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

JUN 27 1989

MEMORANDUM FOR: Ashok C. Thadani, Assistant Director for Systems
Division of Engineering & Systems Technology

FROM: M. W. Hodges, Chief
Reactor Systems Branch
Division of Engineering & Systems Technology

SUBJECT: ACTIVITIES FOR THE WEEK OF 6/27/89 - 7/3/89

A. Potential EDO Items/SRXB Highlights

At the Seabrook Station on June 22, 1989
While operators were attempting to establish natural circulation, a transient occurred due to a steam dump failing open. A manual scram was initiated. Reactor power was about 3% at the time. An AIT is being dispatched and will include L. Lois as a participant.

8908100098 XA

H/13

New Hampshire
Yankee

MEMORANDUM SSP# 890965

Subject BASIS FOR THE MINIMUM PRESSURIZER LEVEL TRIP CRITERIA FOR THE NATURAL CIRCULATION TEST 1-ST-22

From R. A. Gwinn

Date June 29, 1989

To P. V. Gurney

Reference Westinghouse Precautions, Limitations, and Setpoints (PLS)

The following is a response to the question regarding why the Natural Circulation Test, 1-ST-22, required a manual trip at a pressurizer level below 17%.

The manual reactor trip requirement on pressurizer level of 17% is based upon the ability to operate plant in a condition where reactor coolant system pressure is capable of being maintained, and without violating plant technical specifications (3.4.9.2 item c).

At a pressurizer level of 17% and decreasing, the reactor coolant system flow to the chemical volume control system is isolated and the pressurizer heater groups are automatically deenergized. This is a normal system control function as defined in the above Reference. Once reactor coolant system letdown flow is isolated and pressurizer heaters are deenergized, the ability to use auxiliary spray to reduce pressurizer is greatly minimized since the charging flow to the reactor coolant system is no longer heated though the regenerative heat exchanger. Without this charging flow preheating via the regenerative heat exchanger the differential temperature between the pressurizer spray nozzle and the fluid can be exceeded if auxiliary spray flow is used. Without the use of auxiliary spray and backup heaters pressurizer pressure is not controllable and further test performance cannot be expected to continue. Since it is not the intent to perform startup tests that would violate technical specifications or plant design parameters the manual trip criteria of 17% pressurizer as well as the other trip criteria were established to be utilized as anticipatory reactor trip requirements to stop the test should specified plant conditions be exceeded.

Robert A. Gwinn

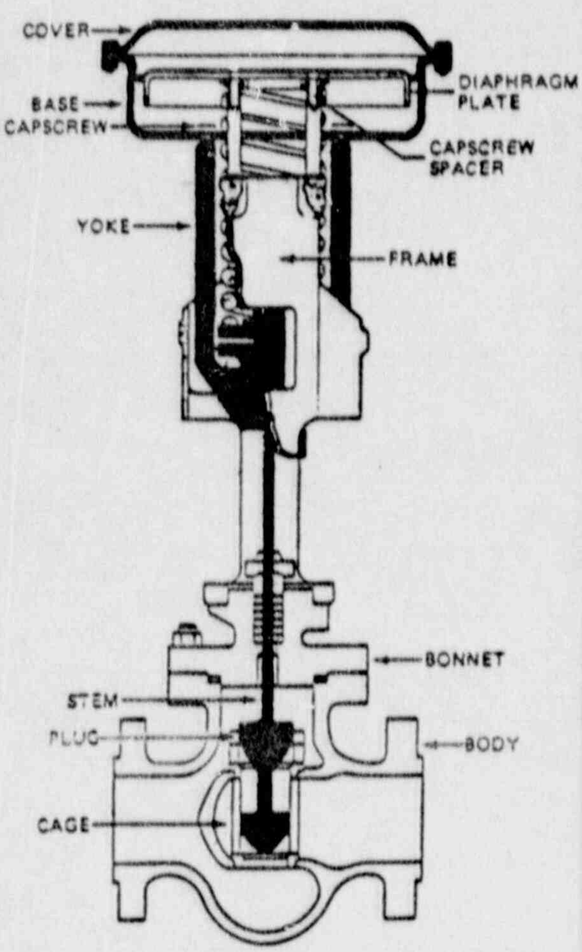
R. A. Gwinn

cc: D. E. Moody
J. M. Grillo
G. J. Kline
G. A. Kann
L. W. Rau
W. J. Temple

H/14

Condenser Steam Dump Valve Evaluation

VALVE FULL OPEN



REVERSE ACTING

Prepared By System Support

H/15

CONDENSER STEAM DUMP VALVE EVALUATION

Prepared by Richard L. Bibber
R. Bibber, System Engineer
6/30/89
Date

C. P. McCafferty
C. P. McCafferty, I&C System Engineer
6/30/89
Date

Reviewed by Jon E Cade
J. Cade, Lead BOP Engineer
6/30/89
Date

A. Kodal, System Engineer
6/30/89
Date

Approved by M E Kenney
M. E. Kenney, System Support Manager
6/30/89
Date

CONDENSER STEAM DUMP VALVE EVALUTAION

CONTENTS

1.0

SUMMARY

The twelve condenser steam dump valves are pilot operated, air to open, Copes Vulcan Valves. (See Photograph No. 1.)

The first cool down bank consists of three valves, MS-V3011, V3015 and V3019.

At the beginning of preparation for the natural circulation test, MS-V3011 was known to be non-operational, because WR87W005592 was still open for stroke test at NOP/NOT.

MS-V3015 was known to be non-operational, because it was isolated, due to air leaks.

However, MS-V3011 was used, and it failed to operate correctly. The reason MS-V3011 failed to operate correctly was due to mechanical binding within the valve body. (See Photographs No. 2, 3, 4 and 5.)

MS-V3015, although it was isolated due to air leakage, also had mechanical binding and could not be stroked.

The reason for the mechanical binding in Valves MS-V3011 and MS-V3015 is that the valve actuators were misaligned with the valve stems.

MS-V3019: This valve, at the present time, can be stroked with minimum binding, but as it is used, the binding can be expected to increase until it is solid.

Therefore, two of the three valves in the cooldown bank are non-operational, due to binding, and the third valve has the initial signs of binding.

The remaining valves have been evaluated. All the actuators have to be disconnected from the valves and checked for alignment, and the valves have to be checked for binding. (See Section 5.0.)

The 'A' train, 'B' train and dual train logic checks show that the valves will perform their design functions, once the valve and actuator problems have been resolved. (See Section 6.0.)

Maintenance work on these valves consists of an I&C RTS to check the calibration and positioner every two years. We feel that the maintenance on these valves is adequate, and although not specifically instructed on the RTS, the I&C technicians do, in fact, check the valve positioner, linkage and look at the packing, etc. as 'skills of the worker', and, therefore, no changes in maintenance practices are required. However, as this is a two year RTS, it must be performed when due and not delayed.

As stated earlier, the condenser steam dump valves are pilot operated valves. This is not the first pilot operated valve which has experienced stroke problems. We, therefore, feel that other secondary valves should be observed. System Support memo SS49036, dated June 27, 1989 (Attachment C), outlines this work. The valves listed are not necessarily Copes Vulcan valves, but valves that have 'A' train, 'B' train and dual train operation; the major secondary plant valves.

Throughout this evaluation, which was started on Thursday, June 22nd at 1300 hours, to Friday, June 30th 1989, various steam dump valves have been stroked. It has become apparent that the more you stroke the valves with the actuator misalignment, the worse the valve movement becomes (i.e., binding of the valves gets worse with stroking the valve).

2.0

RECOMMENDATIONS

1. All twelve condenser steam dump valve actuators should be removed and checked for smooth operation. Replace all actuators which cannot be made to stroke correctly.

2. Disassemble all twelve valves and check for signs of binding. Particular attention must be paid to plug rings, and valve stem interference within the packing gland follower.

3. On reassembly, perform static stroking of the valve to ensure correct operation.

4. Before entering Mode 2, all valves should be dynamically stroked at NOP/NOT several times and the results evaluated.

5. Incorporate a design modification to ensure a positive locking arrangement for the positioner feedback linkage, thereby having positive locking.

6. Complete and evaluate results of System Support Memo SS 49036; other secondary plant valves to be evaluated.

3.0

DESCRIPTION OF VALVE AND ACTUATOR

The steam dump system is comprised of twelve power operated steam dump valves which are arranged in four operating banks with three valves per bank. The system is capable of passing forty percent of the full steam load into the condensers. The steam dumps are six inch, air actuated plug valves that fail closed on loss of air or electrical signal. Each steam dump valve's normal full-open flow is 510,000 lbs/hr at a steam header pressure of 1,100 psia.

The valve assembly consists of the valve body with its internals, a reverse-acting diaphragm operator, a direct acting positioner and a hand wheel operator.

The valve's main body houses the tandem plug arrangement (Figure 1), the balancing chamber and the valve seat. The valve bonnet is bolted to the valve body to provide a pressure boundary. The upper frame is mounted to the valve bonnet and has a valve position indicator mounted on it. The valve actuator is mounted partially to the frame and partially to the valve yoke.

The valve operator (Figure 2) uses a diaphragm plate, yoke, cover and spring to position the steam dump valve. The diaphragm plate is connected by long cap screws and spacers to the frame, which is fixed to the bonnet, and is, thus, stationary. The operator base and cover are assembled to the yoke, which, in turn, is assembled to the valve stem and plug. The upper seating surface of the compression spring is fixed against the diaphragm plate and the lower seating surface of the spring rests on the adjusting screw and nut. Thus the spring, through the adjusting screw and nut, is supported at the lower seat by the yoke, so that the compressed force of the spring is placed against the diaphragm plate (which is stationary) and against the yoke, stem and plug assembly to force the plug toward the closed position.

The valve assemblies are also provided with direct acting positioners. The direct acting positioner is a two-stage amplification, 'push-pull' action, force-balance type control instrument located in the control loop between the controller and the valve actuator. A change in the pneumatic controller signal results in an output pressure change from the positioner. This change is directed to the diaphragm chamber of the valve actuator causing the valve to be repositioned. As the valve is repositioned, a linkage attached from the valve yoke to the positioner causes a feedback force to be exerted on the positioner bellows resulting in a counterbalance of the pneumatic controller signal. The circuit is designed to result in a continued loading change on the valve's diaphragm by the positioner until the valve has actually repositioned itself and has rebalanced the initial pneumatic signal change. This arrangement provides fast, accurate, positive positioning of the valve.

The tandem plug design allows for a positive force to ensure tight seating when the valve is closed. The tandem plug is located inside the balancing chamber, which also guides the valve plug throughout its complete stroke. The inner plug is an integral part of the valve stem. Steam header pressure is equalized across the balancing chamber via the leakage past the plug rings. This pressurizes the area above the plug ensuring a positive seating force on top of the valve's main plug.

During operation, the valve stem moves upward, unseating the inner plug and opening a bleed port between the valve's outlet chamber and the pressurized area above the plug. That bleed port is larger than the leakage area around the plug rings. Because of the small area of the inner plug that is exposed to steam header pressure, the inner plug is easily opened. With the larger port open to the valve's outlet, the upper chamber pressure bleeds to the outlet port through holes drilled in the plug bushing. That equalizes the pressure across the main plug, removing the positive seating pressure. Further movement of the valve stem causes the stem shoulder to stroke the main plug and unseat it from its seating surface.

An inherent design feature holds the main plug rigid against the valve stem shoulder. The area above the main plug in the balancing chamber is slightly smaller than the seat bore area created when the valve is opened. That creates a difference in pressure that maintains the main plug and inner plug in their proper positions during operation.

When the valve is closing, the main plug is seated first. Further stem movement lowers the inner plug to its seat on the main plug. When the inner plug is in that position, inlet pressure builds up again on top of the tandem plug to ensure tight seating.

The steam dump valves are also provided with manual operators. The hand wheel attached to the top of the actuator is used to position the steam dump valves when air or electrical power is not available. The valve hand wheel is attached to the valve cover, and its stem contacts the steam dump valve actuating mechanism. Operating the hand wheel forces the manual actuator stem to act on the valve diaphragm plate. This creates a counter-force on the valve cover which is transmitted to the valve stem. That force overcomes spring tension and opens the steam dump valve.

The steam dump valves and their controls are designed to meet three requirements.

- The valve shall go from full closed to full open within three seconds from receipt of trip open signal (including response of solenoid valves).
- The valve shall go from full open to full closed within five seconds after deenergization of solenoid valve.
- The valve shall be capable of being modulated with a maximum full stroke time of ten seconds or less to open and twelve seconds or less to close.

Steam Dump Valve Data:

Manufacturer	:	Copes Vulcan
Model	:	D100
Quantity	:	12
Size	:	6"
Capacity	:	510,000 lb/hr
Actuator	:	160
Material	:	ASTM A216, Gr. WCB Body
Positioner	:	Bailey AP2 Positioner

4.0

MS-V3011 : WHY IT MALFUNCTIONED

On Thursday, 22 June 1989, at approximately 1313 hours, a Priority One work request was issued from the control room. The work request number was 89W003110, and it instructed I&C to troubleshoot Condenser Steam Dump Valve MS-V-3011.

Working with the control room, the valve was stroked with an I&C technician at the valve. The valve failed to move, and it was noticed that the booster relay, 1-MS-PY3011-1, was bleeding air at a high rate. The booster relay was changed out, but this did not solve the problem. The valve positioner was then checked for proper calibration, and it was found that the valve positioner feedback linkage was disconnected.

The reason for the linkage being disconnected is that the screw holding the linkage to the positioner feedback arm was not long enough, and the nut, which was only engaged by approximately two threads, had fallen off. (See Photograph 6).

After the positioner feedback linkage was connected, calibration of the positioner was performed. On the first attempt, the valve would not open more than 50% of stroke; air was slowly bled off the actuator, and the valve moved to 20% open in an erratic manner. When all the air was bled off the actuator, the valve slammed closed by the spring force, breaking the hand wheel.

It is concluded that the effect of the positicner linkage being disconnected is secondary, and the primary reason the valve did not operate correctly was due to mechanical binding within the valve.

Further evaluation has shown that the valve actuator is tilting at the top and bottom of its stroke. This tilting motion will not allow the valve stem to move up and down smoothly. The valve stem and plug have some very tight tolerances, and this misalignment caused galling between the valve stem and the guide bushing, which, with successive stroking of the valve, worsened and ultimately lead to total siezure between the stem and the guide bushing. (See Photographs 2 through 5.)

5.0

BALANCE OF CONDENSER STEAM DUMP VALVES

On June 26, 1989, a work request, 89W003173, was initiated to examine the Unit 1 steam dump valve. The scope of the work was as follows; the valves were to be stroked; run out of stem; positioner linkage and smoothness of operation was to be checked on each valve.

Results of the work request are as follows.

1-MS-PV-3009	-	no problems found;
1-MS-PV-3010	-	no problems found;
1-MS-PV-3011	-	this valve was not stroked, due to damage already found;
1-MS-PV-3012	-	the stem was lightly scored; positioner linkage is tight and the valve operates smoothly;
1-MS-PV-3013	-	no problems found;
1-MS-PV-3014	-	the positioner arm and linkage was found to be loose; stem lightly dragged on the gland follower; the valve stroked smoothly;
1-MS-PV-3015	-	the positioner linkage was found to be loose; the valve binds and will not fully close or open;
1-MS-PV-3016	-	the stem was lightly scored; the valve strokes smoothly and the linkage is tight;
1-MS-PV-3017	-	no problems found;
1-MS-PV-3018	-	no problems found;
1-MS-PV-3019	-	the positioner linkage was found to be loose; the stem was found to be slightly scored; the valve stroked, but a slight indication of binding was noted;

1-MS-PV-3020 - the valve linkage was found to be tight, but the valve was hunting at 3 psig and would not close until the signal was <2 psig.

All valves were checked with a straight edge for stem run out and no visable run out was seen.

This initial examination will be followed by a more detailed follow-up examination conducted by the system engineer and a representative of Copes Vulcan, the valve manufacturer.

In an effort to establish the operating history of the Copes Vulcan, Model D-100-160, valves, a search has been made of the Nuclear Operations and Maintenance Information Service (NOMIS). The data base indicates several plants have had both good and poor results, and that several plants have made modifications to ensure proper valve response. A new query has been made of NOMIS, and the plants that respond with positive feedback will be contacted. This experience will be factored into our evaluation. The expected completion date is 07/21/89.

6.0

'A' TRAIN, 'B' TRAIN AND DUAL TRAIN LOGIC CHECKS

Steam Dump Valves 1-MS-PV-3009 through 1-MS-PV-3020

Control Logic Verification Review

A review of the main steam dump control logic verification testing was performed. Two procedures, 1-PT(I)-40.7, Condenser Steam Dump System Preoperational Test Procedure, and 1-ST-55, Steam Dump System Test, were reviewed.

1-PT(I)-40.7 was started on 11/19/85 and completed on 11/20/85. This test procedure thoroughly tested and verified, at normal operating pressure and temperature, the steam dump control logic including all steam dump valves modulation and bank sequencing in response to 0-100% steam dump demand in load rejection control and plant trip control, as well as steam pressure in manual and auto control. This procedure also verified the steam dump blocking and interlock functions involving Train A and Train B input signals. Finally, the procedure stroked each valve individually; measuring the modulating open and close times, as well as the trip open and close times. A breakdown of the procedure sections is as follows.

Section 6.1

This section verified all the steam dump valve's modulation from full open to full closed, and back to full open, with the mode selector switch, CS-3056, in the 'STEAM PRESSURE' position and the M/A controller, PK-507, in 'AUTO', while varying the steam pressure (PT0507) test signal. This also verified that each bank of three valves modulated open and closed in the proper sequence.

Next, a Train 'A' Lo-Lo T_{avg} signal was simulated by jumpering SSPS Slave Relay K638A normally open Contacts 1 and 2, and verified that all steam dump valves were blocked. The interlock selector switch, CS-3057A, was then placed in the 'BYPASS INTERLOCK' position, and it was verified that the Bank 1 cool down valves (PV-3011, PV-3015 and PV-3019) only, could be modulated.

Next, a Train 'B' Lo-Lo T_{avg} signal was simulated by jumpering SSPS Slave Relay K638B normally open Contacts 1 and 2, and the same sequence as above was verified, using CS-3057B.

Section 6.2

This section verified load rejection control. T_{avg} and T_{ref} signals were simulated, and with the mode selector switch in the 'T_{avg}' position, each signal was varied to simulate a 50% load reduction. It was verified that all steam dump valves modulated from full closed to full open, and back to full closed, in the proper bank sequence. The T_{ref} signal was then varied to actuate HI1 T_{avg} - T_{ref} ΔT bistable TB-500B, and it was verified that the first half of the steam dump valves tripped open (PV-3010, PV-3011, PV-3014, PV-3015, PV-3018 and PV-3019). The T_{ref} signal was then varied to actuate HI2 T_{avg} - T_{ref} ΔT bistable TB-500C, and it was verified that the second half of the steam dump valves tripped open (PV-3009, PV-3012, PV-3013, PV-3016, PV-3017 and PV-3020). The mode selector switch, CS-3056, was then placed to the 'RESET' position, which blocks all steam dumps to the condensers, and it was verified that all steam dump valves closed.

Section 6.3

This section verified plant trip control. Trains' 'A' and 'B' reactor trip

CHRONOLOGICAL SEQUENCE OF EVENTS RELATED TO FAILURE OF MS-PV-3011

TIME: 1236

DATE: 06/22/89

06/22/89

APPROX TIME	EVENT	CONTACT
1313	WR89W003110 - investigate why MS-PV-3011 failed to operate.	Operations
1345	The system engineer in the field was to visually check the valve; felt solenoids for temperature. Performed visual inspection for obvious discrepancies.	R. Bibber
1515	McCafferty and Guthrie, with I&C, went to the control room to check sequence of events with the Operations Department prior to working.	R. Guthrie
1530 - 2000	WR in the field with I&C - valve stroked - technician noted no change in valve position - noted booster relay bleeding air - booster relay replaced. Further strokes done locally with I&C technician - (MS-PV-3015 and MS-PV-3019 appeared to stroke properly) (by light indication) This did not correct the problem. The positioner was then checked for proper calibration and valve operation. Found feedback linkage was disconnected from the positioner.	N. McCafferty
	The valve was restroked; however, the valve would not stroke more than approximately 50% open. When the air was removed, the valve stuck open approximately 20%. When the air was fully bled off, the valve slammed shut - breaking the hand wheel.	A. Smith/ J. Ardus
2000 2200	Shift engineers stroked the valve locally, loosened the packing - the valve never stroked satisfactorily. However, it was noted that when the valve was stroked, an alignment problem appeared between the valve and the operator, causing binding.	
2200	Tagging order placed.	Mechanical
2300	Tagging order expanded.	Operations

06/23/89

APPROX TIME	EVENT	CONTACT
0700	Tagging order hung - Maintenance to verify.	Maintenance
0800	Priority turned around to make MSIV operational - isolate MS-PV-3011; clear tags so MSIV could be stroked for troubleshooting, and we would continue the test without MS-PV-3011.	M. Kenney
1200	System engineer initiated RTS on MS-PV-3015 and MS-PV-3019 (to check calibration of the positioner and the position of the valve).	N. McCafferty
1600	Updated event evaluation team.	M. Kenney
1630-2200	I&C performed RTS - found loose feedback linkage on MS-PV-3019; lubed linkage and performed check - MS-PV-3019 stroked smoothly; MS-PV-3015 failed RTS. The valve would not stroke properly - hunted and would not modulate. WR written (WR89W003159). WR later voided and replaced by 89W003211, initiated on 06/27/89 at 1830).	N. McCafferty

06/24/89

APPROX TIME	EVENT	CONTACT
0700	Group pursued tortional test - no steam dump work.	M. Kenney
1000	Briefed R. Cliche, Engineering	R. Guthrie
1400	Efforts terminated until Monday, due to management directive.	M. Kenney

06/25/89

APPROX TIME	EVENT	CONTACT
	NO STEAM DUMP WORK	

06/26/89

APPROX TIME	EVENT	CONTACT
0600	WR89W003173 written to stroke all steam dumps except MS-PV-3011; checking for: 1. valve/operator run out; 2. all linkage; 3. smoothness of operation; 4. hime joints.	R. Bibber
0745	Meeting with M. Kenney to go over game plan; verified scope of work.	M. Kenney
1130	Briefed Engineering - J. DeLoach, R. White	M. Kenney
1300-1615	I&C performed WR89W003173; verified additional discrepancies. (See WR.)	I&C
1400	Called Robert K. Griffith and Associates; was told Mr. Griffith was on the road, but Lou Griffith would contact J. Cade.	J. Cade
1500	Received call from Lou Griffith; gave him data, serial numbers, etc.	J. Cade
1530	Received call from Lou Griffith; Copes needed PO to get service representative.	J. Cade
1600	Talked to L. Blanchard, R. Romer for PO; tried to contact R. Streeter.	J. Cade
1605	Talked to Lou Griffith; gave him MPR #320907; told him PO to follow.	R. Bibber
1635	Received call from Tom Garmon, Copes-Vulcan, Inc. manager of valve service. He went through valve symptoms; he would get back.	R. Bibber

06/26/89
continued

APPROX TIME	EVENT	CONTACT
1650	Received call from Tom Garmon and Tim Kunkle, design engineer; went through symptoms again; made arrangements for vendor to have service rep on site.	R. Bibber
1730	Received call from Tom Garmon; Leonard Vaz, service engineer would arrive in Boston On 06/27/89, approximately 1200; would come directly to Seabrook Station.	R. Bibber

06/27/89

APPROX TIME	EVENT	CONTACT
1515	Leonard Vaz ar ed on site.	R. Bibber
1550-1730	In the field with L. Vaz stroking valve and making observations. MS-PV-3011 failed to stroke; MS-PV-3019 stroked; MS-PV-3015 failed to stroke. Vendor visually checked all steam dumps; wants to see all stroked after we fix 3011, 3015 and 3019.	R. Bibber
1830	WR89W093211 written to support additional trouble-shooting; disassembly of Valves MS-PV-3011, MS-PV-3015 and MS-PV-3019.	R. Bibber
	RES submitted to Engineering to evaluate locking device. RES #89-387 - Priority 2.	N. McCafferty
	Issued PO from MPR #320907 to cover service rep.	R. Bibber

06/28/89

APPROX TIME	EVENT	CONTACT
0600	I&C to disassemble MS-PV-3011 under vendor rep's direction.	R. Bibber


Photo #1

Photo #2

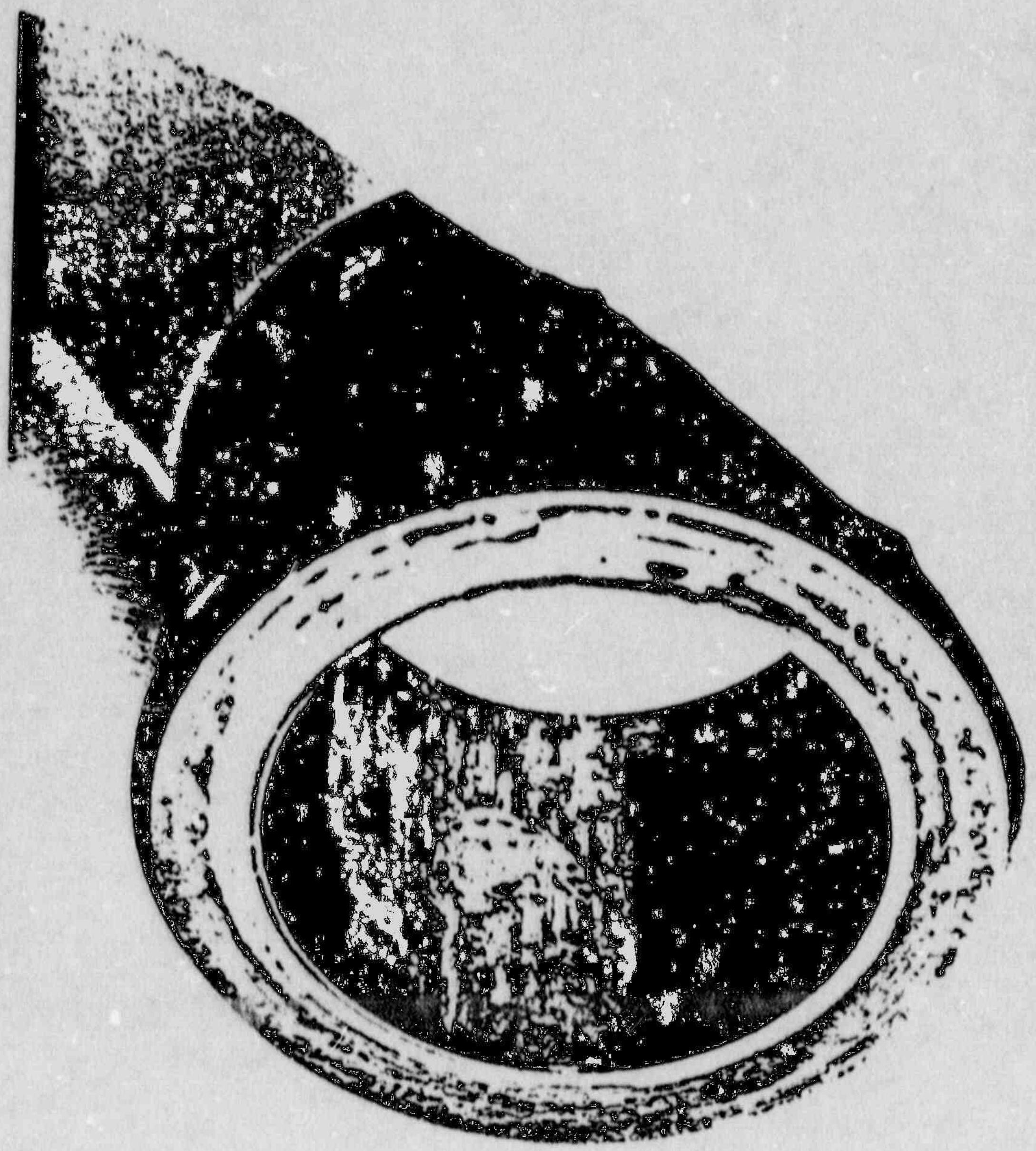
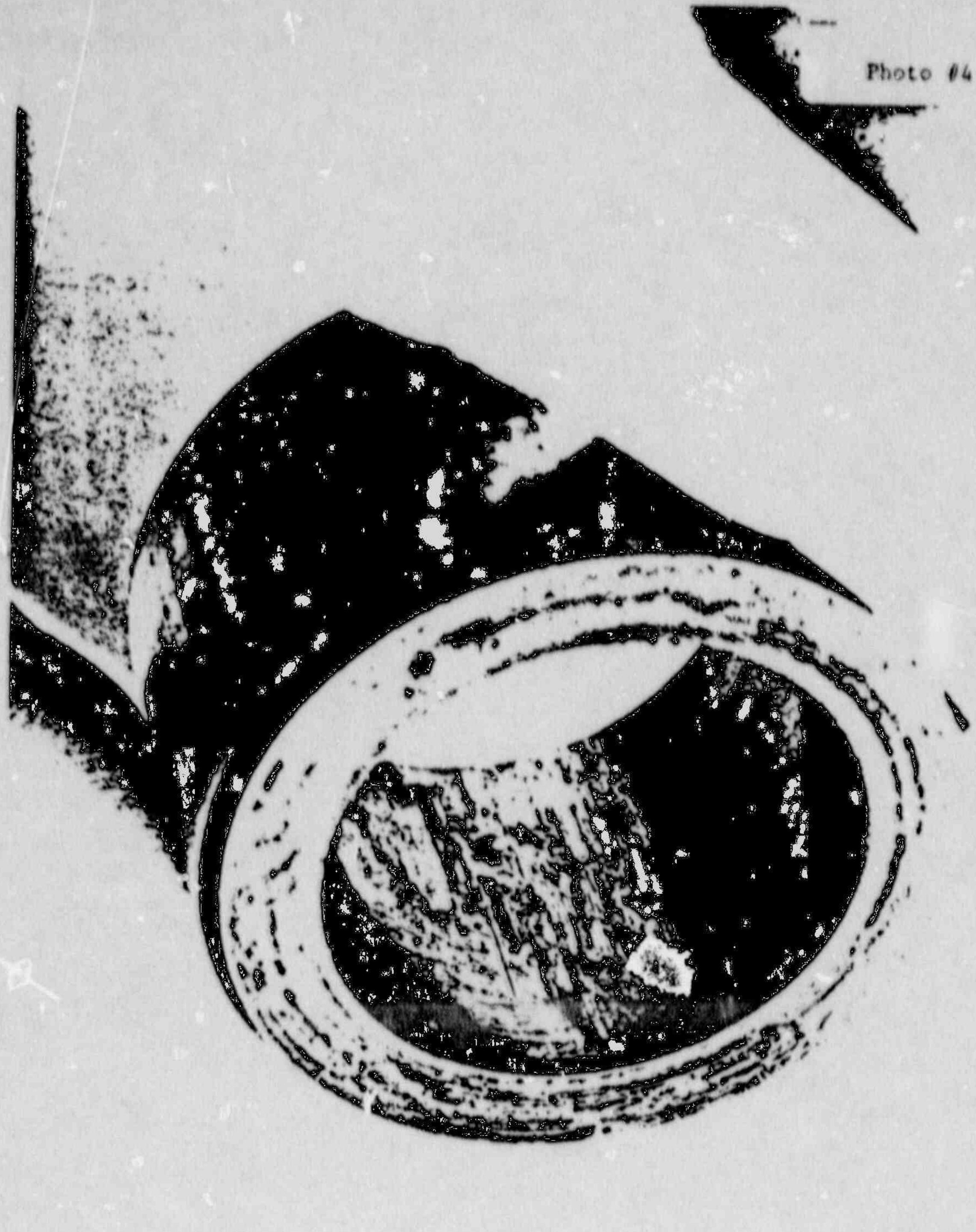


Photo #3

Photo #4



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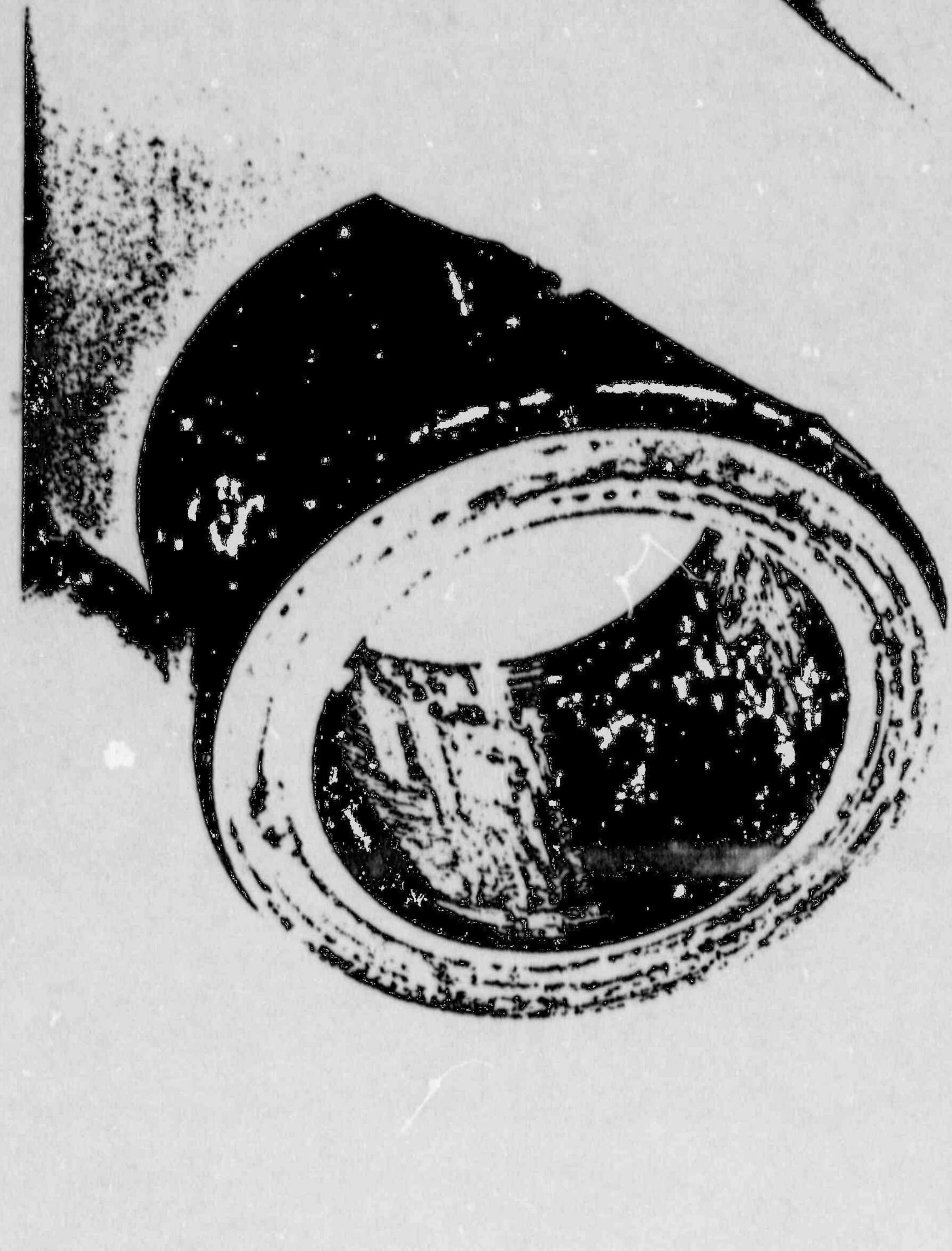

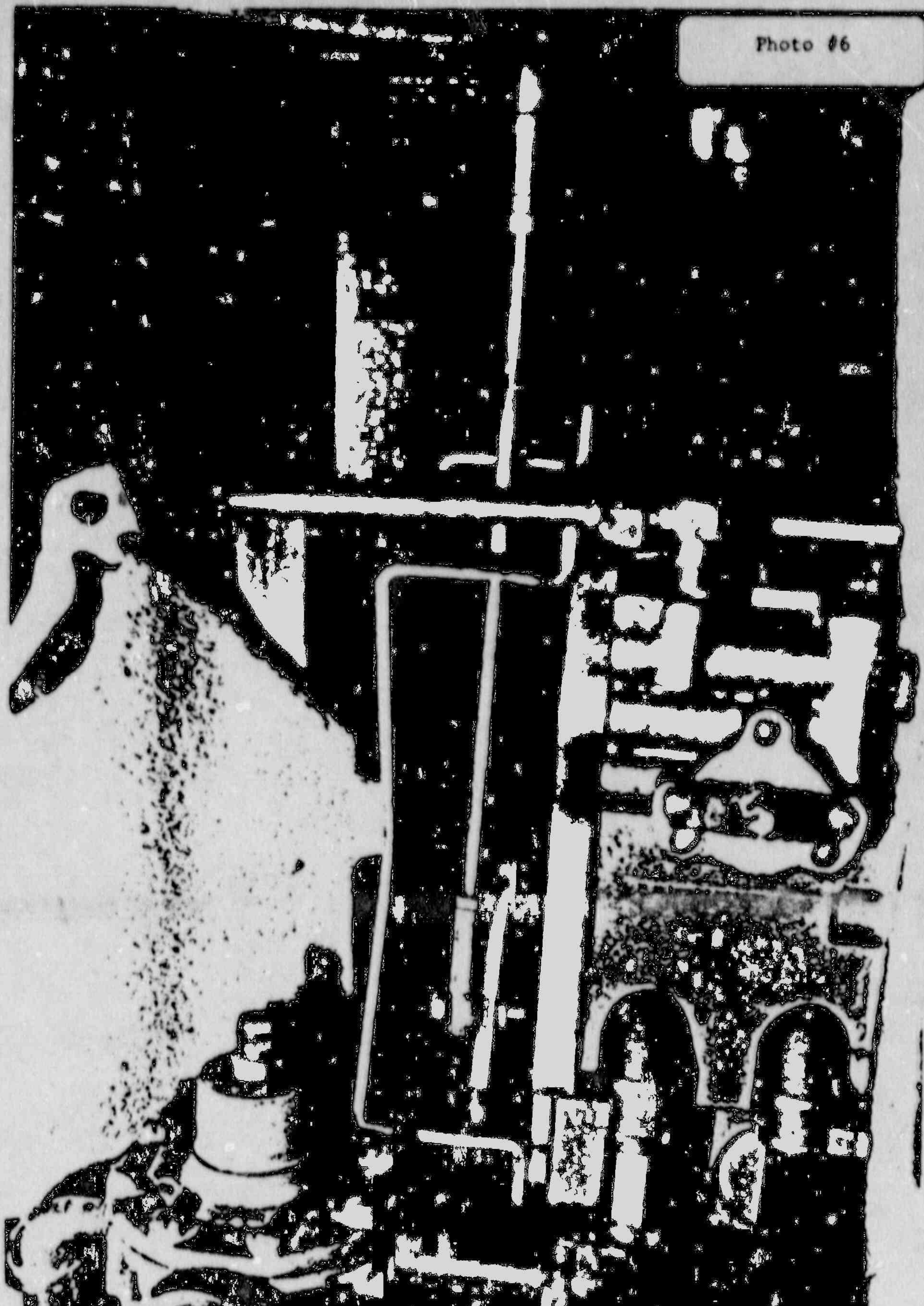
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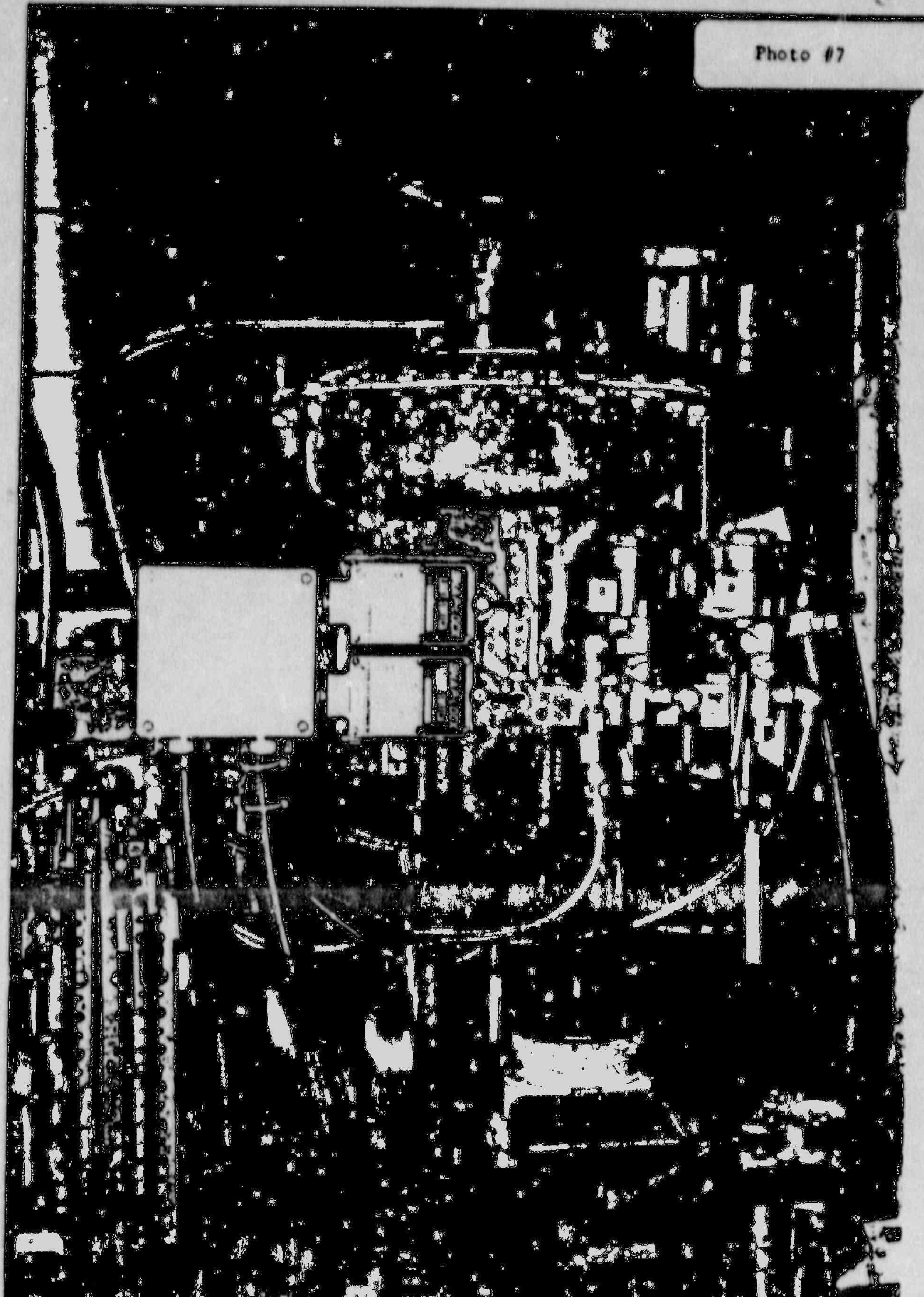
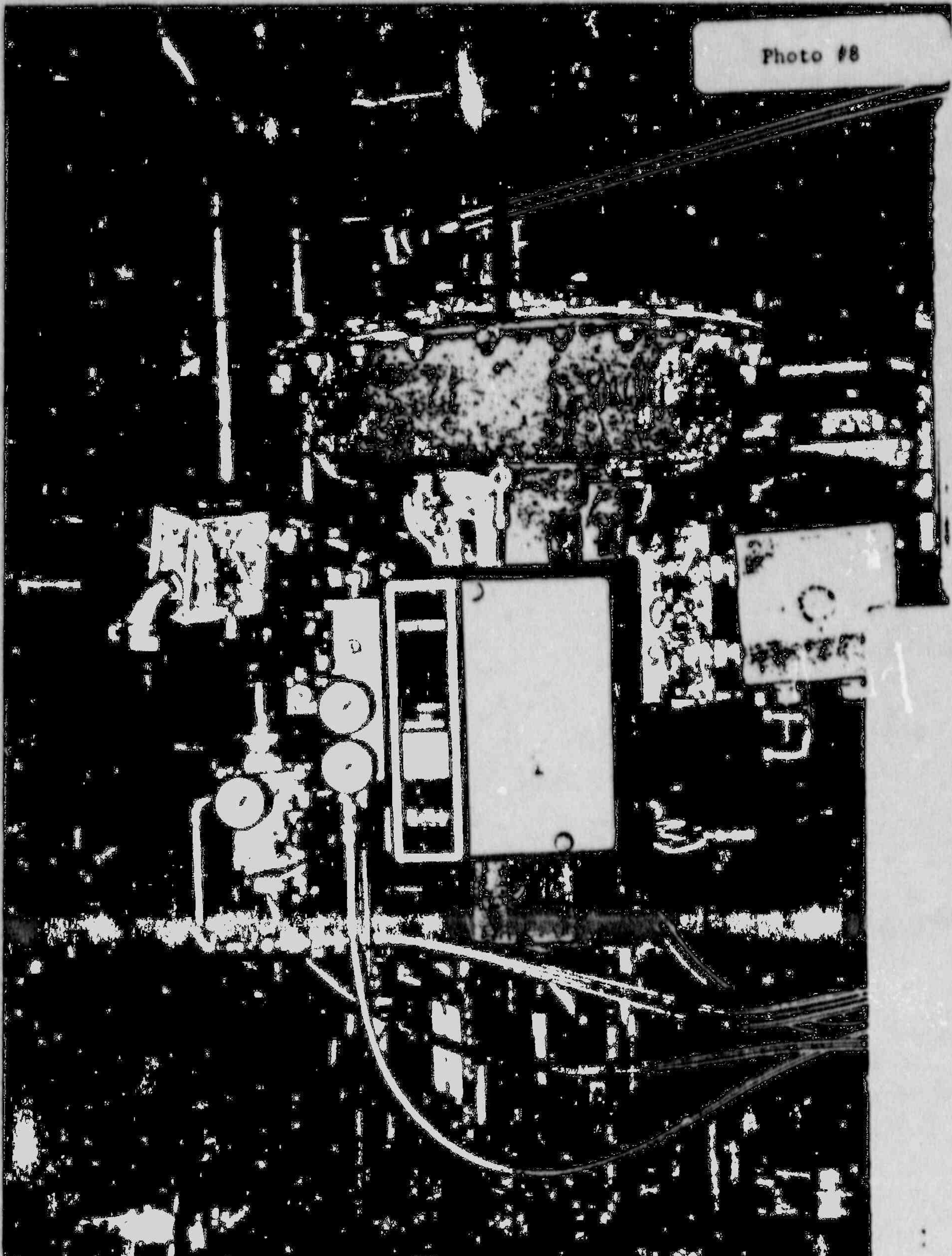
Photo #7

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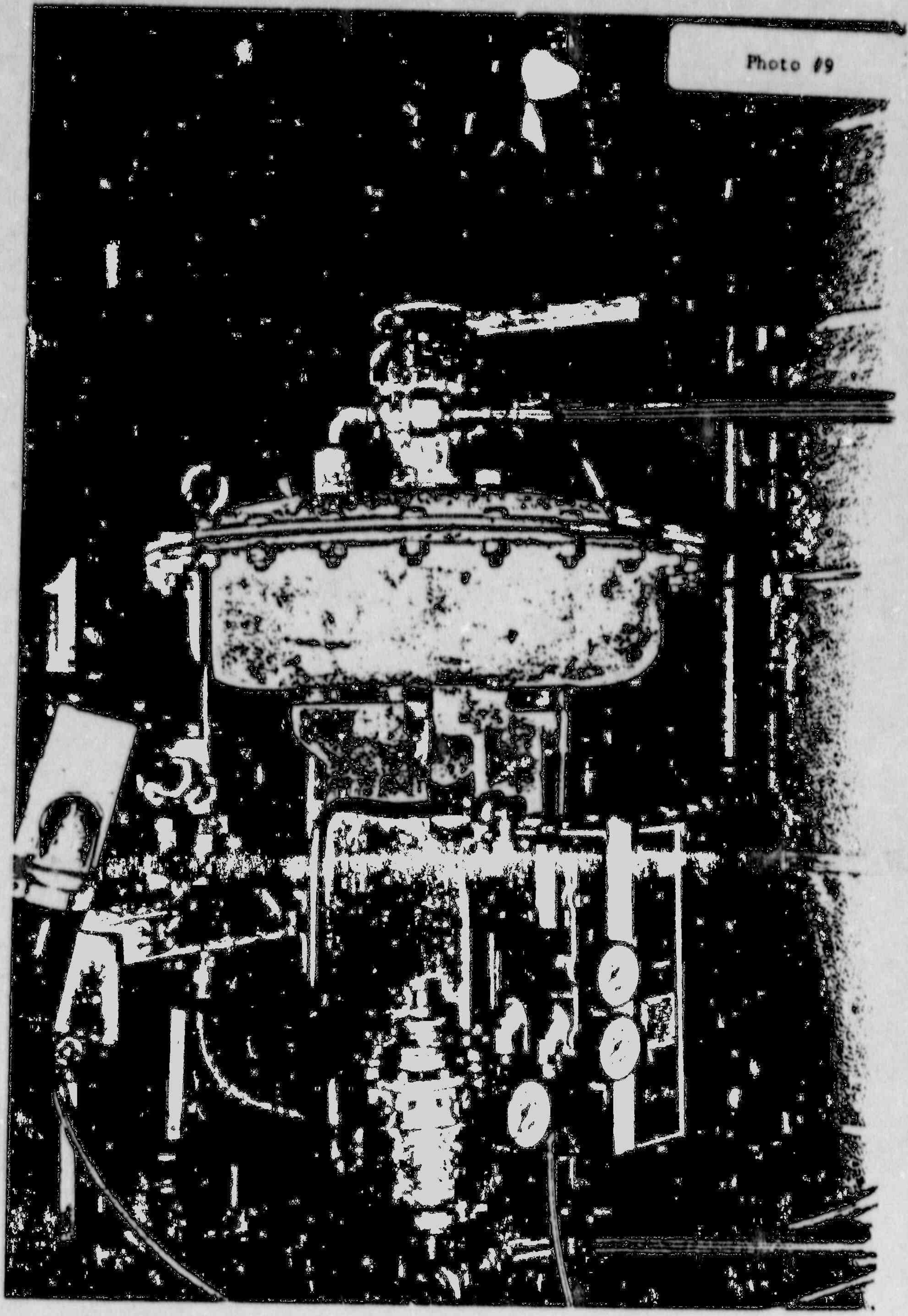

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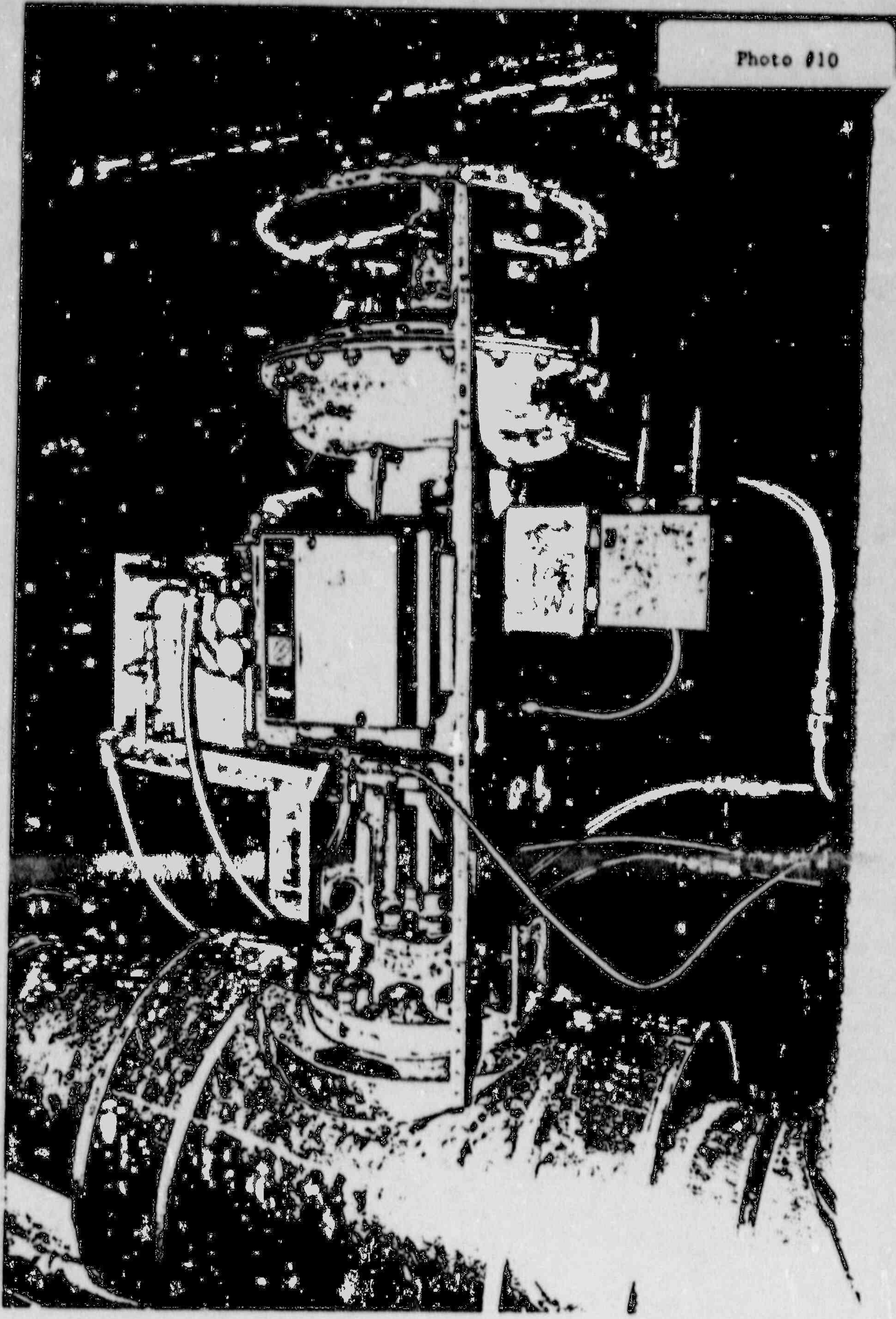

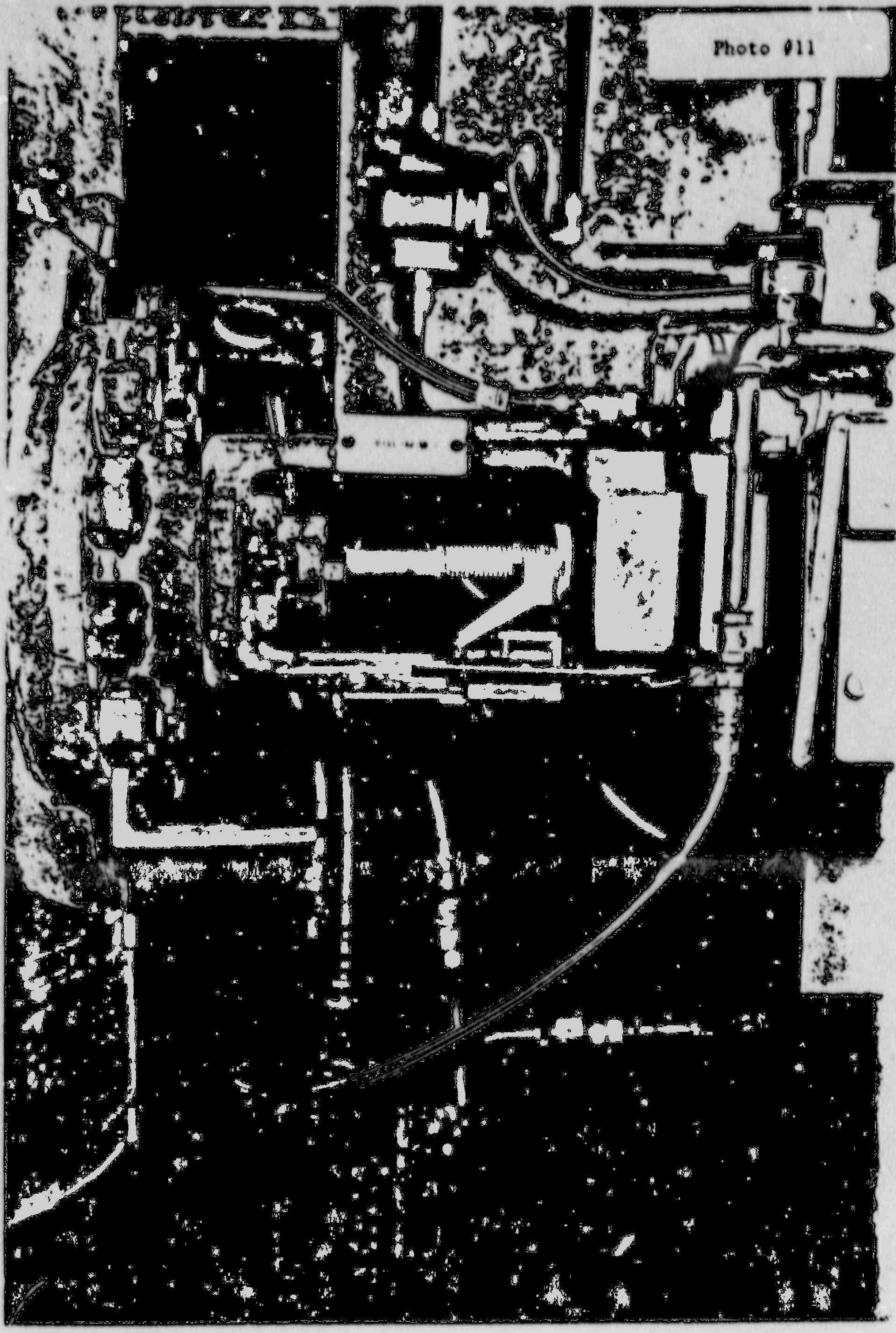
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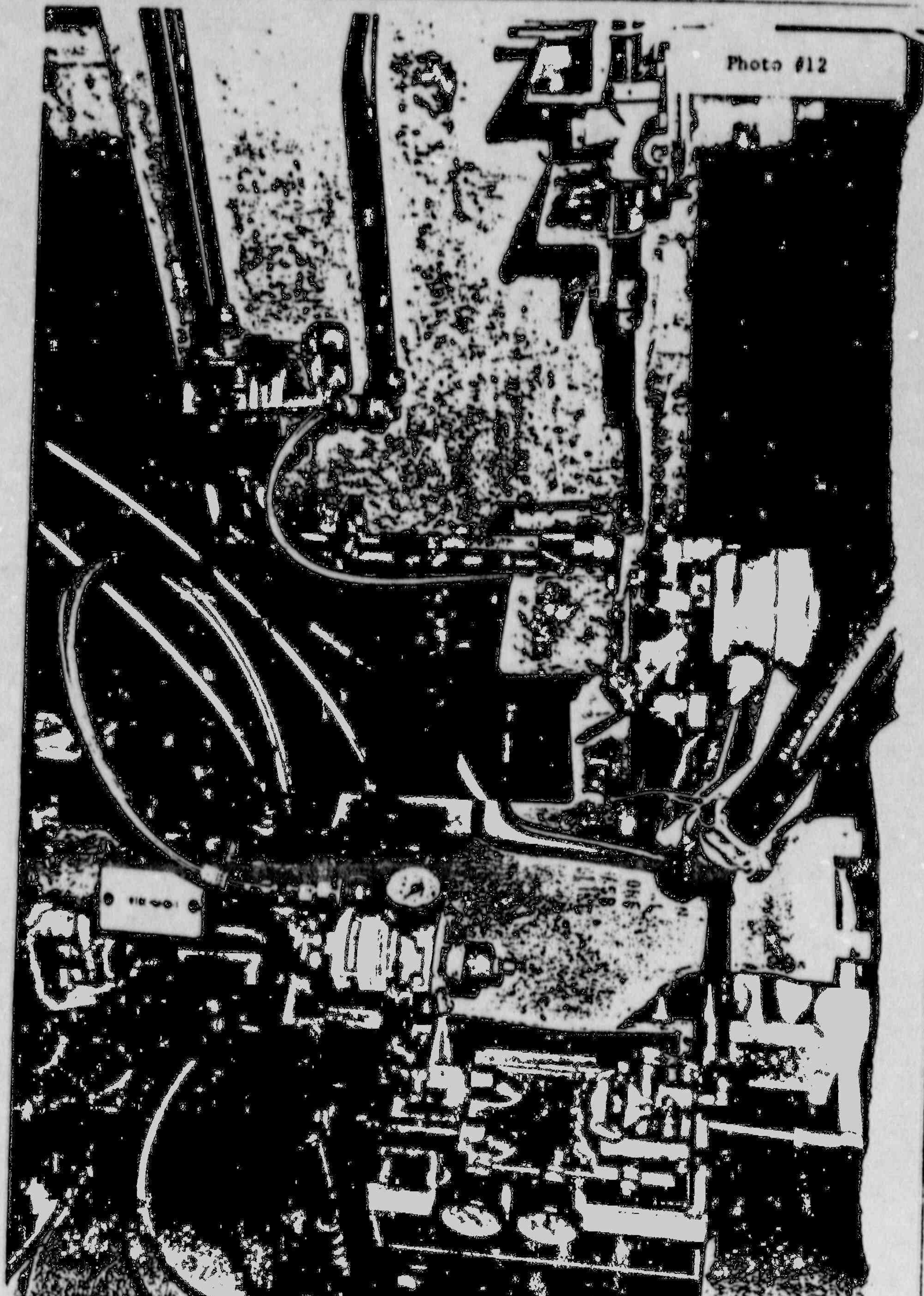

Photo #12

New Hampshire
Yankee

MEMORANDUM

Subject Secondary Plant Valves with A and B Train Logic

From M. E. Kenney

Date June 27, 1989

To D. E. Moody

Reference

Attachment A lists the valves and dampers that have 'A' train, 'B' train and dual train logic. At a meeting today, it was agreed between Engineering and Tech Support that a review of these components is required. This review will consist of the following.

1. Engineering will perform a design review of component logic.

2. Tech Support will arrange for field verification that field conditions meet current design.

3. Each component will be checked for 'A' train, 'B' train and dual train logic.

4. All valve positions will be checked for alignment.

5. Bench tests will be set up of various solenoid configurations.

6. QA will be asked to review the Phase I and Phase 2 test data to verify the test program covered 'A' train, 'B' train and dual train actuations.

It is hoped that this work will be complete by July 8, 1989.

M. E. Kenney
System Support Manager

MEK:djc

cc:

G. S. Thomas	01-40	W. J. Temple	49-CE
J. M. Grillo	49-OP	R. J. Sherwin	02-29
G. J. Kline	02-08	G. Tsouderos	YAEC Bolton
R. E. Cyr	49-SS	S. P. Buchwald	02-25
R. M. Cooney	49-SS	J. E. Cade	02-08
J. J. Warnock	02-07	P. E. Falman	02-08
J. M. Vargas	01-62	R. E. Guthrie	02-08
R. E. White	01-62	R. H. Lieder	02-08
J. L. Peterson	49-OP	J. O. Ross	02-08

VALVES AND DAMPERS WITH A AND B TRAIN SOLENOID VALVES

VALVE/DAMPER [SERVICE]	SOLENOID DESIGN BASES
FAH-DP-14 [Fuel storage building exhaust fan (FAH-FN-122) discharge isolation]	Vent air from the actuator to keep the damper closed when in the fuel handling mode.
FW-FCV-510, 520, 530 and 540 FW-LV-4210, 4220, 4230 and 4240 [Feedwater control and bypass valves]	Vent air from actuator to close valve.
FW-V30, 39, 48 and 57 [Feedwater isolation valves]	Pressurization: Connect the pneumatic tank to the actuator to pressurize the actuator. Hydraulic Dump: Dump hydraulic fluid from the actuator to close the valve.
MS-V395 [Steam inlet to turbine driven EFW pump (FW-P-37A)]	Vent air from actuator to open valve to run pump. Opening is delayed after the opening of a steam supply valve (MS-V393 or 394) for proper starting sequence of the pump. FW-P-37B is redundant.
MS-PV-3009 through 3020 [Condenser steam dump valves]	Vent air from actuator to close valve.
MS-V86, 88, 90 and 92 [Main steam isolation MSIVs]	Hydraulic Dump: Dump hydraulic fluid from the actuator to close the valve. Air Supply: Shut off the two air supplies to the hydraulic pump.
MS-PV-3001, 3002, 3003 and 3004 [Atmospheric steam dump valves ASDVs]	Nitrogen Supply: Open to pressurize the actuator from the back-up nitrogen supply to open the valve. Vent Isolation: Close off the vent line to allow actuator pressurization for opening the valve. Redundant solenoids are provided for each ASDV to ensure that ASDVs on two intact SGs are available after a steam generator tube rupture. Closing the valve from the control room is not a design basis.
SB-V9, 10, 11 and 12 [Steam generator blowdown isolation valves (outside containment)]	Vent air from the actuator to close the valve. The solenoids provide redundant signals for closing the valves on a 'T' signal or when FW-P-37A is operating. The 'B' train solenoid also receives signals for high energy line break (HELB) and FW-P-37B operating.

1.0 OBJECTIVE

This test will determine several natural circulation characteristics and will demonstrate the ability to remove heat from the reactor coolant system using natural circulation. The characteristics to be determined include: time necessary to stabilize natural circulation; reactor coolant flow distribution; depressurization rate following loss of pressurizer heaters; depressurization rate using auxiliary spray; effect of charging flow and steam flow on subcooling margin; subcooling monitor performance.

2.0 REFERENCES

NO.	TITLE	REVISION	CURRENT REVISION
2.1	1-ST-1, Startup Program Administration	2	2
2.2	Seabrook Station Technical Specifications	Amend 1	Nureg-1331 dated 4-89
2.3	Precautions, Limitations and Setpoints for the Westinghouse NSSS	2	2
2.4	Seabrook Station FSAR, RAI Response 640.51-4t	56	56
2.5	ES-0.2, Natural Circulation Cooldown	6	6
2.6	ASME Steam Tables	5th Ed.	5th Ed.
2.7	Seabrook Station FSAR, Table 14.2-5, Item 22	Amend 61	Amend 61
2.8	Startup Test Program Description	2	2

2.9 RECAL-89-004 IR Detector Conversion Constants for Core Exposure Tracking During the Low Power Test Program dated 6-14-89 dated 6-14-89 FC#1 RB 6-21-89

INITIALS/DATE

3.0 PREREQUISITES

RB 6-22-89 3.1 The test director has reviewed the latest revisions of the applicable references to determine if any system changes that have been made will affect the test performance.

RB 6-22-89 3.2 Personnel involved with the performance of this procedure have been briefed on the procedure content and informed of their respective duties.

RB 6-22-89 3.3 The Temporary Modifications Log and Danger Tag Log have been reviewed to identify and correct any items which may restrict the performance of the test.

RB 6-22-89 3.4 Instrument inputs to GETARS is arranged to include those identified by Attachment 9.4, as a minimum, and at a scan rate of less than or equal to 250 millisecond interval.

RB 6-22-89 3.5 The reactor coolant system flow measurement test, 1-ST-11, has been completed and the RCS flow instrumentation has been adjusted as required.

→ The pending WR would complete the requirement of putting [illegible] back in operation. This WR was pending since 1987. The [illegible] the test there was a request for this WR but was denied.

H/17

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3.6 The following systems are available for use:

RB 16-22-89 3.6.1 Station Computer.

RB 16-22-89 3.6.2 Service Air.

RB 16-22-89 3.6.3 Instrument Air.

RB 16-22-89 3.6.4 Circulating Water System.

RB 16-22-89 3.6.5 Main Condenser.

RB 16-22-89 3.6.6 Chemical and Volume Control System (including auxiliary spray).

RB 16-22-89 3.6.7 Steam Dump (including atmospheric relief valves).

RB 16-22-89 3.7 The station Operations Manager and Training Center Manager have been notified of the estimated start of the test, so that as many Operations personnel as possible may witness the test. (See Reference 2.4.)

RB 16-22-89 3.8 The Unit Shift Supervisor has been notified that the test is about to commence.

4.0 SPECIAL PRECAUTIONS

RB 16-22-89 4.1 The requirements of Technical Specifications 3.4.1.1 or 3.10.4 and the associated surveillance requirements must be adhered to throughout the performance of this test.

RB 16-22-89 4.2 Do not exceed 5% thermal power at any time during this test.

RB 16-22-89 4.3 The normal ΔT and T_{avg} indications will be unreliable during natural circulation conditions. The wide range hot and cold leg indications should be used to calculate these values.

RB 16-22-89 4.4 Cold leg temperature should be maintained at approximately the initial (pre-RCP trip) temperature, or greater than 550°F unless otherwise directed.

RB 16-22-89 4.5 All personnel participating in the test should be aware that the moderator temperature coefficient is near zero and may change sign during the test. This is to reduce reactivity feedback effects related to the moderator temperature coefficient.

RB 16-22-89 4.6 Maintain steam generator and feedwater conditions as stable as possible as natural circulation develops.

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RB 16-22-89 4.7 Minimize thermal shock on the pressurizer spray nozzle by initiating spray slowly and maintaining a minimum continuous flow once spray is actuated.

RB 16-22-89 4.8 Do not use auxiliary spray if letdown is isolated.

RB 16-22-89 4.9 If a reactor trip occurs during natural circulation, close the spray valves (RC-PCV-455A and B) and restart Reactor Coolant Pump RC-P-1C prior to closing the reactor trip breakers.

RB 16-22-89 4.10 Refer to the manual trip criteria listed in Attachment 9.3. Insure that these criteria are available in the control room for operator reference.

RB 16-22-89 4.11 Maintain CS-V177 (Loop 4 alternate charging path) in the "CLOSED" position throughout the test.

RB 16-22-89 4.12 Charging flow should be constant and at as low a flow rate as possible during this test.

5.0 INITIAL CONDITIONS

RB 16-22-89 5.1 Reactor power is approximately 3% with rod control in "MANUAL".

RB 16-22-89 5.2 All reactor coolant pumps are operating.

RB 16-22-89 5.3 Steam dump is operating in the pressure control mode and maintaining cold leg temperature at approximately 557°F in manual control. *Applicable portions of Starting and Phasing the Turbine Generator per ON1031.02 may be performed.* FC#1 RB 6-21-89

RB 16-22-89 5.4 The Station computer is operating.

RB 16-22-89 5.5 Pressurizer pressure control and level control are in manual and maintaining pressurizer pressure at approximately 2235 psig and level at 25% (range 25 to 30).

RB 16-22-89 5.6 The startup feedwater pump is maintaining steam generator levels at approximately 50% (40-60%) narrow range, through the bypass valves.

RB 16-22-89 5.7 RCS boron concentration and control bank rod positions are configured to establish an approximately zero moderator temperature coefficient. Control Banks should be arranged so that there is at least 150 pcm of inserted rod worth.

RB 16-22-89 5.8 The steam generator atmospheric relief valves are available for use as necessary.

RB 16-22-89 5.9 Secure steam generator blowdown during primary calorimetric test activities.