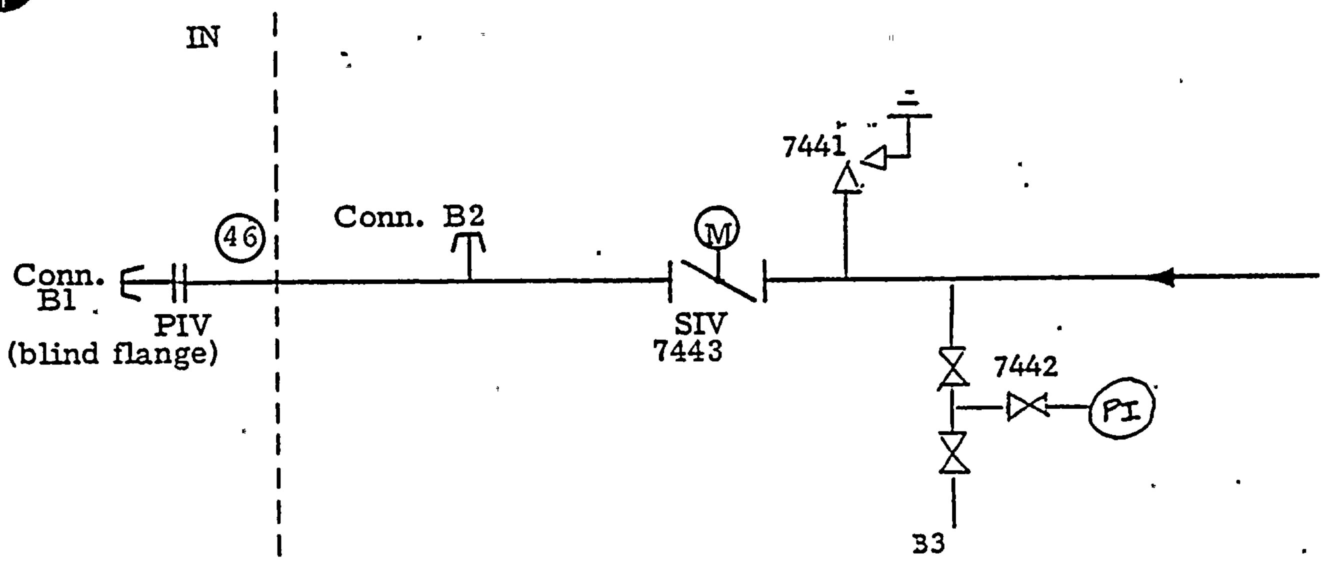
REMARKS:

CALCULATED BY ____________________ DATE __________

R&T REVIEW ____________________ DATE __________

PT-23.43

LEAKAGE TEST - SUPPLY HEADER
PENETRATION NO. 317



Rotameter Serial # ____________

	PIV-BLANK FLANGE	SIV 7443
Rotameter Flow	________ cc/min.	________ cc/min.
Air Temperature (t)	________ °F	________ °F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{\text{(cc/min. @ 0 psig and 70°F)}}{5.08}$

PIV Leakage ________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 10.0 cc/min. @ 60 psig and 70°F.

REMARKS:

SIV Leakage ________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 174.21 cc/min. @ 60 psig and 70°F.

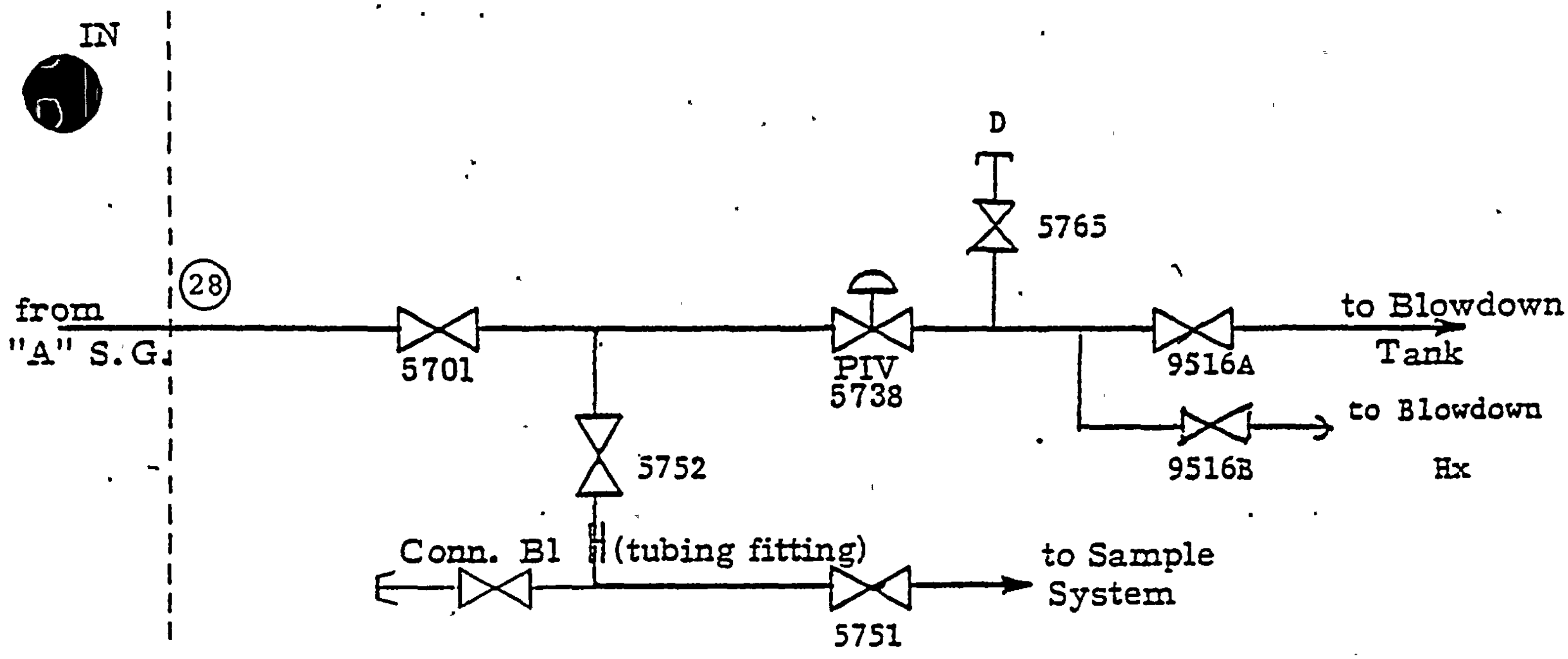
REMARKS:

CALCULATED BY: ________ DATE: ________

R & T REVIEW: ________ DATE: ________

"A" STEAM GENERATOR BLOWDOWN

PENETRATION NO. 321



Rotameter Serial # ____________________

PIV 5738

Rotameter Flow ____________ cc/min.

Air Temperature (t) ____________ ^{o}F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$

PIV Leakage ____________ cc/min. @ 60 psig and 70°F

Max. Leakage 408.07 cc/min. @ 60 psig and 70°F

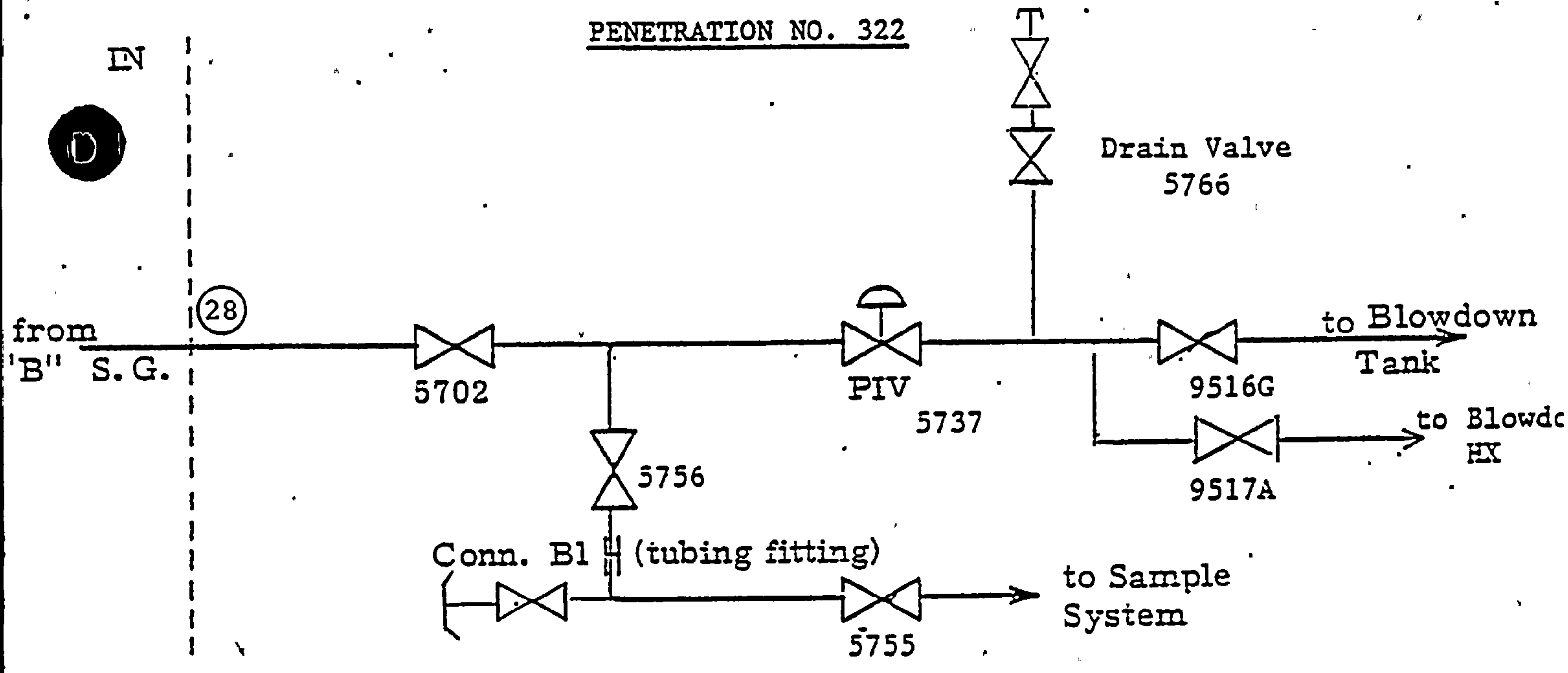
REMARKS:

CALCULATED BY: ________________ DATE: ____________

R&T REVIEW: ________________ DATE: ____________

"B" STEAM GENERATOR BLOWDOWN

PENETRATION NO. 322



Rotameter Serial # ____________________

	PIV 5737	
Rotameter Flow	__________	cc/min.
Air Temperature (t)	__________	°F

cc/min. @ 0 psig and 70°F = (Rotameter Flow) X $\left(\frac{530}{460 + t}\right)^{1/2}$

cc/min. @ 60 psig and 70°F = $\frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$

PIV Leakage ____________ cc/min. @ 60 psig and 70°F

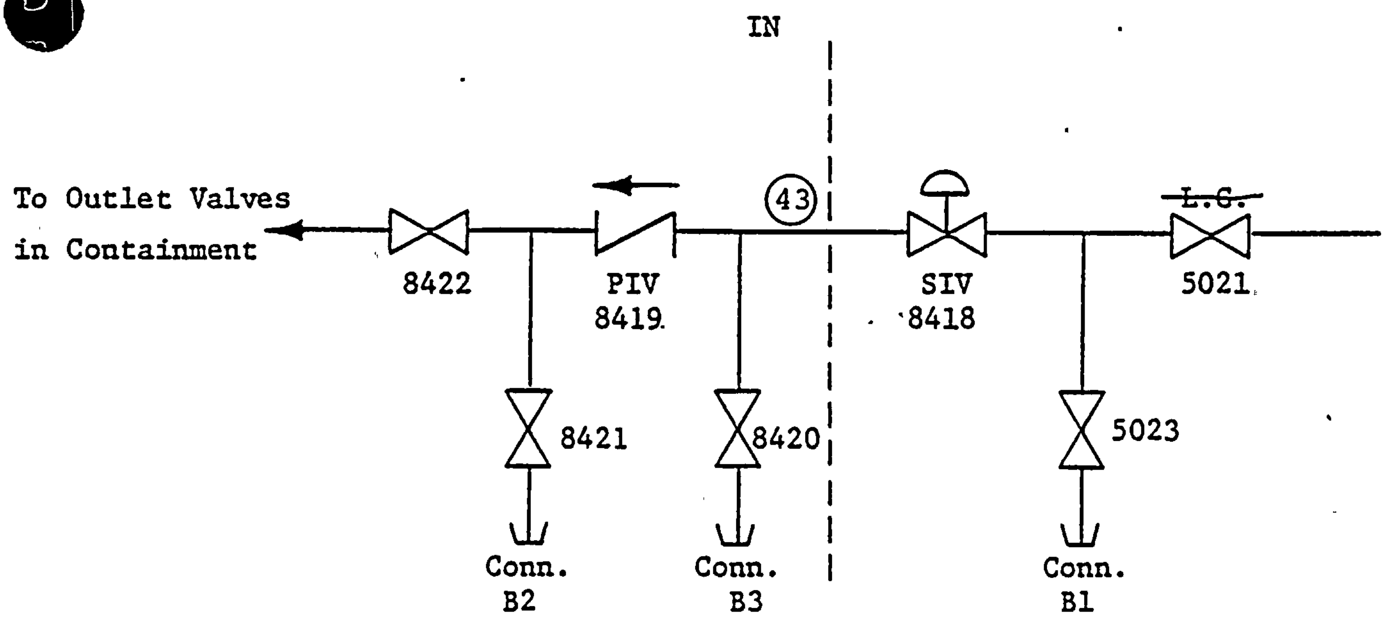
Max. Leakage is 408.07 cc/min. @ 60 psig and 70°F

REMARKS:

CALCULATED BY: ____________________ DATE ____________

R&T REVIEW: ____________________ DATE ____________

DEMINERALIZED WATER PENETRATION NO. 324



	PIV-8419		SIV-8418	
Rotameter Serial #	____________		# ____________	
Rotameter Flow	____________	cc/min.	____________	cc/min.
Air Temperature (t)	____________	°F	____________	°F

$$\text{cc/min. @ 0 psig and } 70^{o}\text{F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^{o}\text{F} = \frac{(\text{cc/min. @ 0 psig and } 70^{o}\text{F})}{5.08}$$

PIV Leakage ____________ cc/min. @ 60 psig and 70°F.

Max. Leakage 116.00 cc/min. @ 60 psig and 70°F.

REMARKS:

SIV Leakage ____________ cc/min. @ 60 psig and 70°F.

Max. Leakage is 58.07 cc/min. @ 60 psig and 70°F.

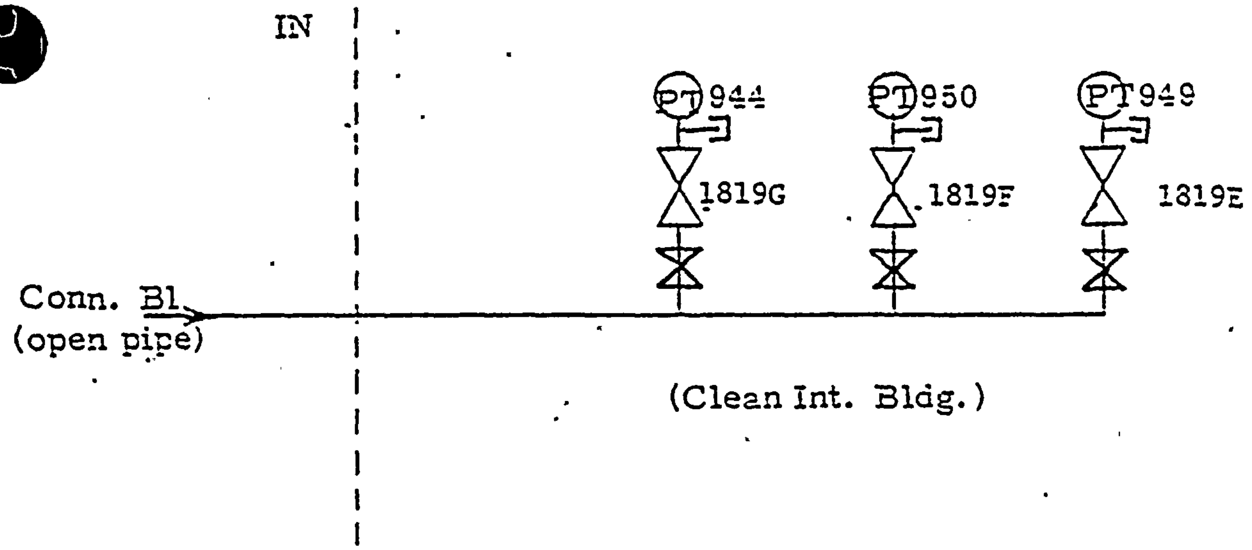
REMARKS:

CALCULATED BY: ____________ DATE: ________

R & T REVIEW: ____________ DATE: ________

CONTAINMENT PRESSURE SENSING TRANSMITTERS PT-949 & PT-950 PT-23.17C:4

PENETRATION NO. 332



Rotameter Serial #____________________

PRIMARY

Rotameter Flow____________cc/min.

Air Temperature(t)_________________°F

$$\text{cc/min. @ 0 psig and 70°F} = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and 70°F} = \frac{(\text{cc/min. @ 0 psig and 70°F})}{5.08}$$

PIV Leakage________________cc/min. @ 60 psig & 70°F

Max Leakage 10.89 cc/min. @ 60 psig & 70°F

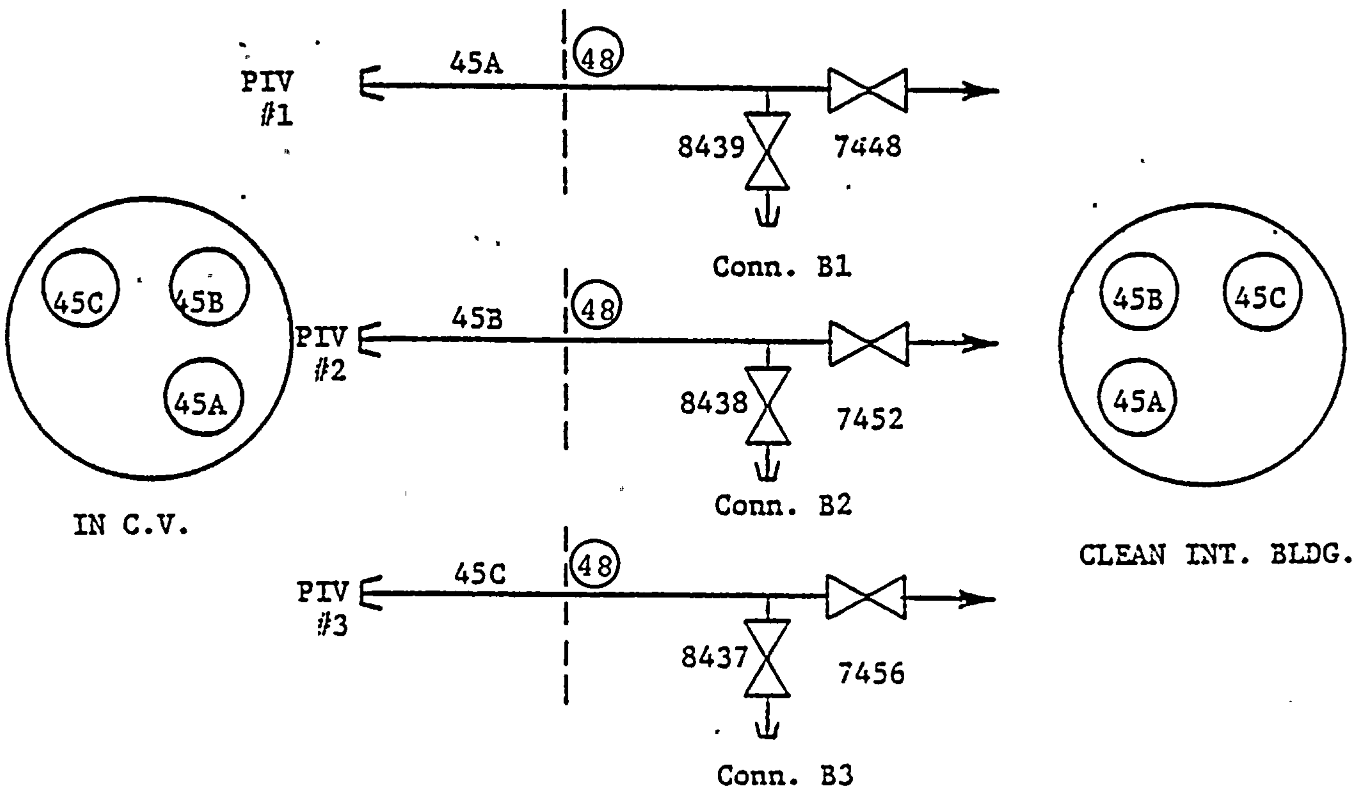
REMARKS:

CALCULATED BY:____________________ DATE:__________

R&T REVIEW:______________________ DATE:__________

PT-23.45 LEAKAGE TEST/INSTRUMENTATION

PENETRATION NO. 332



TEST #45A

Rotameter Serial # ______________________

PIV #1

Rotameter Flow ______________ cc/min.

Air Temperature ______________ ^{o}F

$$\text{cc/min. @ 0 psig and } 70^{o}F = (\text{Rotameter Flow}) \times \left(\frac{530}{460 + t}\right)^{1/2}$$

$$\text{cc/min. @ 60 psig and } 70^{o}F = \frac{(\text{cc/min. @ 0 psig and } 70^{o}F)}{5.08}$$

PIV Leakage ______________ cc/min. @ 60 psig. and $70^{o}F$

Max. Leakage 10.89 cc/min. @ 60 psig. and $70^{o}F$

REMARKS: