August 13, 1973

Note to File

PHILADELPHIA EVENING BULLETIN, SENIOR TECHNICAL EDITORIAL WRITER

I received a call Friday afternoon, August 10, 1973, from the Technical Editorial Writer on the staff of the Philadelphia Evening Bulletin. (I do not recall his name).

The Editorial Writer discussed, at reasonable length (30 minutes), the article that they had written regarding the overall situation at the Jersey Central Oyster Creek Plant. He stated that his paper suppprts Nuclear Power and was concerned that this situation might affect other Nuclear projects in this area - particularly the Limerick Project. He indicated that he plans to write an editorial pointing out the slackness of Jersey Central and how their actions reflect discredit on the Nuclear Industry.

He was impressed with the strong action taken by Regulatory. He may say some nice words about Regulatory in the editorial.

Jim

cc: J. G. Davis, RO:HQ
J. Fouchard, Public Information

B/187

To: James P. O'Reilly
Directorate of Regulatory Operations
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

From: Jersey Central Power & Light Company
Oyster Creek Nuclear Generating Station Docket #50-219
Forked River, New Jersey 08731

Subject: Abnormal Occurrence Report 73-17 .

The following is a preliminary report being submitted in compliance with the Technical Specifications paragraph 6.6.2.

Preliminary Approval:

J. T. Carroll, Jr. 8/8/73
J. T. Carroll, Jr. Date

cc: Mr. A. Giambusso

Date: 8/7/73
Time: 2:30 p.m.

Abnormal Occurrence

Report No. 73-17

SUBJECT: Failure of #1 Diesel Generator to start.

This event is considered to be an abnormal occurrence as defined in the Technical Specifications, paragraph 1.15D. Notification of this event as required by the Technical Specifications, paragraph 6.6.2.a, was made to AEC Region I, Directorate of Regulatory Operations, by telephone on Wednesday, August 8, 1973, at 11:20 a.m., and by telecopier on Wednesday, August 8, 1973, at 2:40 p.m.

SITUATION: While conducting a routine six-month inspection of #1 Diesel Generator, it was discovered that one of the two starting motors occasionally failed to engage, consequently preventing the unit from starting.

CAUSE: The engagement shaft bushing at the pinion end of the starting motor was discovered to have been rotating with the shaft. Due to wear, the bushing had slipped out of position and prevented the pinion gear from engaging the engine ring gear.

REMEDIAL ACTION:

A new starter motor was installed and tested satisfactorily. However, when an operability test was later attempted, the same starter failed to engage, requiring realignment of the motor. A satisfactory operability test was then conducted and the unit was returned to service.

B178

SAFETY SIGNIFICANCE:

Appendix "L" to the FDSAR contains a probability analysis regarding the availability of standby cooling systems and includes an analysis of off-site power availability concurrent with a loss of coolant accident. The results indicated that the reliability of available power from off-site sources or from a self contained unit - only one (1) diesel generator was considered in the analysis - was quite high. Since the station is provided with two (2) separate diesel generator units, having one (1) unit out of service has no effect at all upon the results of the analysis. In addition, the effects of single bus operation during a loss of coolant accident was analyzed in Amendment 32 to the FDSAR and the unit loading under this condition was found to be within the normal KVA rating of the diesel generator. Thus, there is no additional safety significance associated with this event beyond that already analyzed.

Prepared by: G K Reeves Jr Date: 8/8/73

Jersey Central Power & Light Company

MADISON AVENUE AT PUNCH BOWL ROAD • MORRISTOWN, N.J. 07960 • 539-6111

August 6, 1973

Mr. A. Giambusso
Deputy Director for Reactor Projects
Directorate of Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Giambusso:

Subject: Oyster Creek Station
Docket No. 50-219
Hydraulic Shock and Sway Arrestor Failure

The purpose of this letter is to formally submit in writing our Summary Report, dated July 16, 1973, on Snubber Repair Activities during the 1973 Oyster Creek Refueling Outage. This report was sent to your office earlier in a preliminary form. This report is also responsive to Items B.2.a to c inclusive in your R. O. Bulletin No. 73-3, dated July 27, 1973. Also in answer to Item B.2.c all units are of the same model identification, HSSA-10.

In addition we wish to advise in writing that the plant experienced the failure of eight Hydraulic Shock and Sway Arrestor units located on the Emergency Condenser, Core Spray, Main Steam, Feedwater, and Shutdown Cooling system in the drywell. This event is considered to be an abnormal occurrence as defined in the Technical Specifications, paragraph 1.13i. Notification of this event, as required by the Technical Specifications, paragraph 6.6.2.a, was made to AEC Region I, Directorate of Regulatory Operations, by telephone on Friday, July 27, 1973, at 10:00 a.m.

The plant was shutdown on July 21, 1973 because of high unidentified leakage in the drywell. It was decided at this time to perform an inspection on the drywell snubbers which had been rebuilt during the Spring outage. It was discovered that eight of the sixty-two drywell snubbers were missing hydraulic fluid in varying amounts, thereby resulting in their inoperability. The units involved are tabulated below by serial number and location:

8/189

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Serial Number	Location
487491	Shutdown Cooling
487495	Core Spray
487499	Emergency Condenser
487516	Shutdown Cooling
487557	North Feedwater
487561	Emergency Condenser
487562	Emergency Condenser
487574	Emergency Condenser

The oil loss has been attributed to seal failure creating a leakage path. The exact mechanism of seal failure is presently under investigation by Disogrin Company, Bergen Paterson and Rex Hanna. Based on discussion with Bergen Paterson and Rex Hanna at the Oyster Creek site on August 2, two points were recognized. Both of the silicone base radiation resistant fluids (SF1017 and SF1154) possess an aromatic constituent in their chemical make-up which is capable of replacing out a plasticizer in the soft millable gum polyurethane seals. Loss of the plasticizer cause both a reduction in seal volume and a loss in seal effectiveness. It is believed that prolonged exposure at elevated temperatures is a factor in this oil attack on the seals. This point is amplified by noting the location of the recent failures, six of which were above the biological shield where drywell temperatures are the greatest.

Corrective action was taken by replacing the failed units with eight new spares.

The significance of this type failure is in the event of a design bases earthquake no credit could have been taken for the seismic restraining ability of the failed units, the probability was increased that the piping systems affected would go into resonant vibration and possibly fail.

The following surveillance schedule is proposed:

1. Inspect all drywell snubbers as made available by scheduled or forced shutdowns requiring deinerting of the drywell, excepting shutdowns that occur within a four week period.

2. We will inspect all drywell snubbers within six weeks from July 28, 1973. Future surveillance schedules will be based on the results of this inspection. Our intentions will be made known to the Commission in a timely manner.

3. The snubber inspection will consist of the following:

   a) Hydraulic fluid level check

   b) Inspection of pistor rod for scratches to indicate possible misalignment between the rod and outboard bearing

c) Check to see if eyebolt nut is loose, which would indicate unit is free to move.

Enclosed are forty (40) copies of this report.

Very truly yours,

Joseph T. Carroll Jr
for

Donald A. Ross
Manager, Nuclear Generating Stations

DAR/pd
Enclosures

cc: Mr. J. P. O'Reilly, Director
Directorate of Regulatory Operations, Region I

JERSEY CENTRAL POWER & LIGHT COMPANY

OYSTER CREEK

NUCLEAR GENERATING STATION

DPR-16

SUMMARY REPORT ON SNUBBER REPAIR ACTIVITIES DURING SPRING 1973 REFUELING OUTAGE

PREPARED BY:

ARTHUR H. ROHE

AUGUST 6, 1973

DATE OF APPROVAL

STATION SUPERINTENDENT

Table of Contents

I. INTRODUCTION

As part of the in-service inspection program for the April 1973 refueling outage, an inspection of the drywell hydraulic shock and sway arrestors (HSSA) was conducted. This inspection revealed that a majority of the units were totally devoid of fluid which, consequently, resulted in their inoperability. Immediate steps were taken to contact the snubber supplier, Bergen Paterson Pipe Support Company, who recommended that a representative sampling of the snubbers in the drywell be sent to their shops for analysis.

On May 5, 1973, three (3) snubbers were removed from the drywell and shipped to the Rex Hanna Company, the snubber manufacturers for Bergen Paterson. The snubbers, which had been located one on each Main Steam Line and one on the Electromatic Relief Valve discharge piping, were completely dismantled and inspected. It was reported to Jersey Central Power and Light Company that the two snubbers located on the Main Steam Lines were in a very deteriorated condition requiring complete rebuilding. The third snubber was found to be in satisfactory condition requiring only hydraulic fluid addition, which is considered normal maintenance. It should be stated that the two failed units were in service longer than the third which was installed during the 1972 refueling outage.

As a result of this investigation, immediate steps were taken to remove and rebuild all snubbers in the drywell and those snubbers in the Reactor Building associated with safeguard equipment.

II. EQUIPMENT DESCRIPTION

THE HYDRAULIC SHOCK AND SWAY ARRESTOR (HSSA) UNIT (ILLUSTRATED IN FIGURE ONE) IS USED TO PROTECT PIPING SYSTEMS AND EQUIPMENT PIECES SUBJECT TO POSSIBLE DAMAGE FROM SHOCKS OR VIBRATION. IN EFFECT, THE ARRESTOR BECOMES A RIGID STRUCTURAL MEMBER UNDER IMPACTIVE LOADING CONDITIONS. IN DOING THIS IT IS CAPABLE OF TRANSFERRING LOADS FROM THE PIPING OR EQUIPMENT PROTECTED TO RIGID STRUCTURAL MEMBERS. THE ARRESTOR IS FURTHER DESIGNED TO ACCOMMODATE NORMAL THERMAL MOVEMENT OF THE EQUIPMENT PROTECTED WITH A MINIMUM OF RESISTANCE.

THE UNIT CONSISTS OF A DOUBLE ACTING PISTON CYLINDER ARRANGEMENT, AN EXTERNAL VALVE BLOCK AND A SPRING LOADED ACCUMULATOR ASSEMBLY (SEE FIGURE II).

DURING OPERATION, THE PISTON IS FREE TO MOVE UNRESTRICTED IN EITHER DIRECTION WITH THE POPPET VALVES REMAINING FULLY OPEN FOR ALL PISTON VELOCITIES UP TO 10 INCHES PER MINUTE. THIS VELOCITY IS GREATER THAN ANY OPERATIONAL THERMAL GROWTH AND LESS THAN THE VELOCITY OF ANY NORMALLY ANTICIPATED DISTURBING FORCE. BOTH THE COMPRESSION AND TENSION CONTROLLING POPPET VALVES ARE DESIGNED AND SET FOR CLOSURE WHEN THE PISTON VELOCITY EXCEEDS 10 INCHES PER MINUTE. WITH THE POPPET VALVES CLOSED, THE FLUID FLOW IS ESSENTIALLY STOPPED, THEREBY TRANSFORMING THE UNIT INTO A RIGID STRUCTURE (NOT ABSOLUTELY TRUE, DUE TO THE COMPRESSIBILITY OF THE SILICON FLUID; I.E., 3000 PSI WILL COMPRESS FLUID TO PERMIT 20 MILS OF PISTON TRAVEL). CLOSURE IS DESIGNED TO BE EFFECTED WITHIN 1/32-INCH OF PISTON ROD TRAVEL.

II. Equipment Description - Continued

The spring loaded accumulator serves as an oil reservoir to make up for small expected leaks. In addition, it serves to keep the hydraulic fluid under pressure, thereby allowing the HSSA to be mounted in a variety of positions without the hydraulic fluid draining out of the cylinder.

The hydraulic fluid used in the snubbers is of two types; one which is highly radiation resistant for use in the drywell, the other non-radiation resistant for use in the balance of the plant. The two fluids are, respectively, G.E.S.F. 1154 which is methyl phenyl silicone, and G.E.S.F.-96(50) which is dimethyl polysiloxane silicone. Silicone base fluids are used because they are non-flammable, non-corrosive, chemically inert and relatively stable over a wide temperature range. Normal ambient temperature range for continuous operation is from minus 30°F to plus 400°F.

All the seals used in the snubbers are made from DuPont ADIPRENE L-167 which is a polyurethane elastomer made from toluene diisocyanate polyether liquid prepolymer.

Tests verify that the seals are good even after exposure to radiation in excess of $1x10^8$ Roentgens.

The temperature characteristics of the seals are in question at this time. According to Bergen Paterson the polyurethane seals are suitable for continuous operating temperatures of 150°F and are capable of operating at temperatures up to 200°F for "sustained periods without impairment of function." The seals supplier on the otherhand say that 150°F should be considered the maximum operating temperature for the seals and that operation at 200°F will cause seal failure.

III. ORGANIZATION OF MAINTENANCE ACTIVITIES

A. REMOVAL AND REINSTALLATION:

BECAUSE OF THE HIGH RADIATION LEVELS PRESENT THROUGHOUT THE DRYWELL, IT WAS NECESSARY TO ORGANIZE THE REMOVAL ACTIVITIES SUCH THAT THE TIME EXPENDED PER SNUBBER REMOVED WOULD BE A MINIMUM. IT WAS THOUGHT THAT THIS COULD BEST BE ACCOMPLISHED BY DIVIDING THE DRYWELL INTO VOLUMES AND REMOVING THE SNUBBERS ON THIS BASIS. THE SNUBBERS REMOVED FROM THE VOLUME COULD THEN BE REBUILT AND MADE READY FOR REINSTALLATION IN A BATCH. THIS WOULD THEN ASSURE THAT THE SNUBBERS COULD BE TAKEN, WITHOUT CONFUSION, TO THE AREA OF THEIR REINSTALLATION. TO FURTHER FACILITATE THE REINSTALLATION, LARGE IDENTIFICATION NUMBERS WERE CLEARLY MARKED ON THE SNUBBER AND MOUNTING PLATE WHICH ALLOWED THE WORKERS TO QUICKLY MATCH THE SNUBBER TO ITS ASSOCIATED MOUNTING PLATE.

B. MAINTENANCE ACTIVITIES:

THE REBUILDING AREA WAS LOCATED ON 95' ELEVATION IN THE REACTOR BUILDING AND WAS DIVIDED INTO THREE WORK STATIONS. THERE WAS A DISMANTLING AND CLEANING STATION, A REBUILDING STATION, AND A UNIT QUALIFICATION STATION. THE FOLLOWING IS A DESCRIPTION OF THE ACTIVITIES PERFORMED AT EACH STATION.

1. DISMANTLING AND CLEANING STATION

THE PURPOSE OF THIS STATION WAS TO REMOVE ANY CONTAMINANTS AND RESIDUE FROM THE SNUBBER ASSEMBLIES, BOTH EXTERNALLY AND INTERNALLY. IN ADDITION, IT WAS CONVENIENT AT THIS TIME TO INSPECT AND RECORD THE AS FOUND CONDITION OF THE SNUBBERS. AFTER DISASSEMBLY, THE SNUBBER PARTS WERE GIVEN FIRST A DIRTY THEN CLEAN WASHING IN 111-TRICHLOROETHANE (1-50) SOLVENT. THIS PARTICULAR SOLVENT WAS CHOSEN BECAUSE IT LEAVES NO RESIDUE AND IS NON-

toxic.

It was also required to scrape and/or wire brush the remainder of the seals off of their seats in preparation for reassembly. In many cases, it was also required to press out the brass bushing and wiper ring in the outboard bearing because of initial misalignment between the piston rod and bearing housing. The misalignment caused scratching of the chrome-plated piston rod and the soft brass bushing.

2. Rebuilding Station

In order to assure maximum reliability for the rebuilt snubbers, it was desirable to perform the rebuilding operations under the cleanest conditions possible. Since the rebuilding was performed under field conditions, extreme care had to be taken to keep dirt, grit and debris out of the rebuilding area. This was accomplished by requiring a daily clean-up of the rebuilding area and a daily changing of the white blotter paper covering the rebuilding station table. The cleanliness criteria was further aided by the radiation protection requirements which required cotton and plastic gloves to be worn by individuals involved in the rebuilding activities (see attached detailed rebuilding procedure).

3. Unit Qualification Station

After rebuilding, the units were brought to the unit qualification station where they were filled with hydraulic fluid and operationally tested.

This was accomplished by forcing fluid under pressure through an alemite fitting into the accumulator cavity which in turn flowed into the main cylinder. The unit was then "stroked" using a pneumatic device

to assure that any trapped air was forced into the accumulator which could then be bled out through the fill plug. After it was assured through a repeated filling and bleeding procedure that the unit was properly filled, it was again stroked, at 10 inches per minute, to verify that both the tension and compression valves actuated properly, thereby transforming the unit into a rigid structure.

Finally, the units were transferred to a temporary storage area where they were placed on clean blotter paper for a 24 hour period. At the end of this period, if there was no evidence of oil spotting on the blotter paper, the units were transferred to their area of reinstallation. If spotting occurred, they were checked for leaks and repaired accordingly. A total of 9 units were rejected on this basis, 8 of which were repaired. The other unit, it was discovered, had a small crack in the main cylinder and was replaced in total by a new unit.

IV. ANALYSIS

TABLE ONE LISTS THOSE SNUBBERS REPAIRED AND TABULATES THE INDIVIDUAL COMPONENTS REPLACED. IN ALL CASES, THE SNUBBERS WERE MADE INOPERABLE DUE TO A LACK OF HYDRAULIC FLUID. THOSE SNUBBERS LOCATED WITHIN THE DRYWELL SHOWED SEVERE SEAL DETERIORATION TO THE POINT OF BEING INCAPABLE OF RETAINING HYDRAULIC FLUID EVEN FOR A SHORT TIME. IT IS NOT FULLY KNOWN, AS YET, EITHER THE CAUSE OF SEAL FAILURE OR THE LENGTH OF TIME IT TOOK FOR THE FAILURES TO OCCUR.

IT IS FURTHER NOT UNDERSTOOD WHY THERE APPEARED TO BE SAND, GRIT, DIRT AND WATER IN THE ACCUMULATOR, OR WHY MANY OF THE ACCUMULATOR SPRINGS WERE BROKEN. INSPECTION OF THE SEALS INDICATED THAT A POSSIBLE CAUSE OF FAILURE MAY HAVE BEEN DUE TO EITHER EXCESSIVE HEAT OR CHEMICAL ATTACK. PRESENTLY, DISOGRIN COMPANY, THE SEALS SUPPLIER, IS RUNNING A SERIES OF TESTS HEATING SEALS IMMERSED IN THE RADIATION-RESISTANT HYDRAULIC FLUID TO VARIOUS TEMPERATURES AND OBSERVING THE RATE OF DEGRADATION.

THEIR PRELIMINARY RESULTS SHOW THAT AMBIENT DRYWELL TEMPERATURES IN CERTAIN AREAS (165°F) ARE HIGH ENOUGH TO CAUSE SEAL DAMAGE OVER EXTENDED PERIODS OF TIME. HOWEVER, THE BULK OF THE SNUBBERS ARE NOT SUBJECT TO TEMPERATURES IN EXCESS OF 125°F AND, THEREFORE, SHOULD NOT EXPERIENCE SEAL FAILURE. TO EXPLORE THIS AREA FURTHER, TWO THERMOCOUPLES WERE PLACED ON A SNUBBER (SEE FIGURE III) ATTACHED TO THE MAIN STEAM LINE AT A POINT JUST UPSTREAM OF THE MAIN STEAM SAFETY VALVES ON THE NORTH HEADER.

THIS SNUBBER WAS CHOSEN BECAUSE IT EXHIBITED THE MOST SEVERE SEAL FAILURE. THE TEMPERATURE OF THE SNUBBER ACCUMULATOR AT RATED REACTOR PRESSURE, TEMPERATURE, AND STEAM FLOW WAS 139°F, WHICH IS WITHIN THE WORKING

range of the seals. It should be pointed out that the measured temperature is a "skin" temperature and it is conceivable that the internal temperature is higher. This is possible due to small amplitude vibrations being converted into heat because of fluid friction on the poppets and seats.

The damaging effects of radiation has been ruled out since both the seals and 1154 hydraulic fluid are highly radiation resistant.

It has been suggested that perhaps the snubbers had been stored outside during the construction of the plant and this is the reason for their failure. This would then explain how sand, dirt and grit entered the accumulator. However, we have been assured by Harold Erickson of Bergen Paterson that this was not the case. He stated that he supervised the installation of the snubbers originally and maintains they were stored indoors at the site for only a very short period of time prior to installation.

A finalized report from Rex Hanna is expected which will detail the results of their investigation as to why the units failed as they did and their recommendation to assure this will not happen again in the future.

V. SAFETY SIGNIFICANCE

THE SAFETY SIGNIFICANCE OF THE SNUBBER FAILURES IS QUITE PROFOUND SINCE, IN THE EVENT OF AN EARTHQUAKE, NO CREDIT COULD BE TAKEN FOR THE SEISMIC RESTRAINING ABILITY OF THE UNITS. THE CONSEQUENCES OF LOOSING THIS ABILITY MAY OR MAY NOT PRESENT A CONDITION WHEREBY THE PROTECTED COMPONENTS WILL FAIL; THIS IS SOLELY DEPENDENT UPON THE SPECTRAL ENERGY OF THE EARTHQUAKE. THE DYNAMIC LOADING CAUSED BY THE EARTHQUAKE, IN ITSELF, DOES NOT CAUSE APPRECIABLE STRESSES IN THE PROTECTED SYSTEMS UNLESS THE FREQUENCY OF THE EARTHQUAKE RESULTS IN RESONANT VIBRATION. IN THIS EVENT, THE FAILURE PROBABILITY IS VERY GREAT SINCE THE DYNAMIC LOADING IS AMPLIFIED QUITE SIGNIFICANTLY.

THE FUNCTION OF THE SNUBBER IS TO INCREASE THE RESONANT FREQUENCY OF THE SYSTEM TO A POINT WHERE IT IS UNLIKELY THAT AN EARTHQUAKE WILL CONTAIN VIBRATIONAL ENERGY IN THIS FREQUENCY RANGE. THIS IS ACCOMPLISHED BY ADDING SNUBBER RESTRAINTS AT POINTS IN THE PIPING SYSTEM WHERE THE RESONANT AMPLITUDE IS A MAXIMUM FOR THE FIRST SIX MODES OF RESONANT VIBRATION.

IN THE FINAL ANALYSIS IT CAN ONLY BE CONCLUDED THAT THE PROBABILITY OF A COMPONENT OR SYSTEM FAILURE WAS INCREASED UNDER DESIGN BASES EARTHQUAKE CONDITIONS.

FIGURE I

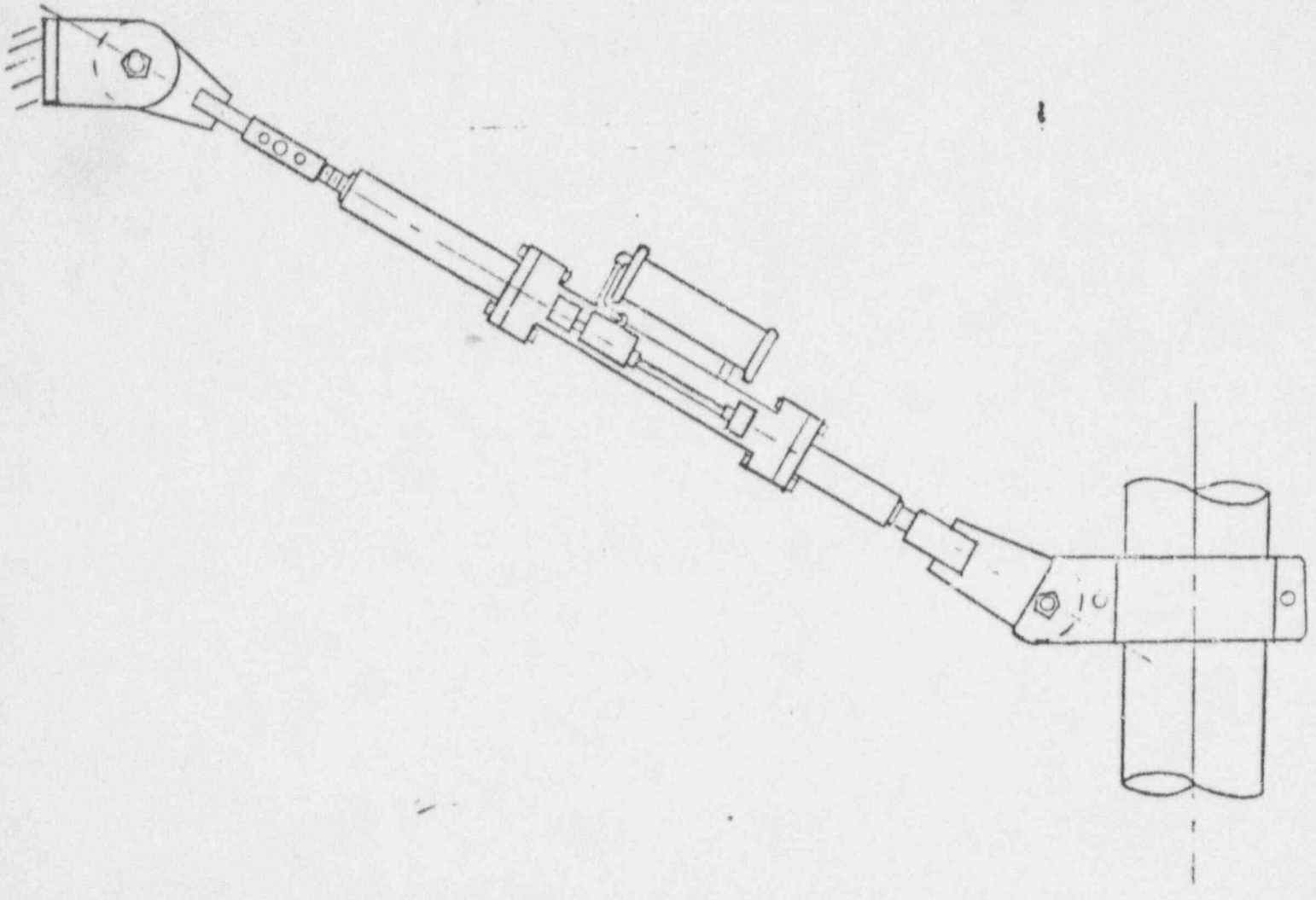


FIGURE II

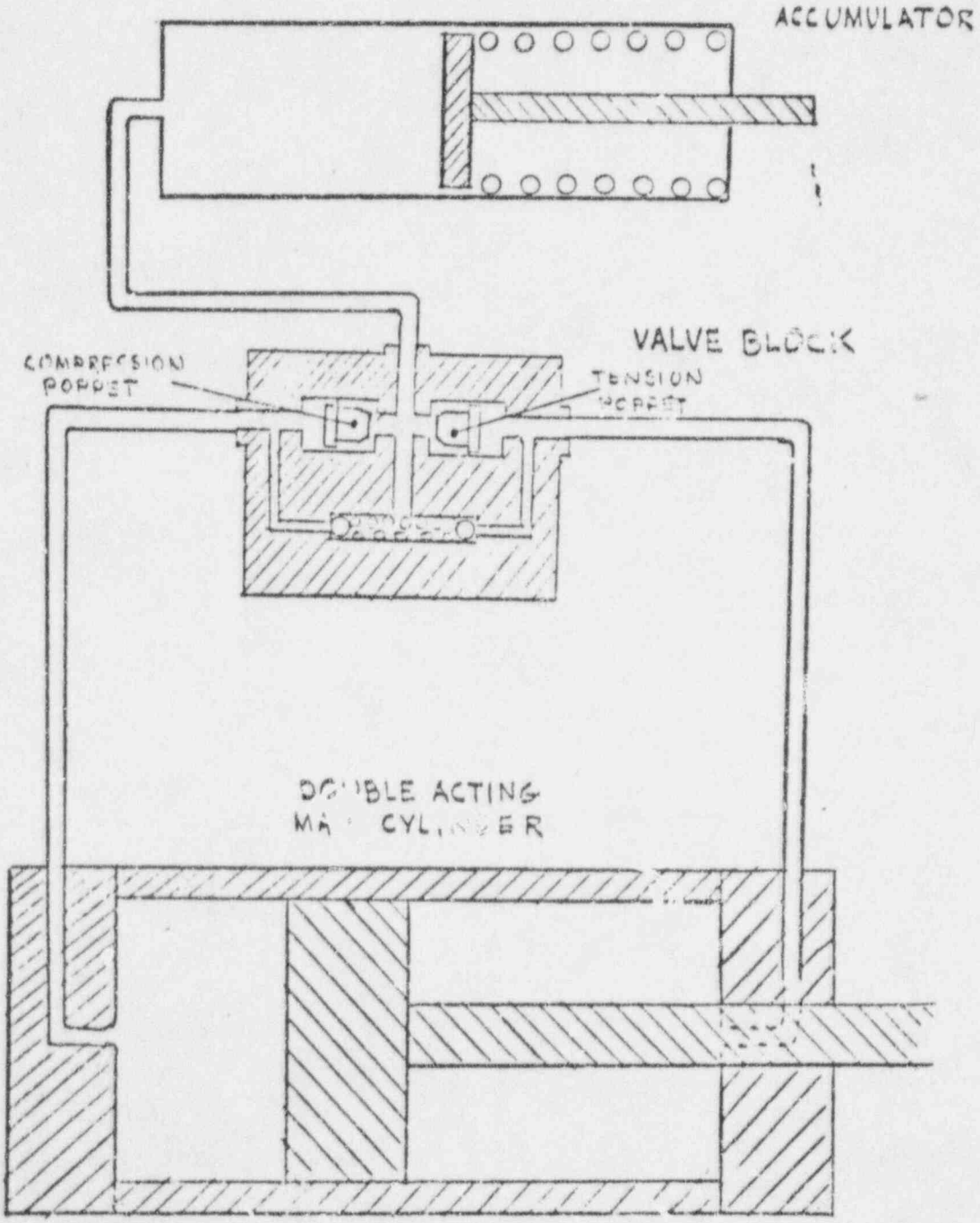

ACCUMULATOR
VALVE BLOCK
COMPRESSION PORPET
TENSION PORPET
DOUBLE ACTING MAIN CYLINDER

FIGURE III

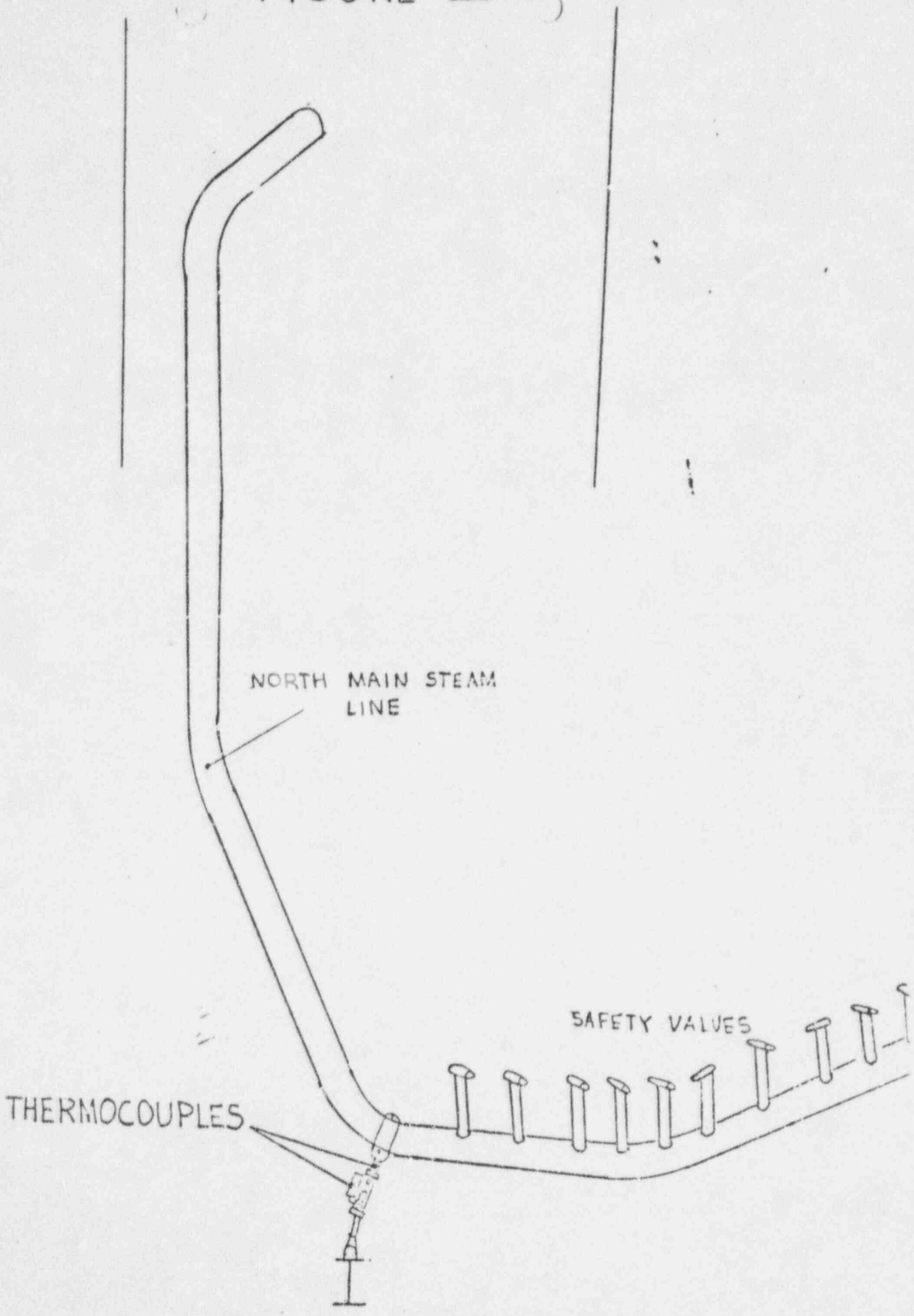
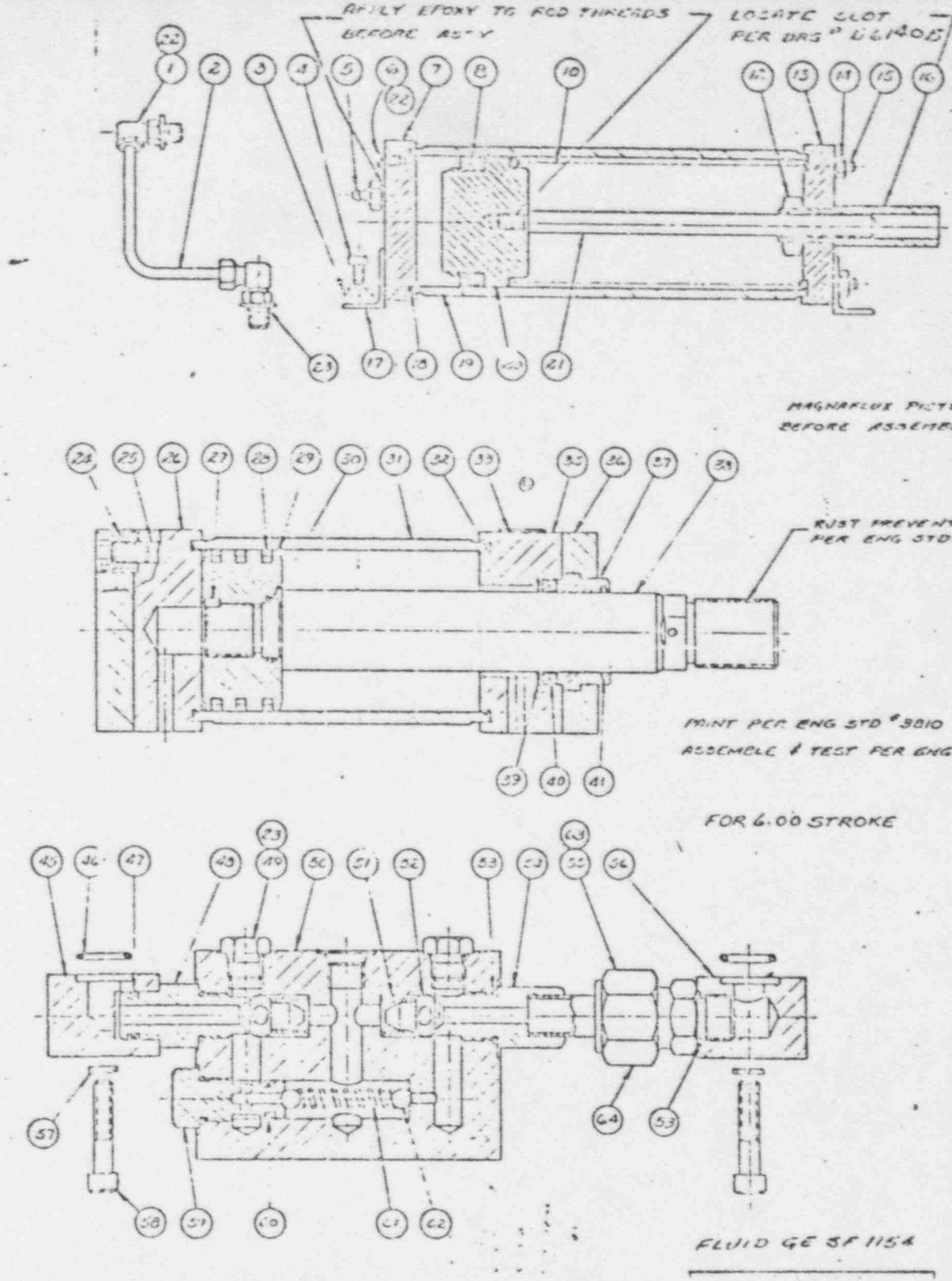


TABLE I

NOMENCLATURE DESIGNATION	SYSTEM
-RB	REACTOR BUILDING
-DW	DRYWELL
CS-	CONTAINMENT SPRAY
COS-	CORE SPRAY
CU-	CLEAN UP
EC-	EMERGENCY CONDENSER
ERV-	ELECTROMATIC RELIEF VALVE
NFW-	NORTH FEEDWATER
NMS-	NORTH MAIN STEAM
SDC-	SHUTDOWN COOLING
SFW-	SOUTH FEEDWATER
SMS-	SOUTH MAIN STEAM
T-	TORUS

No.	PART NAME	REQ	PART NO.
1	[illegible] FITTING	2	D2[illegible]A
2	[illegible]	1	D2[illegible]17A
3	[illegible]	2	D28058-13
4	[illegible] SCREW	2	[illegible]
5	[illegible] PLUG	1	D[illegible]
6	[illegible] SCREW	1	D27259C
7	[illegible] HEAD	1	D2[illegible]
8	[illegible] SEAL	1	D2[illegible]-1
9			
10	[illegible] SPRING	1	D2[illegible]
11	[illegible]	0	
12	[illegible] NUT	1	D23[illegible]-8
13	[illegible] HEAD	1	D2[illegible]37
14	[illegible] NUT	2	D2[illegible]-1
15	[illegible] ROD	4	D2[illegible]L
16	[illegible] TUBE	1	D2[illegible]6
17	[illegible] FOOT	2	[illegible]
18	[illegible] SEAL	1	D[illegible]4A-1
19	[illegible]	1	D2[illegible]5A
20	[illegible]	1	D2[illegible]39
21	[illegible] ROD	1	D2[illegible]E
22	[illegible] INTERNAL O RING	3	4[illegible]-5
23	O RING	2	D27755C-4
24	[illegible] ROD NUT	1	D2[illegible]-6
25	[illegible] ROD	1	D2[illegible]773U
26	[illegible] HEAD	1	5[illegible]
27	[illegible]	1	D2[illegible]-1
28	[illegible] RING	3	C54[illegible]-1
29	PISTON	1	C7213H
30	PISTON O RING	1	A61[illegible]
31	[illegible] TUBE	1	D3071[illegible]8
32	TUBE O RING	2	46151-9
33	NAME PLATE	1	D22590
34			
35	[illegible] HEAD	1	A6120
36	[illegible] RETAINER FLANGE	1	C1103[illegible]
37	GLAND	1	D29922
38	PISTON ROD	1	C1101[illegible]
39	[illegible] WASHER	1	D2[illegible]60
40	[illegible] PACKING	1	D28213-24
41	[illegible] WIPER	1	D20405-4
42			
43			
44			
45	[illegible] MANIFOLD BLOCK	1	D2[illegible]15
46	MANIFOLD O RING	2	46150-10
47	O RING	1	46152-1
48	MANIFOLD CONNECTOR	1	D28590A
49	[illegible] PORT PLUG	2	D2703[illegible]-1
50	VALVE BODY	1	85[illegible]5
51	[illegible] SPRING	2	D1[illegible]06
52	POPPET	2	D275945
53	O RING	4	D27755C-6
54	MANIFOLD TUBE CONNECTOR	1	D2[illegible]37
55	[illegible] TUBE FITTING	2	D28561A
56	[illegible] MANIFOLD BLOCK	1	D29824
57	[illegible] WASHER	8	D1[illegible]-C8
58	MANIFOLD SCREW	4	D2[illegible]-[illegible]7
59	[illegible] VALVE SEAT	1	D2[illegible]8A
60	O RING	1	46150-6
61	[illegible] VALVE SPRING	1	[illegible]
62	[illegible] VALVE BALL	2	[illegible]



PARTS LIST ASSEMBLY

[illegible] CO. STM. SNUBBER

A SUBSIDIARY OF [illegible]

TYPE OF FLUID	COMMENTS
76-50	GOOD CONDITION, HALF FILLED WITH OIL
1154	
96-50	ROD FREE, SEALS GOOD CONDITION TUBE FITTINGS LOOSE, REFILLED W/
96-50	ROD FROZEN, SEALS IN GOOD CON OIL IN ACCUMULATOR, REFILLED
1154	ROD FREE IN CYL DIRTY - NO OIL
76-50	REFILLED
76-50	REFILLED
96-50	REFILLED
96-50	REFILLED
96-50	REFILLED
96-50	REFILLED
96-50	REFILLED
96-50	REFILLED
96-50	GRIT JOINT SAND AND WATER SPRING CAVITY, REFILLED W
96-50	REFILLED
96-50	REFILLED
1154	SEALS IN GOOD CONDITION REFILLED WITH 1154 FLUID
96-50	REFILLED
96-50	REFILLED
96-50	OLD TYPE UNIT, VERY GOOD CON ELECTRICAL VALVE [illegible]
96-50	SEALS IN GOOD
96-50	OLD TYPE UNIT VERY GOOD CONDITION, REFILLED W 1154
96-50	NOT TIGHT, REFILLED WITH 1154
96-50	REFILLED
96-50	REFILLED

Part columns (headings, partly illegible): SEAL; ACCUMULATOR SPRING; SPRING GUIDE; PROTECTIVE TUBE NUT; FRONT HEAD; TIE ROD NUT; TIE ROD; PROTECTIVE TUBE; MOUNTING FOOT; HEAD SEAL; TUBE; PISTON; TAIL ROD; FITTING INT "O" RING; "O" RING; TIE ROD NUT; TIE ROD; BACK HEAD; PISTON LOCK PIN; PISTON RING; PISTON; PISTON "O" RING; CYL TUBE; TUBE "O" RING; NAME PLATE; FRONT HEAD; FRONT RETAINER PLUG; GLAND; PISTON ROD; PACKING WASHER; ROD PACKING; ROD WIPER; CUTTER AND PRIMER; REAR MANIFOLD BLOCK; MANIFOLD "O" RING; "O" RING; MANIFOLD CONNECTOR; PIPE PORT PLUG; VALVE BODY; POPPET SPRING; POPPET; "O" RING; MANIFOLD TUBE CONN.; TUBE FITTING; LOCK WASHER; MANIFOLD SCREW; RELIEF VALVE SEAT; "O" RING; RELIEF VALVE SPRING; RELIEF VALVE BALL; FITTING INT. "O" RING; PACKING WASHER

TYPE OF FLUID	COMMENTS
76-50	REFILLED
76-50	REFILLED
76-50	REFILLED
1154	ROD FROZEN, TUBE FITTING LOOSE, SAND & GRIT IN ACCUM SPRING [illegible]
1154	ROD FROZEN, CYLINDER FILL[illegible] WITH A BLACK SUBSTANCE - NO - OIL
1154	BLACK OIL IN ACCUM, DIRT, GRIT ACCUM NO - OIL
1154	ACCUM PACKING MELTED NO - OIL
1154	ROD FROZEN, DIRT & WATER IN SPRING CAVITY
1154	ROD STUCK, OUTBOARD BRG TIGHT DIRT IN SPRING CAVITY
1154	NO OIL - CYLINDER CLEAN
1154	GOOD CONDITION - NO OIL - CHANGED PACKING
1154	ROD FROZEN, HAD TO BE HAMMERED OUT, BLACK GOO INSIDE - NO OI[L]
1154	GOOD CONDITION, VALVE SEAT BAD BUT CLEAN - PACKING MELTED
1154	REPAIRED AT FACTORY
1154	ACCUMULATOR PACKING MELTED, RUSTY - NO OIL
1154	ROD FROZEN, ACCUMULATOR SPRING BROKEN, DIRT + GRIT IN ACCUM
1154	ROD FROZEN IN GLAND, DIRT & WATER IN ACCUM SOME OIL
1154	ROD FROZEN, DIRT IN ACCUM, FITTING LOOSE
1154	ROD FROZEN, FITTINGS LOOSE, WATER OIL + SAND + GRIT IN ACCUM
1154	ROD LOOSE [illegible] SPRING BROKEN + SAND + GRIT IN ACC
1154	ACCUMULATOR RUSTY, BLACK GOO IN CYLINDER
1154	ACCUMULATOR RUST - NO OIL
1154	ROD FROZEN, RUST [illegible] ACC SPRING DAMAGED - NO OIL
1154	ROD FREE, [illegible]
1154	ROD STUCK IN GLAND [illegible] DIRT + RUST IN ACCUM [illegible]
1154	REPAIRED AT [illegible]

Part columns (checklist headings, left to right): [illegible], Piston Head, Accumulator Spring, Spring Guide, Protective Tube Nut, Front Head, Tie Rod Nut, Tie Rod, Protective Tube, Mounting Foot, Head Seal, Tube, Piston, Tail Rod, Fitting Int. "O" Ring, "O" Ring, Tie Rod Nut, Tie Rod, Back Head, Piston Lock Pin, Piston Ring, Piston, Piston "O" Ring, Cyl Tube, Tube "O" Ring, Name Plate, Front Head, Front Retainer Flg, Gland, Piston Rod, Packing Washer, Rod Packing, Rod Wiper, Outboard Retainer, Outboard Rod Wiper, Rear Manifold Block, Manifold "O" Ring, "O" Ring, Manifold Connector, S.A.E. Port Plug, Valve Body, Poppet Spring, Poppet, "O" Ring, Manifold Tube Conn, 1/4" Tube Fitting, Front Manifold Block, Lock Washer, Manifold Screw, Relief Valve Seat, "O" Ring, Relief Valve Spring, Relief Valve Ball, Fitting Int. "O" Ring, Packing Washer

TYPE OF FLUID	COMMENTS
115[illegible]	ROD FROZEN, BLACK GOO IN CYLINDER, RUST, DIRT IN ACCUM [illegible]
1154	ROD FROZEN, BLACK GOOP IN CYL, ELECTROLYTIC REACTION
1154	ROD FROZEN, ACCUMULATOR DIRTY - NO OIL
1154	ROD FROZEN, TUBE FITTINGS LOOSE SAND, DIRT + WATER IN ACCUM [illegible]
1154	ROD FROZEN TIGHT, WATER IN ACCUM, BROKEN ACCUM SPRING, NO OIL
1154	ROD FROZEN, ACCUMULATOR DIRTY - NO OIL
1154	CYLINDER [illegible] PISTON [illegible]
1154	ROD FROZEN, TUBE FITTINGS LOOSE [illegible]
9650	TUBE FITTINGS LOOSE, REFILLED WITH 1154 SEALS IN GOOD SHAPE
9650	ROD FROZEN, DIRT FOUND IN THE ACCUMULATOR, REFILLED 1154
1154	ROD FROZEN - NO OIL
1154	ROD FREE, [illegible] TUBE FITTINGS LOOSE, RESIDUE IN ACCUM [illegible]
1154	ROD FROZEN TIGHT, NO OIL SAND & GRIT IN CYL. TUBE FITTING [illegible]
1154	GENERALLY GOOD SHAPE, CHANGED PACKING & REFILLED - SOME OIL
9650	ROD FROZEN, SAND, DIRT, GRIT IN ACC, NO OIL, REFILLED WITH 1154
1154	ROD FROZEN, TUBE FITTINGS LOOSE, SEALS [illegible] CRATED [illegible]
1154	GOOD SHAPE GENERALLY [illegible] HEAD - NO OIL
1154	FAIR CONDITION, GRIT [illegible] ACCUM [illegible]
1154	ROD FROZEN, DIRT IN ACCUMULATOR
1154	ROD FROZEN, SEALS VERY BAD, DIRT IN ACCUMULATOR
1154	ROD FROZEN, TUBE FITTINGS LOOSE, MUD & SILT IN ACCUM [illegible]
1154	ROD FROZEN, ACCUMULATOR [illegible] NO OIL
1154	
1154	ACCUM [illegible]
	ROD FROZEN [illegible]

IDENTIFICATION NUMBER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		137	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	137	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LOCATION AND SYSTEM OF SNUBBERS	[illegible]-RB	[illegible]-RB	T-RB	T-RB	EC-RB	CoS-RB		FC-RB	EC-RB	CoS-RB	[illegible]-RB	SC-RB	EC-RB	CoS-RB	CoS-AE	[illegible]-RP	SDC-DW	CW-DW	EC-DW	SFW-DW	CW-DW	EC-DW	SFW-DW	SHS-DW	EC-DW	EC-DW
[illegible] TUBE FITTING																										
[illegible] TUBE																										
WASHER																										
MOUNTING SCREW																										
FILLER PLUG								X					X	X		X	X	X	X	X	X	X	X	X	X	X
BLEEDER SCREW								X					X	X		X	X	X	X	X	X	X	X	X	X	X
[illegible] HEAD																										
PISTON HEAD								X					X	X			X	X	X	X	X	X	X	X	X	X
ACCUMULATOR SPRING																					X			X		
SPRING GUIDE																										
PROTECTIVE TUBE NUT																										
FRONT HEAD																										
TIE ROD NUT																										
TIE ROD																										
PROTECTIVE TUBE																										
MOUNTING FOOT																										
HEAD SEAL								X					X			X	X	X	X	X	X	X		X		X
TUBE																										
PISTON																										X
TAIL ROD																										X
FITTING INT "O" RING								X					X	X		X	X	X		X	X		X	X	X	X
"O" RING								X					X	X		X	X	X	X	X	X		X	X	X	X
TIE ROD NUT																										
TIE ROD																										
BACK HEAD																										
PISTON LOCK PIN																										
PISTON RING																										
PISTON																										
PISTON "O" RING								X					X	X			X		X	X	X	X			X	X
CYL TUBE																										
TUBE "O" RING								X					X	X		X	X	X		X	X	X	X	X	X	X
NAME PLATE																										
FRONT HEAD																										
[illegible] RETAINER [illegible]																										
GLAND																										
PISTON ROD													X	X		X										
PACKING WASHER																		X								
ROD PACKING								X					X	X		X	X	X	X	X	X	X	X	X	X	X
ROD WIPER								X					X	X		X	X	X	X	X	X	X	X	X	X	X
OUTBOARD BEARING																							X	X		X
OUTBOARD ROD NUT																		X					X	X		X
REAR MANIFOLD BLOCK																										
MANIFOLD "O" RING								X					X	X		X	X	X	X	X	X	X	X	X	X	X
[illegible] RING								X					X	X		X	X	X	X	X	X	X	X	X	X	X
MANIFOLD CONNECTOR																										
[illegible] PORT PLUG																										
VALVE BODY																										
POPPET SPRING																										
POPPET																										
"O" RING													X	X		X	X	X	X	X	X	X	X	X	X	X
MANIFOLD TUBE CONN																										
[illegible] TUBE FITTING																										
[illegible] MANIFOLD [illegible]																										
LOCK WASHER																										
MANIFOLD SCREW																										
RELIEF VALVE SEAT																										
"O" RING													X	X		X	X	X	X	X	X	X	X	X	X	X
RELIEF VALVE SPRING																										
RELIEF VALVE BALL																										
FITTING INT "O" RING													X	X		X	X		X	X	X	X	X	X	X	X
BACK UP WASHER																							X			
TYPE OF FLUID	96-50	96-50	96-50	96-50	96-50	96-50		96-50	96-50	96-50	96-50	96-50	96-50	96-50	96-50	96-50	1154	1154	1154	1154	1154	1154	1154	1154	1154	1154
	RE FIL[illegible]	SEALS WATER	SEALS PIPE [illegible]	REFILL	REFILL	REFILL		REFILL IN [illegible]	REFILL	REFILL	REFILL	REFILL	SEALS [illegible]	SEALS [illegible]	REFILL	SEALS [illegible]		ROD FX GUIDE [illegible]		PISTON	ROD F[illegible]	ROD F	ROD F[illegible] [illegible]	ROD F[illegible]		ROD FX [illegible]

Snubber identification number	Location and system of snubbers	Type of fluid	Remarks
[illegible]	CC-RB	96-50	REF
[illegible]	CC-[illegible]	[illegible]	[illegible]
[illegible]	EC-RB	96-50	SEAL
[illegible]	CCS-RB	96-50	REFIL
[illegible]	EC-RB	96-50	SEA
[illegible]	CD-DW	1154	ROD [illegible]
[illegible]	CCS-RB	96-50	REF
[illegible]	T-RB	96-50	ROD SEAL
[illegible]	CCS-RB	96-50	REFIL
[illegible]	T-RB	96-50	ACCU [illegible]
[illegible]	EC-RB	96-50	REF
[illegible]	EC-RB	96-50	REF
[illegible]	CC-RB	96-50	REF
[illegible]	EC-RB	96-50	REF
[illegible]	EC-RB	96-50	RE
[illegible]	T-RB	96-50	[illegible]
[illegible]	CCS-RB	96-50	[illegible]
[illegible]	CCS-RB	96-50	REF
[illegible]	EC-RB	96-50	SEAL
[illegible]	CCS-RB	96-50	REF
[illegible]	ERV-DW	1154	[illegible]
[illegible]	CCS-RB	96-50	REF
[illegible]	CCS-RB	96-50	REF
[illegible]	[illegible]-RB	96-50	REF
[illegible]	[illegible]	96-50	REF
[illegible]	[illegible]	96-50	REF
[illegible]	[illegible]	1154	[illegible]

Part	EC-RB	EC-RB	CD-DW	T-RB	T-RB	T-RB	CCS-RB	EC-RB	ERV-DW	[illegible]
Tube fitting										
Tube										
Washer										
Mounting screw										
Filler plug										
Bleeder screw	XX	XX	XX	XX	XX	XX	XX	XX	XX	
Back head										
Piston head	X	X	X	X	X	X	X	X	X	
Accumulator spring										
Spring guide										
Protective tube nut										
Front head										
Tie rod nut										
Tie rod										
Protective tube										
Mounting foot										
Head seal		X	X		X	X	X		X	X
Tube										
Piston										
Tail rod										
Fitting int "O" ring	XX	XX	XX		X	XX	XX	XX	XX	XX
"O" ring	XX	XX	XX	X	X	XX	XX	XX	XX	
Tie rod nut										
Tie rod										
Back head										
Piston lock pin										
Piston ring										
Piston										
Piston "O" ring	X	X	X	X	X	X	X	X	X	
Cyl tube										
Tube "O" ring	X	X	X	X	X	X	X	X	X	X
Name plate										
Front head										
Front retainer ring										
Gland										
Piston rod	X	X	X					X	X	
Packing washer										
Rod packing	X	X	X	X	X	X	X	X	X	
Rod wiper	X	X	X	X	X	X	X	X	X	
[illegible]										
[illegible]										
Rear manifold block										
Manifold "O" ring	X	XX	XX	XX	X	XX	X	XX	XX	
"O" ring										
Manifold connector										
Spare port plug										
Valve body										
Poppet spring										
Poppet										
"O" ring	X	X	X	X	X	X	X	X	X	X
Manifold tube conn										
Tube fitting										
Front manifold block										
Lock washer										
Manifold poppet										
Relief valve seat										
"O" ring	X	X	X	X	X	X	X	X	X	X
Relief valve spring										
Relief valve adj.										
Fitting int "O" ring	X	X	X	X	X	X	X	X	X	X
Packing washer										

IDENTIFICATION NUMBER	1X	#7
LOCATION AND SYSTEM OF SNUBBERS	FC-KT	(EC-D4)
1/2" TUBE FITTING		
1/4" TUBE		
WASHER		
MOUNTING SCREW		
FILLER PLUG	X	X
BLEEDER SCREW	X	X
BACK HEAD		
PISTON HEAD	X	
ACCUMULATOR SPRING		
SPRING GUIDE		
PROTECTIVE TUBE NUT		
FRONT HEAD		
TIE ROD NUT		
TIE ROD		
PROTECTIVE TUBE		
MOUNTING FOOT		
HEAD SEAL	X	
TUBE		
PISTON		
TAIL ROD		
FITTING INT "O" RING	X	X
"O" RING	X	
TIE ROD NUT		
TIE ROD		
BACK HEAD		
PISTON LOCK PIN		
PISTON RING		
PISTON		
PISTON "O" RING	X	X
CYL TUBE		
TUBE "O" RING	X	
NAME PLATE		
FRONT HEAD		
FRONT RETAINER PLG		
GLAND		
PISTON ROD		
PACKING WASHER		
ROD PACKING		
ROD WIPER		
OUTBOARD ROD [illegible]		
OUTBOARD ROD BUSHING		
REAR MANIFOLD BLOCK		
MANIFOLD "O" RING		
"O" RING		
MANIFOLD CONNECTOR		
BASE PORT PLUG		
VALVE BODY		
POPPET SPRING		
POPPET		
"O" RING	X	X
MANIFOLD TUBE CONN		
1/2" TUBE FITTING		
FRONT MANIFOLD PLUG		
LOCK WASHER		
MANIFOLD SCREW		
RELIEF VALVE SEAT	X	X
"O" RING		
RELIEF VALVE SPRING		
RELIEF VALVE PLUG		
FITTING INT "O" RING	X	X
BACKUP WASHER		
TYPE OF FLUID	96-50	154
	GENERAL [illegible]	ROD F

REVISED 1-12-69 C. Sco

C.N. NO. 3836

G.T.K

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED
ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (Bergen Pipesupport)

1. CLEANLINESS

Cleanliness is the most important part of this assembly. Cleanliness of parts, work-place, and the person who assembles and tests the snubber will directly affect its performance. Some of the flow passages are extremely small and the slightest chip, piece of lint, or particle of dirt will prevent the snubber from operating properly.

2. PREASSEMBLY INSPECTION

Visually inspect all parts for:

1. Correct material.
2. Surface finishes where specified:
   a. Gland ID
   b. Rod
   c. O-Ring grooves
   d. Valve bores & seats
   e. Poppet surfaces
   f. Head bore and side with ports
3. Nicks or cuts on all seals, & check fully to detail dwgs
4. Deburring of all parts especially at intersection of two holes and at threads.
5. Chamfers and corner breaks.
6. Chips, lint, dust, rust, dirt, etc.
7. Flatness of male pkg adapter. Use surface plate & indicate to within .001 T.I.R. on narrow part of adapter.
8. Inspect piston rods for cracks using Magnaflux process.

3. PARTS CLEANING

Thoroughly clean all parts immediately before assembly or sub-assembly in trichloroethane. If any cleaned parts are not assembled during the same work period they must be re-cleaned during the next work period when they will be assembled and sealed.

CAUTION:

Use trichloroethane with precautions listed on DWG STD 3809.

4. POPPET VALVE SEATING

Use tool No. T-8356 and fixture No. T-8390. Insert the seating tool into the valve body (B-5695) and apply 400 to 450 psi to the fixture cylinder, holding it for 5 seconds. Repeat for opposite side. (SEE SHEET 6)

5. POPPET SHOULDER

Use tool No. T-8355 and fixture No. T-8390. Place the poppet blank in the tool cavity and apply proper pressure (see sheet 7) to the fixture cylinder. Hold pressure for 5 seconds. (See also sheet 7)

APPROVED
G.F.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING RECOMMENDED PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (Bergen Pipesupport)

6. VALVE ASSEMBLY

Assemble the valve per correct parts list given on order. Be sure that all parts purchased or manufactured are clean. As part of the assembly install both manifold connectors, tubes, and blocks. Torque the connector fittings and relief valve seat to 216 inch-pounds. Do not torque the compression sleeve fitting on the manifold connection tube more than finger-tight. Place a length of masking tape over holes in manifold blocks. Seal all three vertical holes with SAE port plugs.

7. VALVE TESTING

Install the valve-manifold assembly on the valve test rig. Close valves leading to open (unused) ports and one valve leading to valve under test.

A. Open Poppet Flow Rate (SEE SHEET 8)
   1. Open valves 1, 2, & 3 wide. Crack open valve #9. Start pump.
   2. Slowly close valve 3 until weight begins to rise. Control rise of weight with valve #9 so it will not close safety switch in less than 2 minutes.
   3. Measure oil flow rate (see sheet 9 for limits). Adjusting valve #1 may be necessary to attain maximum flow rate.

B. By-Pass Flow Rate (SEE SHEET 5)
   1. Open valves 1, 2, & 3. Start pump.
   2. Adjust valve 3 until gage reads 20 psi.
   3. Measure by-pass flow through poppet orifice. Accept flow rates as listed on sheet 9. Poppets not passing these amounts can be re-seated in die. Those passing more must be scrapped.

C. Poppet Opening (SEE SHEET 4)
   1. Poppets must open to free flow within 20 seconds after being subjected to more than 20 psi.

Repeat above tests for opposite side of valve. After testing, install an SAE port plug, finger tight, in the center of the valve.

REVISED [illegible] 6/13/80

C.N. NO. 3838

G.F.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING RECOMMENDED PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (Bergen Pipesupport)

8. CYLINDER AND ACCUMULATOR ASSEMBLY

Look carefully at the order to determine what mounting style and stroke is required. Assemble the piston to rod, torque as indicated on Sheet 10, , and install grub pin. Peen over grub pin using round nose punch with 0.375 radius. From this point on pay close attention to the sections on Preassembly Inspection and Parts Cleaning. The cylinder must be just as clean as the valve and accumulator. The bench, vises, tools, and hands must be absolutely clean. Torque the tie rods as indicated on Sheet 10. . When complete, apply masking tape over ports. Store the cylinder under cover in a clean place since even the external dirt may find its way inside.

Assemble the accumulator with the same care as the cylinder. Torque tie rods to 100 inch-pounds. Install an SAE port protector plug in the port and turn in finger tight. Torque the Alemite fitting to 125 inch-pounds and the Sealscrew to 50 inch-pounds. Store the accumulator in a clean place and cover. NOTE: COAT SPRING WITH MAGNAPLATE 31 PER ENG STD 3018. Use epoxy cement on tail rod and Alemite fitting.

9. FILLING AND STATIC TEST

Before removing the tapes from the cylinder, carefully clean the surface around the ports. When filling, use clean, filtered fluid as listed on the assembly or parts lists drawing given on the order. Pull the rod out to full extension. Fill both ends of the cylinder with ports facing upward. Fill the Valve-Manifold Assembly, install valve-manifold assembly with the O-Rings specified and torque manifold block cap screws to 125 inch-pounds torque. Do not torque the manifold connector fitting at this time.

Install transparent filler tube with elbow in center port of valve, and fill half full with filtered fluid. Using the stroking rig, move the rod in and out an inch or two until all air is bled out. Pull the rod all the way out, adding oil as it is needed. Rotate the snubber 90 degrees so that valve plugs are up. Remove the filler tube and connect the high pressure pump to the valve. Pump until pressure gage reads 4000 psi. Look for leaks at valve, tube fittings, manifold blocks, tube-to-head seals, and gland. Hold for one minute. Release pressure and push rod all the way in.

ISSUED 1-2-68

REVISED 1-10-68 C/N 3850

C.N. NO. 2250

APPROVED G.E.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (Bergen Pipesupport)

10. FINAL ASSEMBLY
With the snubber still in the stroking rig, set the accumulator loosely in place without the cap screws. Screw the (freshly cleaned) SAE elbows loosely into the valve and accumulator ports. Install the connecting tube assembly (freshly cleaned) with the compression nuts hand tight. Insert the cap screws to hold the accumulator in place, torquing to 125 inch-pounds. Torque the bent tube compression nuts and the SAE elbow nuts to 125 inch-pounds. Torque the manifold connector fitting at this time to 125 inch-pounds. Apply rust preventive coat to rod threads per BNG STD 3002.

11. FILLING AND TESTING
Keep the snubber in the stroking rig with accumulator on top. Pump filtered fluid into accumulator until tail rod extends about one inch.

Loosen bleeder adjusting screw until fluid begins to leak out. Bleed until no more air bubbles appear. Tighten bleeder screw.

With the stroking rig, compress snubber all the way, being careful not to get sprayed by oil from vent hole.

Pull snubber out and push back in thru full stroke. Test for lock-up in both directions. Bleed tail rod into dimension shown on drawing. Pull snubber rod all the way out.

12. INSPECTION
Clean snubber in trichloroethane. Check leakage with a blotter with unit on a clean piece of paper. Micrometer readings of tail rod projection are to be taken and recorded on dated tag under the following conditions.
(1) Twice daily, morning and afternoon at approximately the same time, for three days. Should a large variation appear on all units, it may be due to a large difference in the daily change in the ambient temperature. Disregard such readings and extend test one more day. After the first 24 hours rods should move in and out with temperature only. Those whose readings which continue to increase should be checked for leakage in accumulator

13. PAINTING
Clean assembly and paint per BNG STD 3810. Mask rod end and face of front flange mountings. After this operation handle the units carefully to avoid damaging the paint finish.

ISSUED

REVISED 1-10-68 CH 2

G.N. NO. 3835

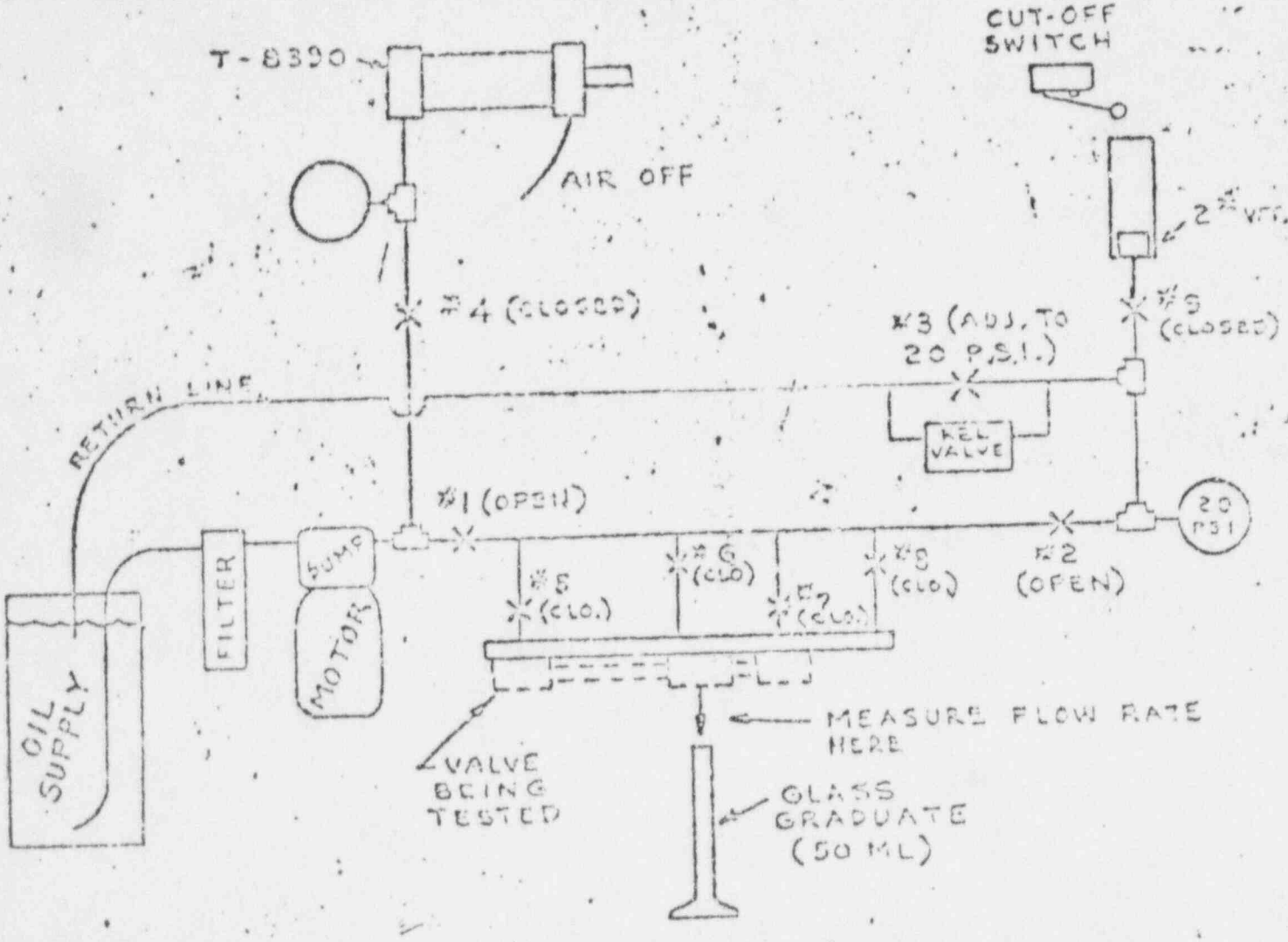
G.H.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED
ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (BERGEN PIPESUPPORT)



NOTE:
OPEN VALVE #5-6-7 OR 8 AS REQ'D FOR SIZE OF UNIT BEING TESTED. SEE SHEET #9 FOR FLOW RATE.

ISSUED

REVISED 1-10-68 CN 3(P

C.N. NO. 3835

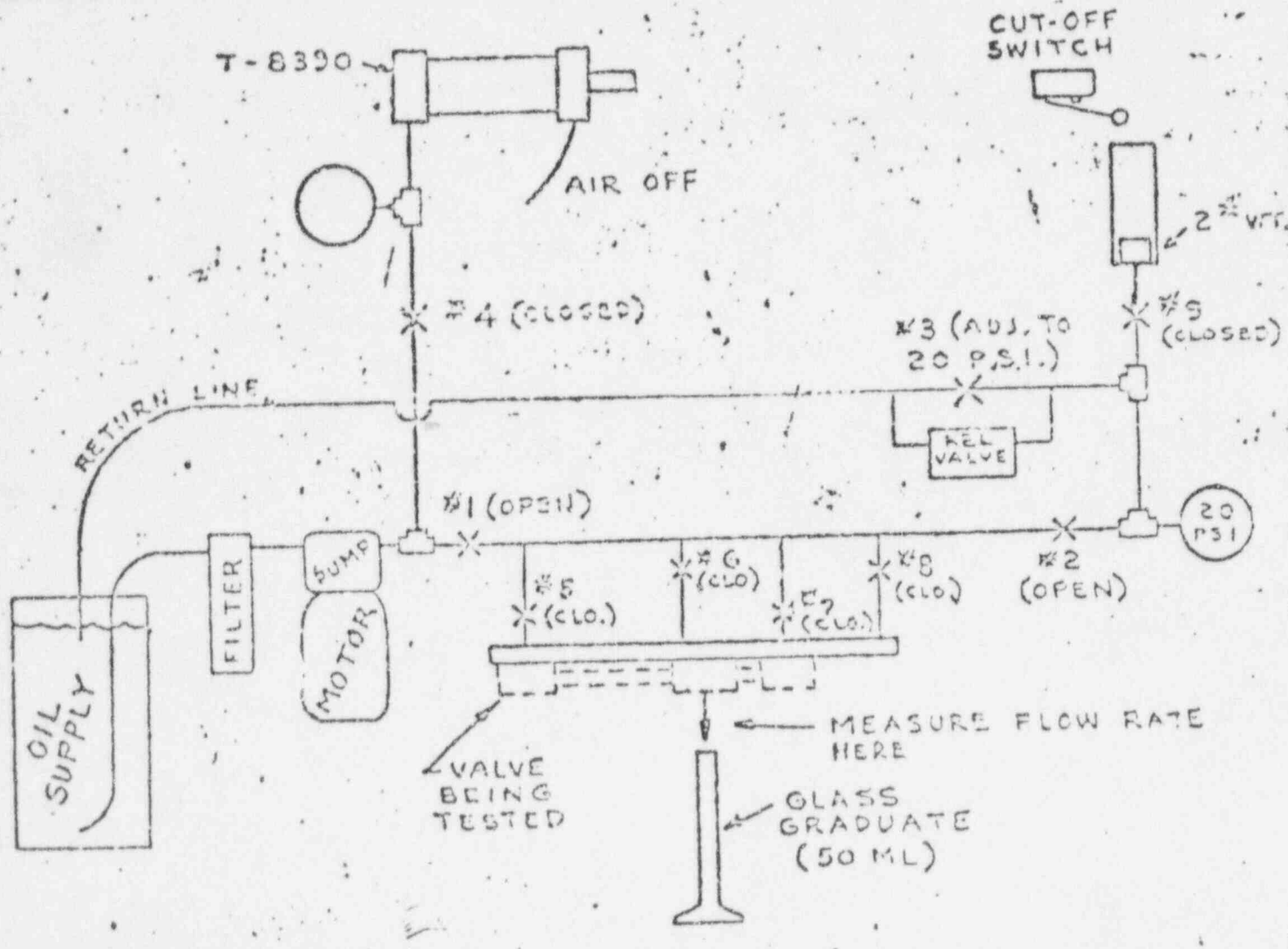
G.F.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED
ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (BERGEN PIPESUPPORT)



NOTE:
OPEN VALVE # 5-6-7 OR 8 AS REQ'D FOR SIZE OF UNIT BEING TESTED. SEE SHEET # 9 FOR FLOW RATE.

ISSUED 1-2-68

REVISED 1-10-68 CN 3850

C.N. NO. 3838

APPROVED G.F.K.

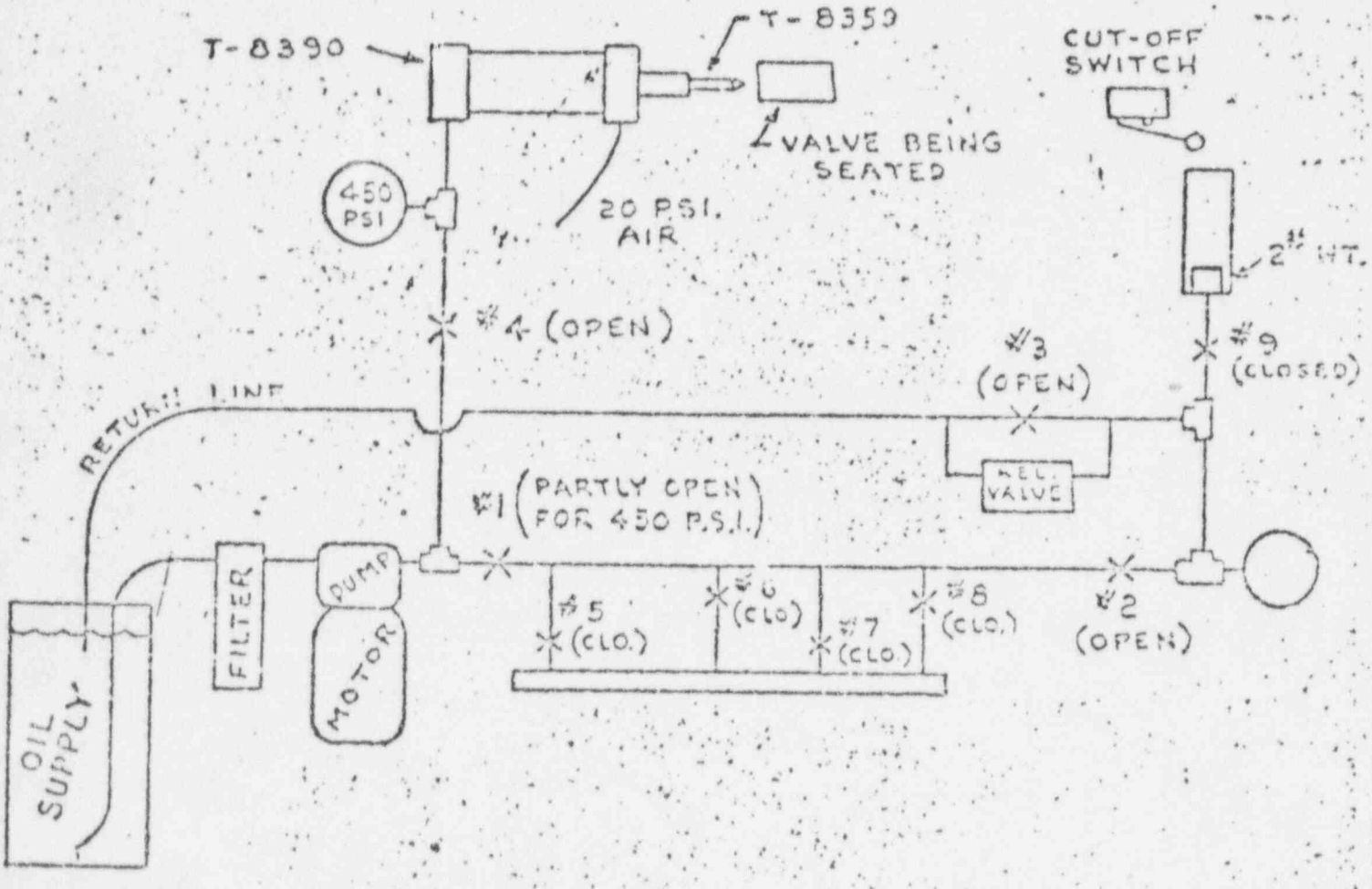
HANNA COMPANY

A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (BERGEN, PIPESUPPORT)



NOTE:
SEE ALSO SHEET NO. 1

REVISED 1-10-68 C.N. 3850

C.N. NO. 3838

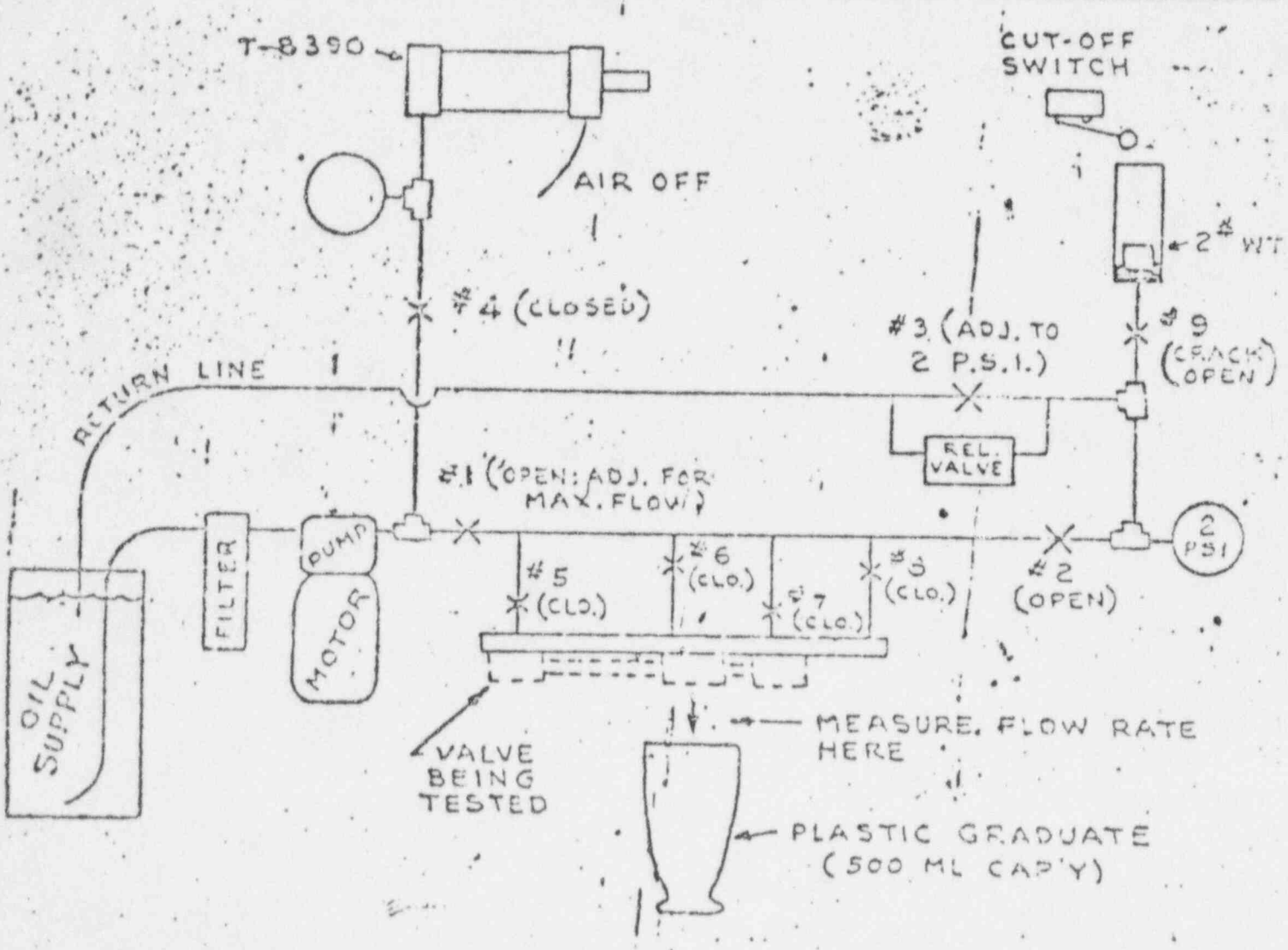
APPROVED G.F.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMELY (BERGEN PIPESUPPORT)



NOTE
OPEN VALVE #5-6-7 OR 8 AS REQ'D FOR SIZE OF UNIT BEING TESTED. SEE SHEET #9 FOR FLOW RATE.

ISSUED 1-6-65

REVISED 1-10-68 CN 150

C.N. NO. 3838

APPROVED G.F.K.

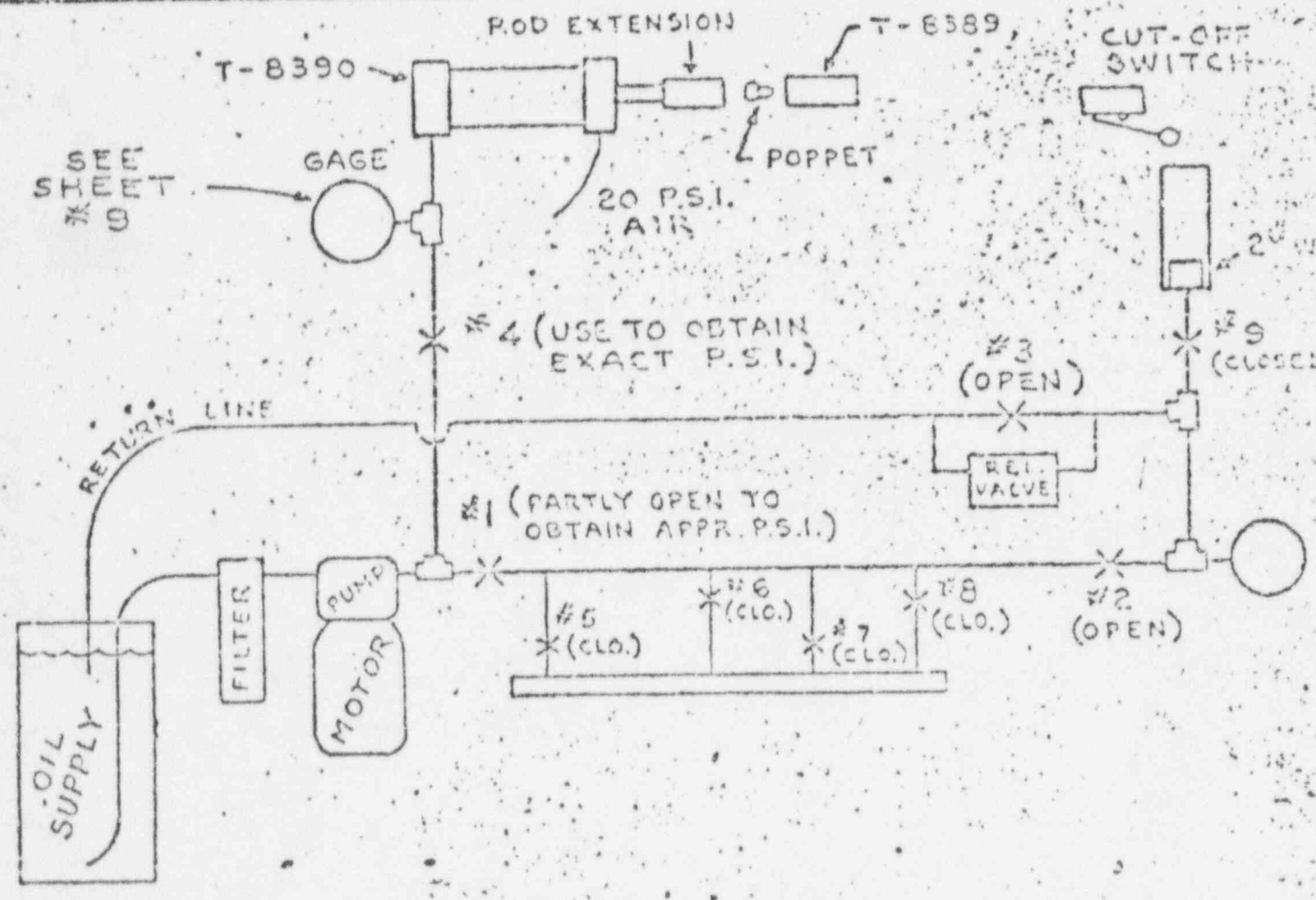
HANNA COMPANY

A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (BERGEN PIPESUPPORT)



NOTE:
POPPET GROOVING PRESSURE TO BE DETERMINED BY TRIAL. (# APPR.) USE VALVES AS INDICATED. #1 SHOULD BE SET, WITH #4 WIDE OPEN, TO GIVE P.S.I. SHUT VALVE #4 AND PLACE POPPET IN DIE. CRACK VALVE #4 TO OBTAIN EXACTLY PSI ON GAGE. HOLD 5 SECONDS SHUT OFF PUMP AND OPEN VALVE #4. REMOVE POPPET FROM DIE & CLOSE VALVE #4 CHECK FLOW RATE OF POPPET PER SHEET NO. 5 IF POPPET DOES NOT PASS ENOUGH OIL, TRY MAKING NEXT POPPET AT SLIGHTLY HIGHER P.S.I. FIND PROPER PRESSURE BY THIS METHOD AND GROOVE REMAINING BLANKS.

CAUTION:
IT IS BETTER TO MAKE POPPETS AT JUST SLIGHTLY UNDER THE FINAL 'ARRIVED AT' PRESSURE AS THEY CAN BE REWORKED IF THEY ARE NOT DEEP ENOUGH, BUT MUST BE SCRAPPED IF TOO DEEP.

ISSUED 1-2-68
REVISED 1-10-68 CN 3850
C.N. NO. 3838

APPROVED
G.F.K.
1

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING PROCEDURE STANDARD

TITLE

OIL TYPE	S O R E	POPPET NO.	APPR. * GROOVING PRESSURE	OPEN POPPET FLOW (APPR., 2 PSI) ML/MIN.	SEATED POPPET FLOW (20 PSI) ML/MIN.	POPPET SELECTION DRWG. NO.
MIL H 5606	2½		PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3¼			1,080/1,630	18.4 TO 27.2	D-27594 Q
	4			1,900/2,470	27.8 TO 41.1	D-27594 J
GE SF 96-50	2½	D-27594 L	320 PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3¼	D-27594 P	180	1,080/1,630	18.4 TO 27.2	D-27594 Q
	4	D-27594 M	200	1,900/2,470	27.8 TO 41.1	D-27594 J
	5	D30787	600	2,100/3,500	38 TO 57	D30790
GE SF 1017	2½	D-27594 S	160 PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3¼	D-27594 U	200	1,080/1,630	18.4 TO 27.2	D-27594 Q
	4	D-29908A	230	1,900/2,470	27.8 TO 41.1	D-27594 J
	5	D30787	600	2,100/3,500	38 TO 57	D30790

* TRIAL & ERROR WILL DETERMINE EXACT PRESSURE

REVISED

C.N. NO. 3850

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING RECOMMENDED PRACTICE STANDARD

TITLE TORQUES FOR BERGEN PIPE SUPPORT UNITS

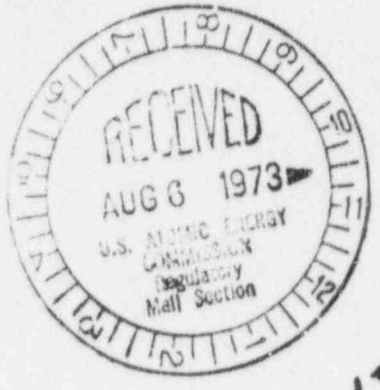
All torques are inch-pounds unless otherwise specified

ACCUMULATOR	2.50 BORE	3.25 BORE	4.00 BORE
TIE RODS	100 IN-LB	100 IN-LB	100 IN-LB
PROTECTIVE TUBE NUT	216	216	216
PISTON ROD	EPOXY	EPOXY	EPOXY
MOUNTING SCREWS	125	125	125
ALEMITE FITTING	125	125	125
.25 TUBE FITTING	125	125	125
SEELSCREW	50	50	50
CHECK VALVE			
PORT PLUGS	96	96	96
RELIEF VALVE SEAT	216	216	216
MANIFOLD CONNECTOR	216	216	216
MANIFOLD TUBE CONNECTOR	216	216	216
MANIFOLD SCREW	125	125	125
.50 TUBE FITTING	125	125	125
CYLINDER			
TIE RODS	48 FT-LBS	84 FT-LBS	110 FT-LBS
PISTON ROD	200 FT-LBS	250 FT-LBS	300 FT-LBS

Jersey Central Power & Light Company

MADISON AVENUE AT PUNCH BOWL ROAD • MORRISTOWN, N.J. 07960 • 539-6111

August 3, 1973



AO 73-15

Mr. A. Giambusso
Deputy Director for Reactor Projects
Directorate of Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Giambusso:

Subject: Oyster Creek Station
Docket No. 50-219
Main Steam Isolation Valve

The purpose of this letter is to report a surveillance closure of main steam isolation valve NS04B of less than 3 seconds. This event is considered to be an abnormal occurrence as defined in the Technical Specifications, Paragraph 1.15.A. Notification of this event as required by the Technical Specifications, Paragraph 6.6.2.a., was made to AEC Region I, Directorate of Regulatory Operations on Wednesday, July 25, 1973.

Prior to a plant startup, full closure timing and scram checks were being conducted on all four main steam isolation valves. In testing valve NS04B, the closure time was measured to be 2.6 seconds; whereas, the Technical Specifications minimum limit in Paragraph 5.6.1.2 is 3 seconds. Two additional timing checks were conducted, both of which indicated the valve to be closing faster than the stated limit.

The hydraulic dashpot associated with the valve operator was found to contain insufficient oil. Approximately four quarts of oil were added, whereupon satisfactory closure times were obtained. While stroking the valve, oil was detected leaking along the operating shaft at the seal cartridge assembly. This apparently was the cause for the loss of oil.

Pertinent component data is as follows:

Seal Manufacturer: Hydro-Line Manufacturing Company

Seal Cartridge Assembly: N661-20-V

B1191

5295

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The seal cartridge assembly was replaced, adequate oil was added to the hydraulic cylinder, valve timing adjusted, and the main steam isolation valve returned to service. The remaining three main steam isolation valves were inspected to oil leakage, dashpot oil levels checked, and all found to be satisfactory.

The minimum valve closure time limit of 3 seconds is based upon limiting the vessel peak pressure during the isolation valve closure transient analysis such that the main steam safety valves do not lift. Since the closure times for the other valves were normal, the effect of the pressurization transient due to fast closure of NS04B would probably have been minimal had an isolation transient occurred while the plant was at power. In this particular instance, the plant was shut down and the reactor water temperature was below 212° F.

This particular seal maintenance is not considered to be unusual and hence no further surveillance requirements will be imposed. The plant will continue to time the valves in the prescribed manner and take whatever maintenance action is appropriate to satisfy the timing requirements.

Enclosed are forty (40) copies of this report.

Very truly yours,

Donald A. Ross
Manager, Nuclear Generating Stations

DAR:cs
Enclosures

cc: Mr. J. P. O'Reilly, Director
Directorate of Regulatory Operations, Region I