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The Administrative Record Staff

NOTICE

All drawings located at the end of the document.

CORRES CONTROL
OUTGOING LTR NO

DOE ORDER #

93 RF 15270

EG&G ROCKY FLATS

DIST	LTR	ENC
AMARAL, M E		
BENEDETTI, R L		
BENJAMIN, A		
BERMAN, H S		
BRANCH, D B		
CARNIVAL, G J		
COPP, R D		
DAVIS, J G		
FERREIRA, D W		
HANNI, B J		
HARMAN, L K		
HEALY, T J		
HEDAHL, T		
HILBIG, J G		
KIRBY, W A		
KUESTER, A W		
MANN, H P	X	
MARX, G E		
McDONALD, M M		
McKENNA, F G		
MONTROSE, J K		
MORGAN, R V		
POTTER, G L		
PIZZUTO, V M		
RILEY, J H		
RISING, T L		
SANDLIN, N B		
SETLOCK, G H		
STEWART, D L		
SULLIVAN, M T		
SWANSON, E R		
WILKINSON, R B	X	
WILLIAMS, S (ORC)		
WILSON, J M		
WYANT, R B		

EG&G ROCKY FLATS, INC
ROCKY FLATS PLANT, P O BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

December 17, 1993

93-RF-15270

M H McBride
Acting Assistant Manager for
Environmental Restoration
DOE, RFO



000014521

Attn S R Grace

MEMBRANE FAILURE AT THE OPERABLE UNIT NUMBER 2 (OU-2) FIELD TREATABILITY UNIT (FTU) ON NOVEMBER 15, 1993 - NMH-651-93

A report explaining the events surrounding the shutdown/non-treatment of surface water at the OU-2 FTU resulting from the membrane failure that occurred on November 15, 1993 is attached. This report details the cause of the shutdown, results of the shutdown, and actions taken to repair the facility. Additional copies of the report are provided for forwarding to the State of Colorado and the Environmental Protection Agency.

If you have any questions or concerns, please contact Ty Vess at extension 6540

N M Hutchins
N M Hutchins, Acting
Associate General Manager
Environmental Restoration Management

CORRES CONTROL	x	x
ADMIN RECORD	X	X
PATS/T130G		
TRAFFIC		

MTV.lmw

Orig and 1 cc - M H McBride

CLASSIFICATION	
UCNI	
UNCLASSIFIED	
CONFIDENTIAL	
SECRET	

Attachment
As Stated

AUTHORIZED CLASSIFIER	CC
SIGNATURE	A H Pauole - DOE, RFO
REVIEW WAVE/PER	R J Schassburger - " "
CLASSIFICATION OFFICE	M N Silverman - " "
DATE	

IN REPLY TO RFP CC NO

ACTION ITEM STATUS	
<input type="checkbox"/> PARTIAL/OPEN	
<input type="checkbox"/> CLOSED	

LTR APPROVALS
MCB. JMB
ORIG & TYPIST INITIALS
MTV:lmw

ADMIN RECORD

**MEMBRANE FAILURE RESULTING IN
SHUTDOWN OF OPERATIONS AT THE
OPERABLE UNIT NUMBER 2 FIELD
TREATABILITY UNIT**

Prepared by



November 30, 1993

1.0 SCOPE

This report will describe the series of events that occurred from November 15 to November 20, 1993, at the Operable Unit Number 2 (OU-2) Field Treatability Unit (FTU) as a result of the membrane failure that occurred on November 15, 1993

2 0 History

The OU-2 FTU began removing Volatile Organic Compounds (VOCs) from surface water sites east of the Protected Area at the Rocky Flats Plant in May of 1991. In April, 1992, chemical precipitation and microfiltration was added to the FTU to remove radionuclides and metals. The facility is required to collect and treat surface water (up to sixty gallons per minute) twenty-four hours per day, 365 days per year. Operations and Maintenance of the OU-2 FTU is performed by subcontractors, with an EG&G project manager assigned to the project for oversight and guidance.

3 0 History of Events

<u>Date</u>	<u>Time</u>	<u>Activity</u>
11/15/93	16 15 hrs	During normal operations, a blank membrane (lower train, eastern blank) failed, rendering the system inoperable. The 6" I D PVC pipe is rated for an operating pressure of 180 psi. The failure occurred during normal operating conditions, with a pipe pressure of 46 psi, well below the rated operating pressure of 180 psi for the blank membrane (which consists of 6" I D PVC pipe). The failure caused several hundred gallons of process water to spill into the secondary containment. The microfiltration system (which consists of the membranes) is located in trailer T900A. See Attachment A for system diagram. Collection of surface water ceased at this time.
	16 25 hrs	Subcontractor (RTG, Inc), notified EG&G Project Manager (M T Vess) of the membrane failure.
	16 50 hrs	Environmental Operations Manager (M C Broussard) notified of occurrence by EG&G Project Manager (PM).
	17 00 hrs	Radiological Engineering (J L Anderson) briefed of occurrence, and determined that there was no radiological concern. As a precaution, radiological and VOC monitoring was performed (no detectable contaminants).
	17 00 hrs	Subcontractor began pumping water from secondary containment into the concentration tank (TK-8), located in Trailer T900A. Began to clean trailer.
	17 05 hrs	Cause of spill identified as a material failure of the blank membrane. Appendix B shows photographs of the failure.

<u>Date</u>	<u>Time</u>	<u>Activity</u>
11/15/93	17 29 hrs	Shift Superintendent notified of occurrence by Environmental Operations Manager, and briefed by PM No actions required or taken by the Shift Superintendent
	18 00 hrs	Shift change (subcontractor) Shift safety meeting held discussing cleanup precautions Continued cleaning trailer
11/16/93	05 45 hrs	Replacement part is being shipped via air freight (from Billerica, MA) and is scheduled for arrival at Stapleton at 18 17 hours Continued cleaning up from spill all day PM requested a work package and Lock Out/Tag Out (LO/TO) to repair the system
	18 00 hrs	Shift change, began preparing to install new blank membrane upon arrival
	19 40 hrs	Replacement part onsite, began installing (work control number TR073051)
	20 30 hrs	Replacement of new blank membrane complete LO/TO removed and the system was tested by recirculating clean water from tank TK-10 through the membrane system using the cleaning pump Pressure rose rapidly when water reached the top membrane train System was shut down and a new work control (TR073039) was issued to LO/TO and repair the system again Night shift began removing membranes from the system to inspect for fouling or plugging
11/17/93	05 30 hrs	PM onsite to evaluate removed membranes Membranes were severely clogged, and required cleaning PM began getting authorization to clean the membranes at the Main Decontamination Facility (MDF)
	06 00 hrs	Shift change Subcontractor began preparing to clean membranes at the MDF Continued to remove membranes from the system
	12 00 hrs	Began cleaning clogged membranes at MDF
	16 30 hrs	MDF out of clean water, beginning to experience freezing conditions Unable to clean any more membranes today Three of the nine membranes from the top train cleaned today Night shift cleaned T900A (from membrane removal activities)
11/18/93	08 00 hrs	Informed that the MDF could not be used until some of the waste water could be transferred to Building 891 (Operable Unit Number 1) Protected Area (PA) decon pad will be used Began gathering pumps, hoses, generator, PPE, and membranes to transport into the PA

<u>Date</u>	<u>Time</u>	<u>Activity</u>
11/18/93	11 00 hrs	Could not get membranes into the PA Protective force requires X-rays of the membranes prior to allowing them into the PA Arranged for Building 891 to accept a tanker of the MDF wastewater
	12 20 hrs	Took samples from the plugged membranes and placed in 100 ml solutions of HCl, hydrogen peroxide, NaOH and sodium hypochlorite to find best cleaning solution Hydrogen peroxide appeared to be the only solution that worked This will be used to clean the membranes once they are reassembled in the system
	14 00 hrs	Ten (10) new membranes ordered from Memtek to replace the blank membranes in the system This will increase the flow through the system by 33%, and will reduce the amount of chemicals used to perform chemical cleans of the membranes by 33% The additional flow will also significantly reduce any time that the FTU cannot collect water due to poor membrane flow
	15 40 hrs	MDF ready to clean membranes Due to cold weather and the time of day, cleaning of the membranes will occur first thing tomorrow morning Night shift cleaned up from day shifts activities
11/19/93	09 30 hrs	Began cleaning membranes at the MDF
	10 45 hrs	Began replacing cleaned membranes using manufactures recommended procedures (see Attachment C)
	15 50 hrs	Began removing blank membranes from system in order to be ready to install the new membranes tomorrow morning Made arrangements with Receiving, Transportation, Electricians, and Shift Superintendent to have the new membranes arrive onsite tomorrow (saturday), and for the LO/TO to be removed as soon as reassembly was completed
	18 00 hrs	Finished removing blank membranes Began cleaning and monitoring blank membranes to prepare them for storage
11/20/93	06 00 hrs	Shift change Began preparing for arrival of new membranes All tools, hardware, and paperwork being put in place at this time
	11 10 hrs	Membranes arrived on plantsite RTG left to pick them up from bldg 551
	11 45 hrs	Began installing new membranes
	15 05 hrs	Installation almost complete Notified LO/TO personnel that the locks would need removal soon
	16 30 hrs	LO/TO removal done

<u>Date</u>	<u>Time</u>	<u>Activity</u>
11/20/93	16 50 hrs	Tested system by pumping clean water from tank TK-10 through the system using the cleaning pump No leaks or problems detected System declared operational again
	17 20 hrs	Began chemical cleaning cycle using hydrogen peroxide to remove any additional sediments or sludge that remained in the membranes
	18 20 hrs	Placed system into recirculation until final pH was stabilized
	19 30 hrs	Began discharging treated water
	19 40 hrs	Weirs turned on and began collecting surface water

4.0 Cause of Shutdown

The blank membrane failed as a result of a material failure in the 6" PVC piping The cause of the material failure appears to be a weak glued fitting The fitting failed at 46 psi, (normal operating pressure), which is below the rated working pressure of 180 psi for the membrane It is assumed that the poor glue fitting was initially capable of operating at the rated pressures, but due to nearly continuous operation of the facility for the last nineteen months, mechanical vibrations have most likely caused fatigue to occur at the weak fitting in the membrane

When the membrane ruptured, sludge was still in the membranes, and a solids flush to remove the sludge from the membranes could not be performed By not performing a solids flush, the top train of membranes to become severely plugged and required disassembly of the membrane system to remove the sludge

5.0 Results of Shutdown

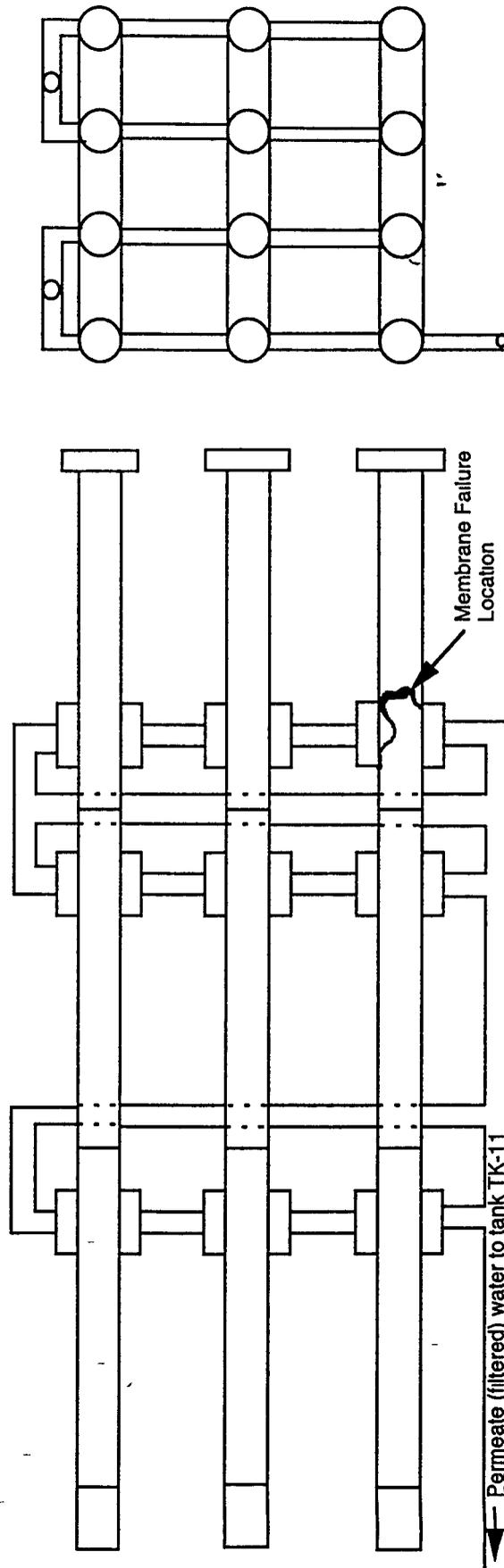
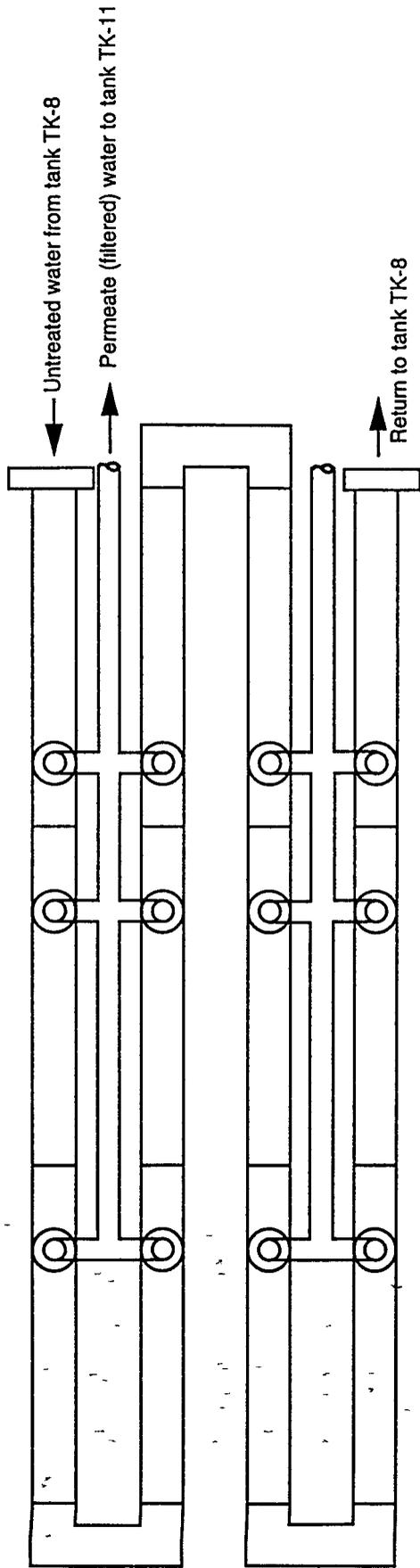
Surface water from Surface Water (SW) locations SW-59, SW-61, and SW-132 was not collected from the time of the rupture (16 15 hrs on 11/15/93) until 19 40 hrs on 11/20/93, for a total period of noncollection of five (5) days, three (3) hours, and twenty five (25) minutes The Colorado Department of Health (CDH) and the Environmental Protection Agency (EPA) were both notified of the shutdown and when the system was once again operational

6.0 Conclusion

The cause of the membrane rupture was a material failure of the 6" PVC blank membrane The failure occurred at normal operating pressures, well below the maximum operating pressure of the pipe Normal preventative maintenance could not have caught the problem prior to failure, as when the pipe failed it gave no warning (leaks) As a result of the membrane failing, a solids flush could not be performed, causing the upper membranes to become clogged All efforts were made to bring the facility back to an operable status, but due to the extent of the clogged membranes it took several days to perform the work During the shutdown, additional membranes were ordered and installed in the microfiltration system to increase the capacity of the system, reduce chemical use, and reduce periods of non-collection

APPENDIX A

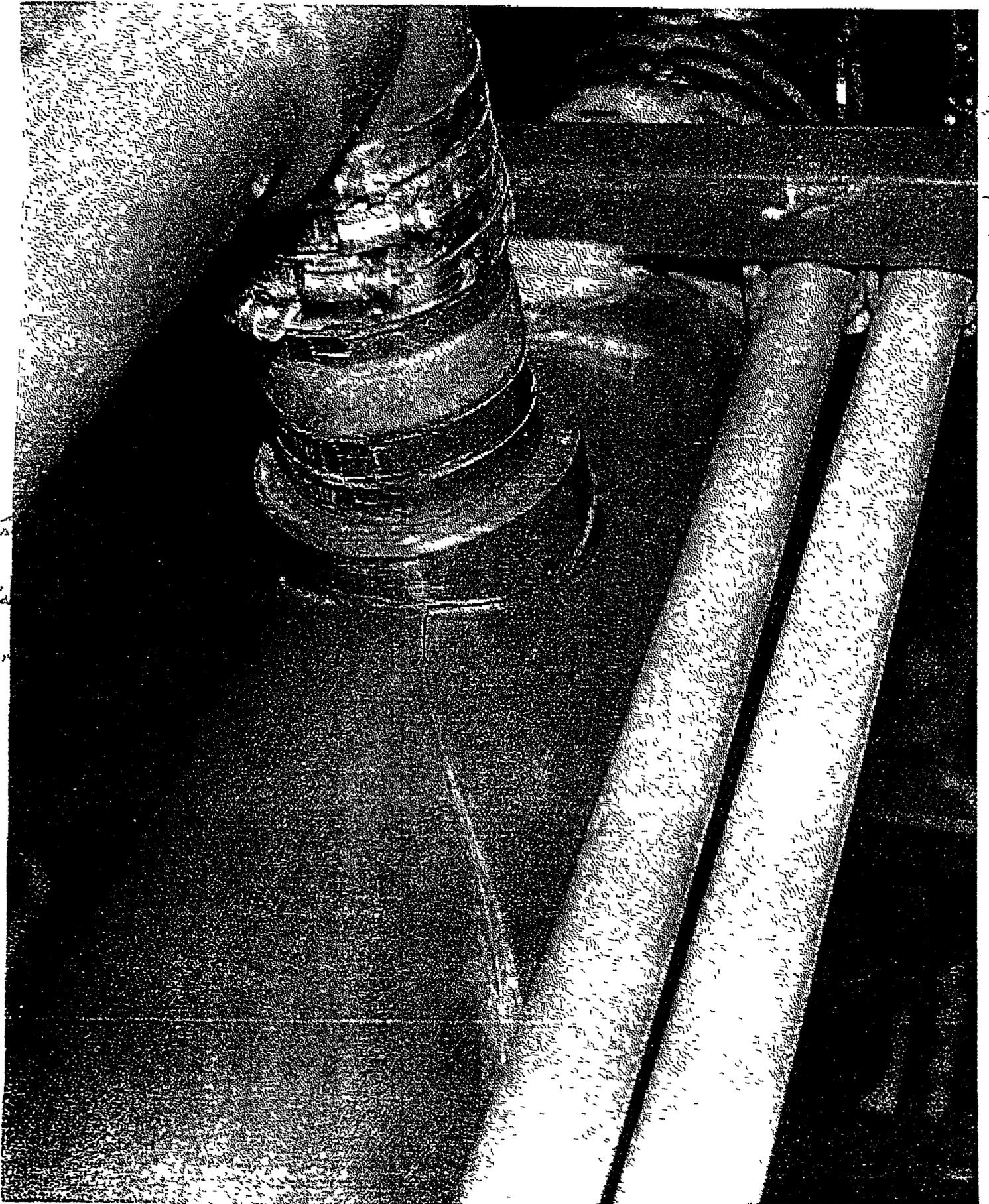
MICROFILTRATION SYSTEM DRAWINGS

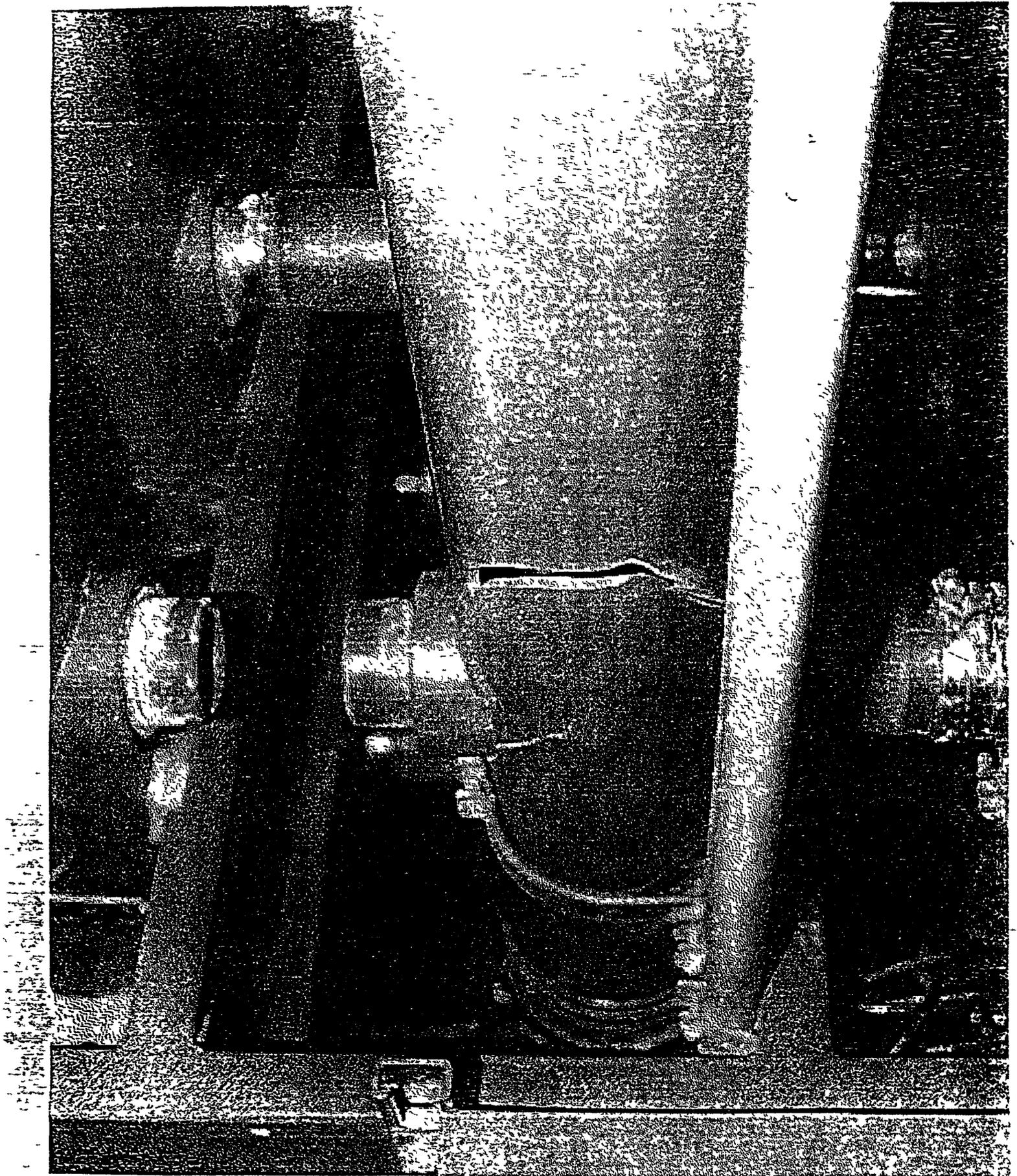


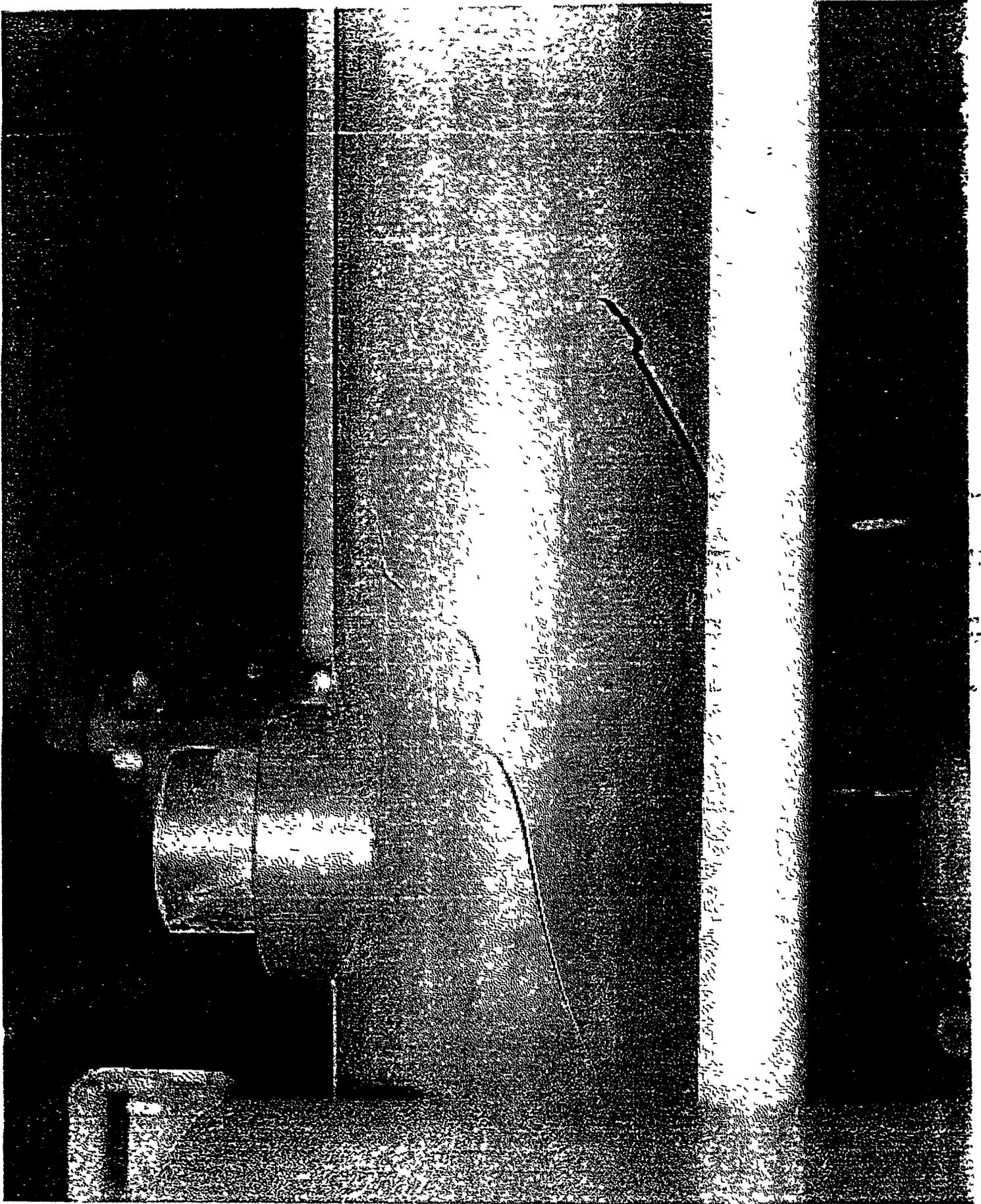
OPERABLE UNIT NUMBER 2 FIELD TREATABILITY UNIT - MICROFILTRATION UNIT

APPENDIX B

**PHOTOGRAPHS
OF
MEMBRANE FAILURE**







APPENDIX C

MANUFACTURES (MEMTEK) RECOMMENDED MEMBRANE REASSEMBLY PROCEDURE

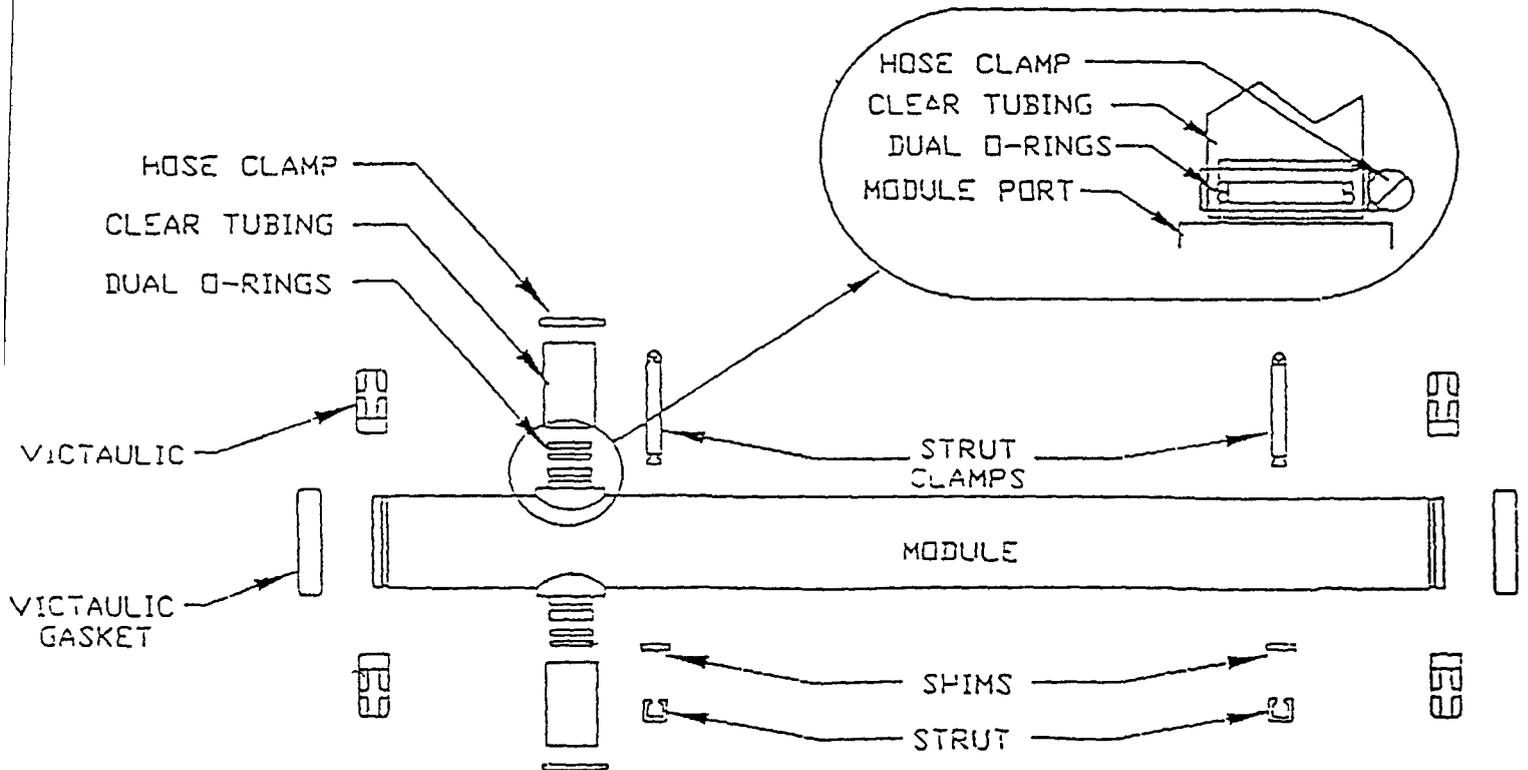
13
14

MEMTEK



PART = A2032
 INSTALLATION INSTRUCTIONS

1. * Place the polypropylene shims into the superstrut where the modules are to be clamped
2. Install a victaulic gasket onto each end of the module.
3. Place the module onto the shims and clamp lightly into position with the superstrut clamps.
4. Slide the victaulic gasket into position and install the victaulic coupling. Insure that the filtrate and vent ports are aligned properly for later insertion into the clear tubing.
5. Install the o-rings into the grooves on the module filtrate and vent ports. Note each port requires 2 o-rings.
6. Install the clear tubing onto the filtrate and vent ports and tighten the hose clamps. The hose clamps should be over the o-rings.
7. Tighten the superstrut clamps.



* NOTE A - Shims are only required when installing a potted type module (Part # A2032) in place of a bundle/snell type module (Part # A1075)

B - Module keys are not required when installing (Part # A2032). Alignment is automatically achieved in the manufacturing process.

