

JERSEY CENTRAL POWER & LIGHT COMPANY

OYSTER CREEK
NUCLEAR GENERATING STATION
DPR-16

TRZAR

SUMMARY REPORT ON
SNUBBER REPAIR ACTIVITIES
DURING SPRING 1973
REFUELING OUTAGE

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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.-6(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 1×10^8 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 (11-50) SOLVENT. THIS PARTICULAR SOLVENT WAS CHOSEN BECAUSE IT LEAVES NO RESIDUE AND IS NON-

III. ORGANIZATION OF MAINTENANCE ACTIVITIES - CONTINUED

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

III. ORGANIZATION OF MAINTENANCE ACTIVITIES - CONTINUED

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

IV. ANALYSIS - CONTINUED

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 HAINA 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.

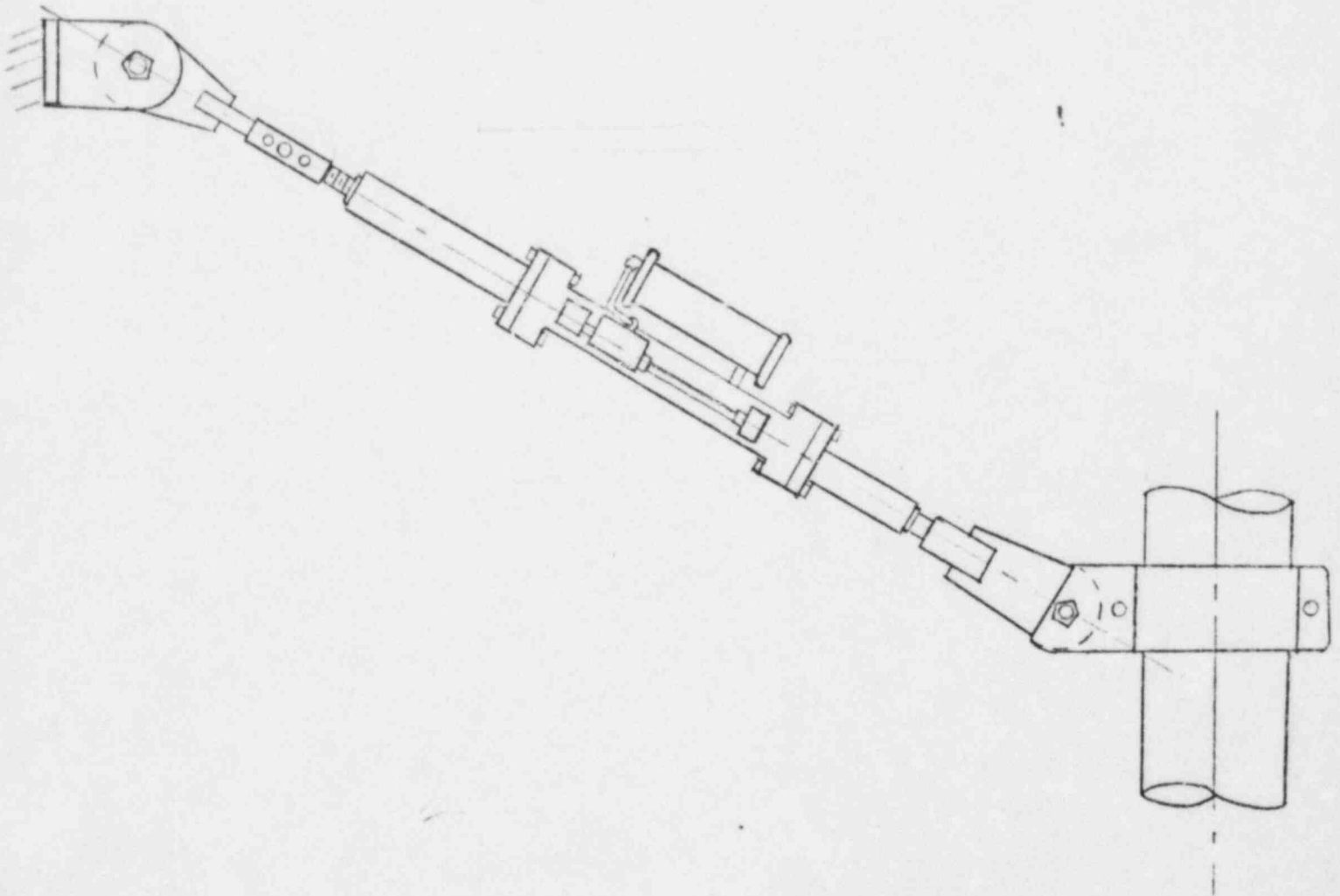
V. SAFETY SIGNIFICANCE

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 ●

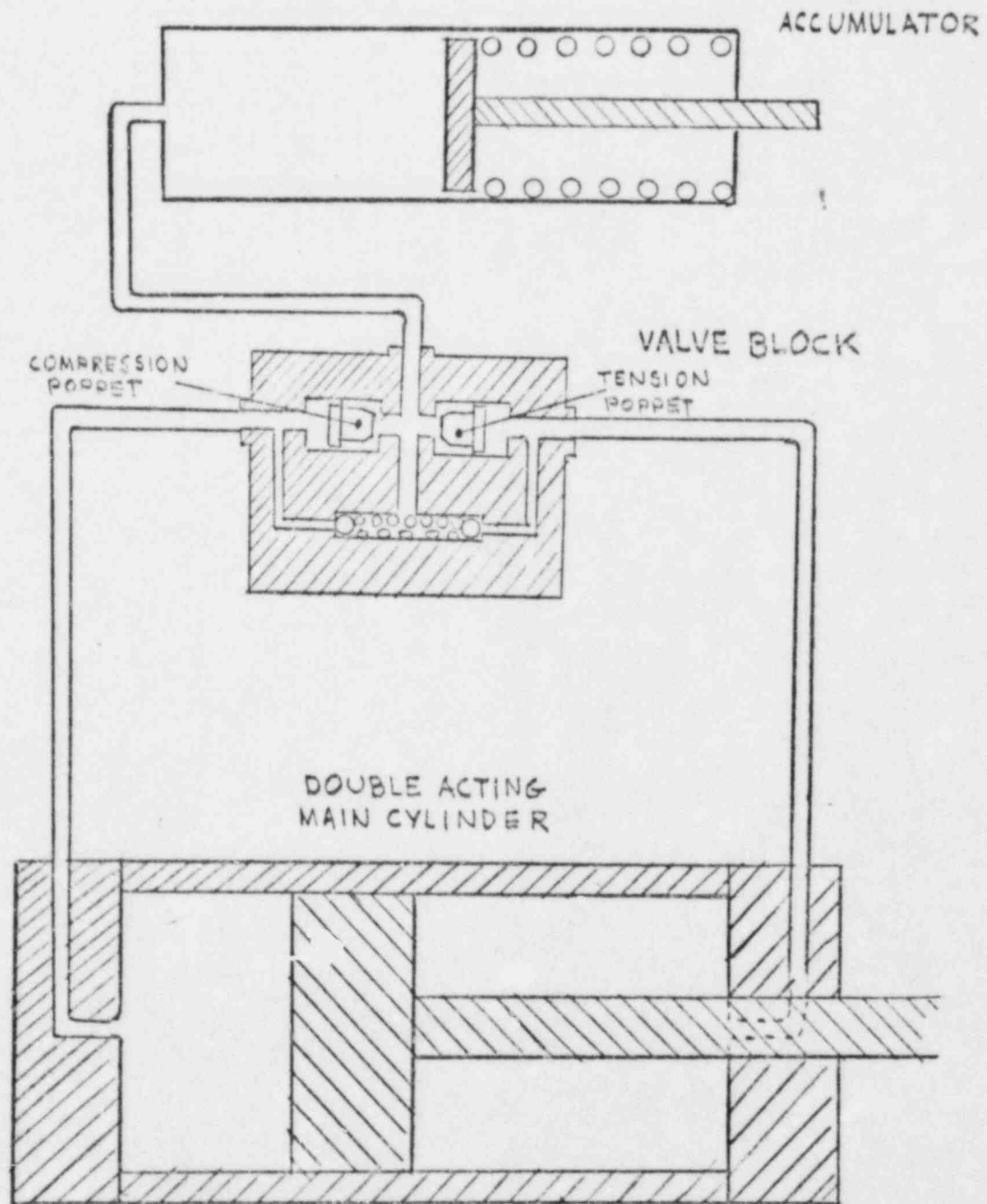


FIGURE III

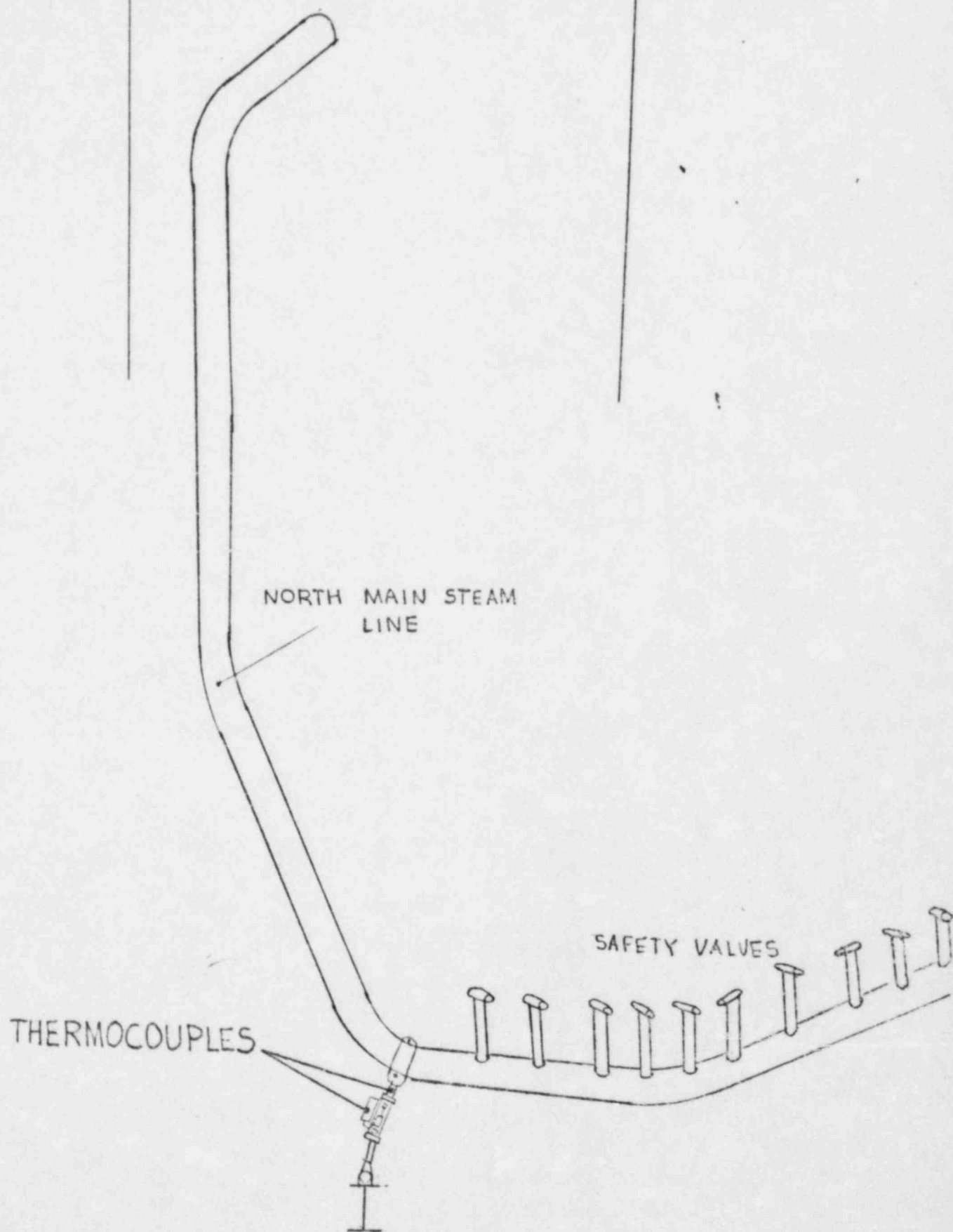


TABLE I

NOMENCLATURE
DESIGNATIONSYSTEM

-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

[illegible]

COMMENTS

GOOD CONDITION, HALF FILLED LINTH OIL
ROD FREE, SEALS GOOD CONDITION TUBE FITTING'S LOOSE, REFILLED W/ HIC ROD FROZEN, SEALS IN GOOD COND. OIL IN ACCURATE POSITION, REFILLED W/ HIC ROD FROZEN IN GROUND, ACCURATE DIRTY - NO OIL
REFILLED
REFILLED
REFILLED
REFILLED
REFILLED
REFILLED
REFILLED
CUT DIRT SAND AND WATER IN SPRING CAVITY, REFILLED W/ HIC
REFILLED
REFILLED
SEALS IN GOOD CONDITION REFILLED WITH HIC FLUID
REFILLED
REFILLED
OLD TYPE UNIT, VERY GOOD COND. ELECTRIC ANALYSIS ON DETON VALVE SEALS IN GOOD
OLD TYPE UNIT, VERY GOOD CONDITION, REFILLED W/ HIC
ROD TIGHT, REFILLED WITH HIC.
REFILED
REFILED
REFILLED

SNUBBER IDENTIFICATION NUMBER		LOCATION AND SYSTEM OF SNUBBERS		SNUBBER PARTS REPLACED OR RECHANGED	
487446	COS-R12				
487465	EC-R2				
487469	EC-R3				
487487	SNIS-D2				
487488	NMS-D2				
487489	COS-D2				
487491	SDC-D2				
487492	CS-D2				
487493	SNIS-D2				
487494	NFW-D2				
487495	COS-D2				
487496	SDC-D2				
487497	SDC-D2				
487498	NMS-D2				
487501	COS-D2				
487502	SDC-D2				
487504	SNIS-D2				
487506	NFW-D2				
487507	CFW-D2				
487510	NFW-D2				
487512	NFW-D2				
487513	NFW-D2				
487514	NFW-D2				
487515	CS-D2				
487516	SNIS-D2				
487517	SDC-D2				
487518	SDC-D2				
487519	SDC-D2				
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487717	SDC-D2				
487718	SDC-D2				
487719	SDC-D2				
487720	SDC-D2				
487721	SDC-D2				
487722	SDC-D2				
487723	SDC-D2				
487724	SDC-D2				
487725	SDC-D2				
487726	SDC-D2				
487727	SDC-D2				
487728	SDC-D2				
487729	SDC-D2				
487730	SDC-D2				
487731	SDC-D2				
487732	SDC-D2				
487733	SDC-D2				
487734	SDC-D2				
487735	SDC-D2				
487736	SDC-D2				
487737	SDC-D2				
487738	SDC-D2				
487739	SDC-D2				
487740	SDC-D2				
487741	SDC-D2				
487742	SDC-D2				
487743	SDC-D2				
487744	SDC-D2				
487745	SDC-D2				
487746	SDC-D2				
487747	SDC-D2				
487748	SDC-D2				
487749	SDC-D2				
487750	SDC-D2				
487751	SDC-D2				
487752	SDC-D2				
487753	SDC-D2				
487754	SDC-D2				
487755	SDC-D2				
487756	SDC-D2				
487757	SDC-D2				
487758	SDC-D2				
487759	SDC-D2				
487760	SDC-D2				
487761	SDC-D2				
487762	SDC-D2				
487763	SDC-D2				
487764	SDC-D2				
487765	SDC-D2				
487766	SDC-D2				
487767	SDC-D2				
487768	SDC-D2				
487769	SDC-D2				
487770	SDC-D2				
487771	SDC-D2				
487772	SDC-D2				
487773	SDC-D2				
487774	SDC-D2				
487775	SDC-D2				
487776	SDC-D2				
487777	SDC-D2				
487778	SDC-D2				
487779	SDC-D2				
487780	SDC-D2				
487781	SDC-D2				
487782	SDC-D2				
487783	SDC-D2				
48					

COMMENTS

REFILLED

REFILLED

REFILLED

ROD FROZEN, TUBE FITTING 1 3/8" SNOW & GRIT IN ACCUM SPRING - NO
ROD FROZEN, CYLINDER FILLED WITH
A BLACK SUBSTANCE - 12-01-02
BLACK OIL IN ACCUM, DIRT, GRIT &
ACCUM NO OIL
ACCUM PACKING MELTED

ROD FROZEN, DIRT & WATER IN
SPRING CHAVITY

ROD STUCK, OUTBOARD ZRG TIGHT
DIRT IN SPRING CHAVITY

NO OIL - CYLINDER CLEAN

GOOD CONDITION - NO OIL -
CHANGED PACKING

ROD FROZEN, HAD TO BE HAMMERED
OUT, BLACK OIL IN CYL - NO OIL

GOOD CONDITION, VALVE SEAL
BAD BUT CLEAN - PACKING MELTED

REPAIRED AT FACTORY

ACCUMULATOR PACKING MELT, SPH
RUSTY - NO OIL

ROD FROZEN, ACCUMULATOR SPRING
BROKEN, DIRT & GRIT IN ACCUM

ROD FROZEN IN GLAND, DIRT & WATER
IN ACCUM SOME OIL

ROD FROZEN, DIRT IN ACCUM, IN
FITTINGS LOOSE

ROD FROZEN, FITTINGS LOOSE, WATER
OIL & SAND & GRIT IN ACCUM

ROD LOOSE, NO OIL, ACCUMULATOR
SPRING BROKEN & SAND & GRIT IN ACCU

ACCUMULATOR RUSTY, BLACK OIL IN
CYLINDER

ACCUMULATOR RUSTY - NO OIL

ROD FROZEN, RUST & DIRT IN ACCU
SPRING DAMAGED, NO OIL

ROD FREE, GENERALLY IN
GOOD SHAPE

ROD STUCK IN GLAND, FITTINGS
DIRT & RUST IN ACCUM

REPAIRED AT FACTORY - NO OIL

[illegible]

COMMENTS

ROD FROZEN, BLACK 200 INCH
CYLINDER, RUST, DIRT IN ACCUMULATOR
ROD FROZEN, BLACK 200 INCH
IN CYL, ELECTROLYTIC VENTILATOR, NO
ROD FROZEN, ACCUMULATOR
PLATE - NO OIL

ROD FROZEN, TUBE FITTINGS LOOSE
THROU DIRT, WATER IN ACCUMULATOR
ROD FROZEN TIGHT, WATER IN A VENT
BROKEN ACCUM SPRINGS, NO OIL

ROD FROZEN, ACCUMULATOR
UNIT - NO OIL

CYLINDER - NO OIL, PISTON ROD
UNIT - NO OIL

ROD FROZEN, TUBE FITTINGS LOOSE
NO OIL, PISTON - NO OIL

TUBE FITTINGS LOOSE, REPAIRS
WITH 1154 SEALS, IN GOOD SHAPE
ROD FROZEN, DIRT FOUND IN THE
ACCUMULATOR, RE FILLED 1154
ROD FROZEN - NO OIL

ROD FROZEN, BEARING TROUBLE, TUBE FITTING
LOOSE, RESIDUE IN ACCUMULATOR, NO OIL

ROD FROZEN TIGHT, NO OIL
CHAND & SKEIT IN CYL, TUBE FITTING
GENERALLY GOOD SHAPE, CHAND'S
PACKING - REPAIRS - SOME OIL

ROD FROZEN, SAND, DIRT, G-RIT IN ACCU
NO OIL, RE FILLED WITH 1154

ROD FROZEN, TUBE FITTING
SEALS INTEGRATED, NO OIL

GOOD SHAPE, GENERALLY
CYLINDER, BEARING, ROD - NO OIL
FAIR CONDITION - G-RIT 5000 IN.
ACCUMULATOR - NO OIL

ROD FROZEN, DIRT IN
ACCUMULATOR

ROD FROZEN, SEALS VERY GOOD
DIRT IN ACCUMULATOR - NO OIL

ROD FROZEN, TUBE FITTINGS LOOSE
MUD & SILT IN ACCUMULATOR - NO OIL

ROD FROZEN, ACCUMULATOR UNIT
NO OIL

ACCUMULATOR - NO OIL
NO OIL

ROD FROZEN, ACCUMULATOR DIRT
SAND, G-RIT ETC - NO OIL

SNUBBER IDENTIFICATION NUMBER		LOCATION AND SYSTEM OF SNUBBERS	
481764	EC-DU	1	1/2" TUBE FITTING
481765	EC-DU	2	1/2" TUBE
481766	SMIS-DU	3	WASHER
481767	SFW-DU	4	MOUNTING SCREW
481768	EC-DU	5	FILLER PLUG
481769	CU-DU	6	PISTON SCREW
481770	SFW-DU	7	BACK HEAD
481771	CU-DU	8	PISTON HEAD
481772	EC-DU	9	ACCUMULATOR SPRING
481773	CU-DU	10	SPRING GUIDE
481774	EC-DU	11	PROTECTIVE NUT
481775	CU-DU	12	FRONT HEAD
481776	EC-DU	13	TIE ROD NUT
481777	CU-DU	14	TIE ROD
481778	EC-DU	15	PROTECTIVE TUBE
481779	CU-DU	16	MOUNTING FOOT
481780	EC-DU	17	HEAD SEAL
481781	CU-DU	18	TUBE
481782	EC-DU	19	PISTON
481783	CU-DU	20	TAIL ROD
481784	EC-DU	21	FITTING INT. O-RING
481785	CU-DU	22	O-RING
481786	EC-DU	23	TIE ROD NUT
481787	CU-DU	24	TIE ROD
481788	EC-DU	25	BACK HEAD
481789	CU-DU	26	PISTON LOCK PIN
481790	EC-DU	27	PISTON RING
481791	CU-DU	28	PISTON
481792	EC-DU	29	PISTON O-RING
481793	CU-DU	30	CYL TUBE
481794	EC-DU	31	TUBE O-RING
481795	CU-DU	32	NAME PLATE
481796	EC-DU	33	FRONT HEAD
481797	CU-DU	34	RETAINER PLUG
481798	EC-DU	35	GLAND
481799	CU-DU	36	PISTON ROD
481800	EC-DU	37	PACKING WASHER
481801	CU-DU	38	ROD PACKING
481802	EC-DU	39	ROD WIPER
481803	CU-DU	40	OUTBOARD BEARING
481804	EC-DU	41	OUTBOARD ROD WIPER
481805	CU-DU	42	REAR MANIFOLD BLOCK
481806	EC-DU	43	MANIFOLD O-RING
481807	CU-DU	44	O-RING
481808	EC-DU	45	MANIFOLD CONNECT
481809	CU-DU	46	ELK PORT PLUG
481810	EC-DU	47	VALVE BODY
481811	CU-DU	48	POCKET SPRING
481812	EC-DU	49	POCKET
481813	CU-DU	50	O-RING
481814	EC-DU	51	MANIFOLD TUBE CONT
481815	CU-DU	52	1/2" TUBE FITTING
481816	EC-DU	53	FRONT MANIFOLD BLOCK
481817	CU-DU	54	LOCK WASHER
481818	EC-DU	55	MANIFOLD SCREW
481819	CU-DU	56	RELIEF VALVE SEAT
481820	EC-DU	57	O-RING
481821	CU-DU	58	RELIEF VALVE SPRING
481822	EC-DU	59	RELIEF VALVE PAUL
481823	CU-DU	60	FITTING INT. O-RING
481824	EC-DU	61	BACK HEAD
481825	CU-DU	62	TYPE OF FLUID

COMMENTS

ROD FROZEN, ACCUM PISTON CRACK
SAND, DIRT, GRIT IN ACCUM

ROD FROZEN IN GEARING

ROD FROZEN IN BEARING KIT
SAND, GRIT IN ACCUM

ROD FREE, LOOSE TUBE FITTING

ROD FROZEN, DIRT IN ACCUM

PISTON ROD SEARED

ROD FREE, SOME SEALS WERE
GOOD, DIRT IN ACCUM, OUTBOARD
SEALS

SEALS, GOOD CONDITION
NO OIL

REFILLED

SEALS, GOOD CONDITION
NO OIL

SEALS, GOOD CONDITION
NO OIL

REFILLED

REFILLED

REFILLED

REFILLED

REFILLED WITH H34, SEALS
IN GOOD SHAPE

REFILLED

REFILLED

REFILLED

SEALS IN FAIR SHAPE - NO GRIT OR
DIRT IN ACCUM - REFILLED WITH H34
SEALS IN GOOD SHAPE, REFILLED
WITH H34
REFILLED

NUMBER IDENTIFICATION NUMBER		LOCATION AND SYSTEM OF SNUBBERS		TYPE OF FLUID	
1	2	3	4	5	6
1/2" TUBE FITTING	1/2" TUBE	WASHER	MOUNTING SCREW	FILLER PLUG	BLEEDER SCREW
BACK HEAD	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 INTO "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 BENDING	OUTBOARD ROD WIP	BEAR MANIFOLD BLOCK
MANIFOLD "O" RING	"O" RING	MANIFOLD CONNECTOR	ELK PORT PLUG	VALVE BODY	POCKET SPRING
POCKET SPRING	POCKET	"O" RING	MANIFOLD TUBE CONN	1/2" TUBE FITTING	FRONT MANIFOLD BLOCK
LOCK WASHER	MANIFOLD SCREW	RELIEF VALVE SEAT	"O" RING	RELIEF VALVE SPRING	RELIEF VALVE PRO.
FITTING INTO "O" RING	PACKING WASHER				

REFILLED
OLD STYLE ACCUM - EXCESS PAINT - GOOD SHAPE - NO OIL
SEALS IN GOOD SHAPE - NO OIL
REFILED
SEALS IN GOOD SHAPE - NO OIL
RED FROZEN, RUST SAND GRIT IN ACCUM - NO OIL
REFILLED
ACCUMULATOR TUBE FITTINGS LOOSE - NO OIL
REFILLED
ACCUMULATOR RUSTY, VALVES RUSTY - NO OIL
REFILLED
REFILLED
REFILLED
REFILLED
WRENCH MARKS ON DISC FOR CLEANING OIL
OLD VALVE IN GOOD CONDITION NO OIL
REFILLED
SEALS IN GOOD SHAPE, NO OIL
REFILLED
OVERHAULED AT FACTORY NO OIL
REFILLED
REFILLED
REFILLED
REFILLED
CLEAR - TEST IN TAIL ROD TIGHTENED

147 X5X SNUBBER IDENTIFICATION NUMBER

EC-K15 LOCATION AND SYSTEM OF SNUBBERS

		1/4" TUBE FITTING	1
		1/4" TUBE	2
		WASHER	3
		MOUNTING SCREW	4
	X	FILLER PLUG	5
	X	BLEEDER SCREW	6
	X	BACK HEAD	7
	X	PISTON HEAD	8
		ACCUMULATOR SPRING	9
		SPRING GUIDE	10
		PROTECTIVE TUBE NUT	11
		FRONT HEAD	12
		TIE ROD NUT	13
		TIE ROD	14
		PROTECTIVE TUBE	15
	X	MOUNTING FOOT	16
	X	HEAD SEAL	17
		TUBE	18
		PISTON	19
		TAIL ROD	20
	X	FITTING INT. O-RING	21
	X	O-RING	22
		TIE ROD NUT	23
		TIE ROD	24
		BACK HEAD	25
		PISTON LOCK PIN	26
		PISTON RING	27
		PISTON	28
	X	PISTON O-RING	29
	X	CYL TUBE	30
	X	TUBE O-RING	31
		NAME PLATE	32
		FRONT HEAD	33
		FRONT RETAINER NUT	34
		GLAND	35
	X	PISTON ROD	36
	X	PACKING WASHER	37
	X	ROD PACKING	38
	X	ROD WIPER	39
		OUTER ROD WIPER	40
		REAR MANIFOLD BLOCK	41
	X	MANIFOLD O-RING	42
	X	O-RING	43
		MANIFOLD CONNECTOR	44
		ELAS PORT PLUG	45
		VALVE BODY	46
		POCKET SPRING	47
		POCKET	48
	X	O-RING	49
	X	MANIFOLD TUBE CONN	50
		1/2" TUBE FITTING	51
		FRONT MANIFOLD BLOCK	52
		LOCK WASHER	53
		MANIFOLD SCREW	54
	X	RELIEF VALVE SEAT	55
		O-RING	56
		RELIEF VALVE SPRING	57
		RELIEF VALVE PAD	58
	X	FITTING INT. O-RING	59
		PACKING WASHER	60

96-50 TYPE OF FLUID

COMMENTS

GENERALLY GOOD SHAPE
2. SOME OIL (204)
ROD FREE, NO OIL

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING RECOMMENDED 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 .003 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 ENG STD 3809.

4. POPPET VALVE SEATING

Use tool No. T-8359 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 GROOVING

Use tool No. T-8369 and fixture No. T-8390. Place the poppet blank in the tool cavity and apply proper pressure (see sheet 9) to the fixture cylinder. Hold pressure for 5 seconds. (See also sheet 7)

ISSUED 1-2-63

REVISED 1-10-68 C 3850

C.N. NO. 3838

APPROVED

G.F.K.

HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

ENGINEERING PRACTICE RECOMMENDED 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.

C.N. NO. 3838

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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 Seelscrew to 50 inch-pounds. Store the accumulator in a clean place and cover. NOTE: COAT SPRING WITH MAGNAFILM 31 PER ENG STD 3013. 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 1-2-68REVISED 1-10-68 CN 3850C.N. NO. 3838APPROVED
G.F.K.HANNA COMPANY
A REX CHAINBELT COMPANYNO. 3822ENGINEERING RECOMMENDED
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 ENG STD 3032.

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 ENG 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 1-2-68
REVISED 1-10-68 CH 850
C.N. NO. 3838

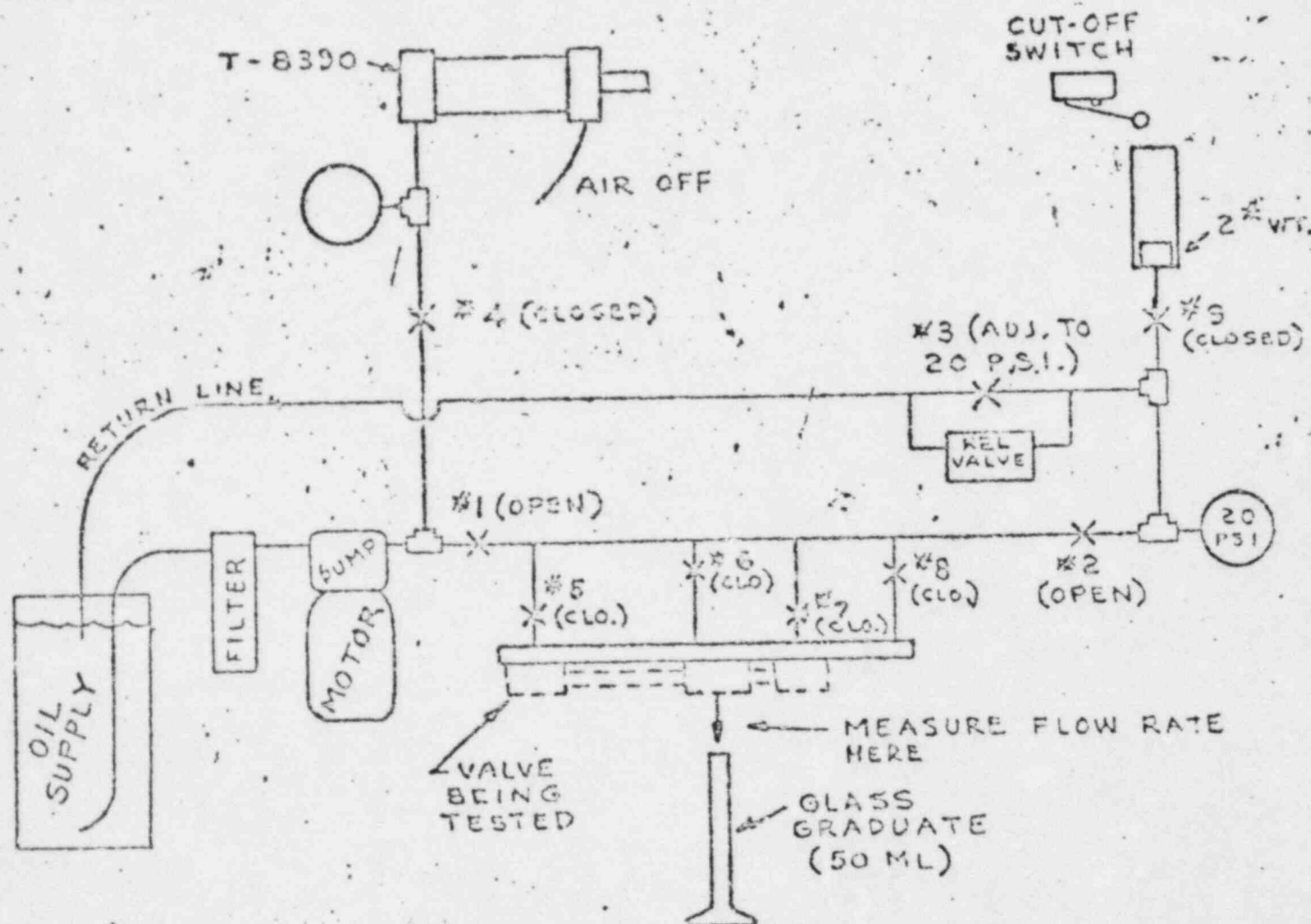
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A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED
ENGINEERING PRACTICE STANDARD

TITLE SNUBBER ASSEMBLY (BERGEN PIPE SUPPORT)



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.

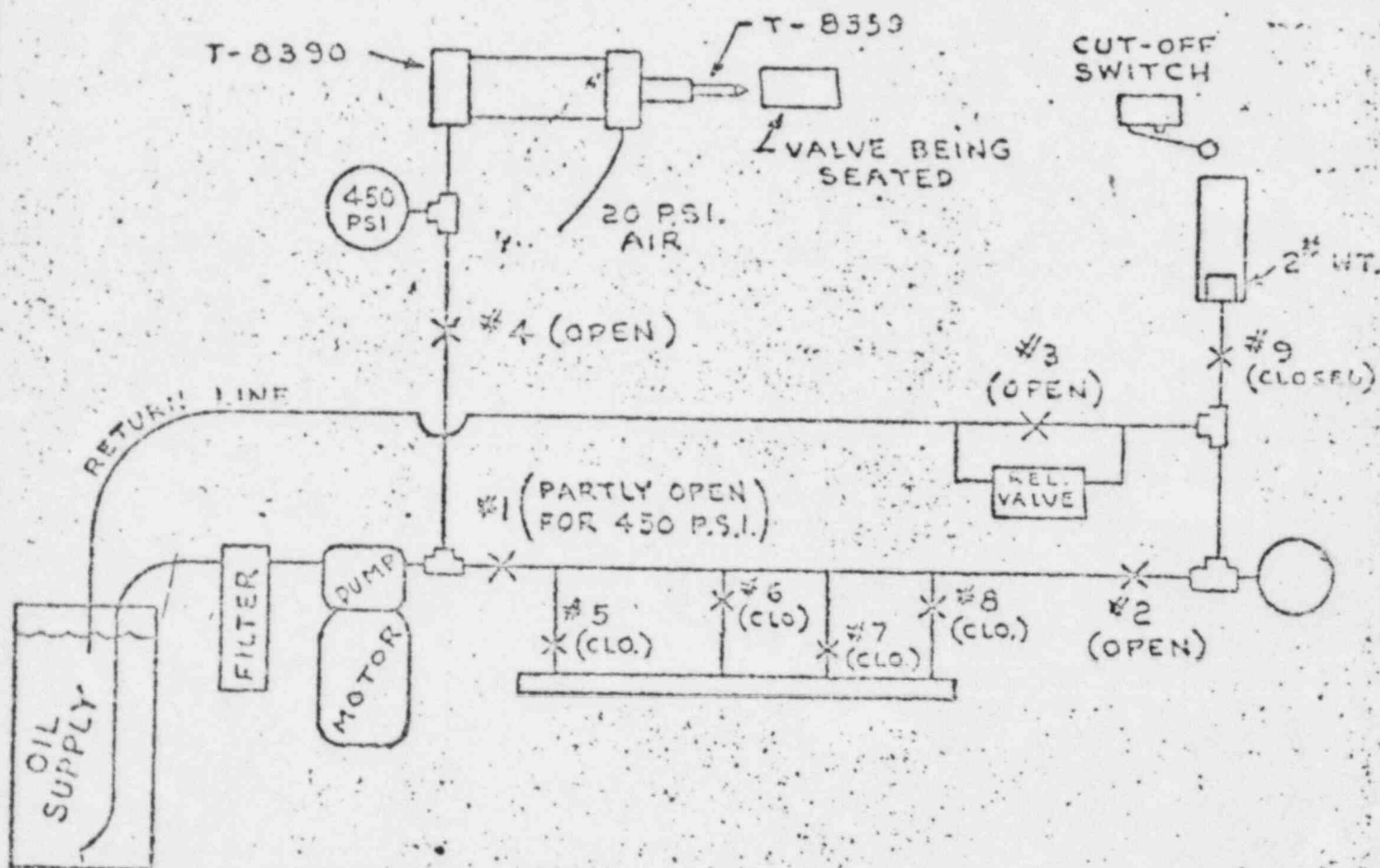
HANNA COMPANY
A REX CHAINBELT COMPANY

NO. 3822

RECOMMENDED
ENGINEERING PRACTICE

STANDARD

TITLE SNUBBER ASSEMBLY (BERGEY PORT)



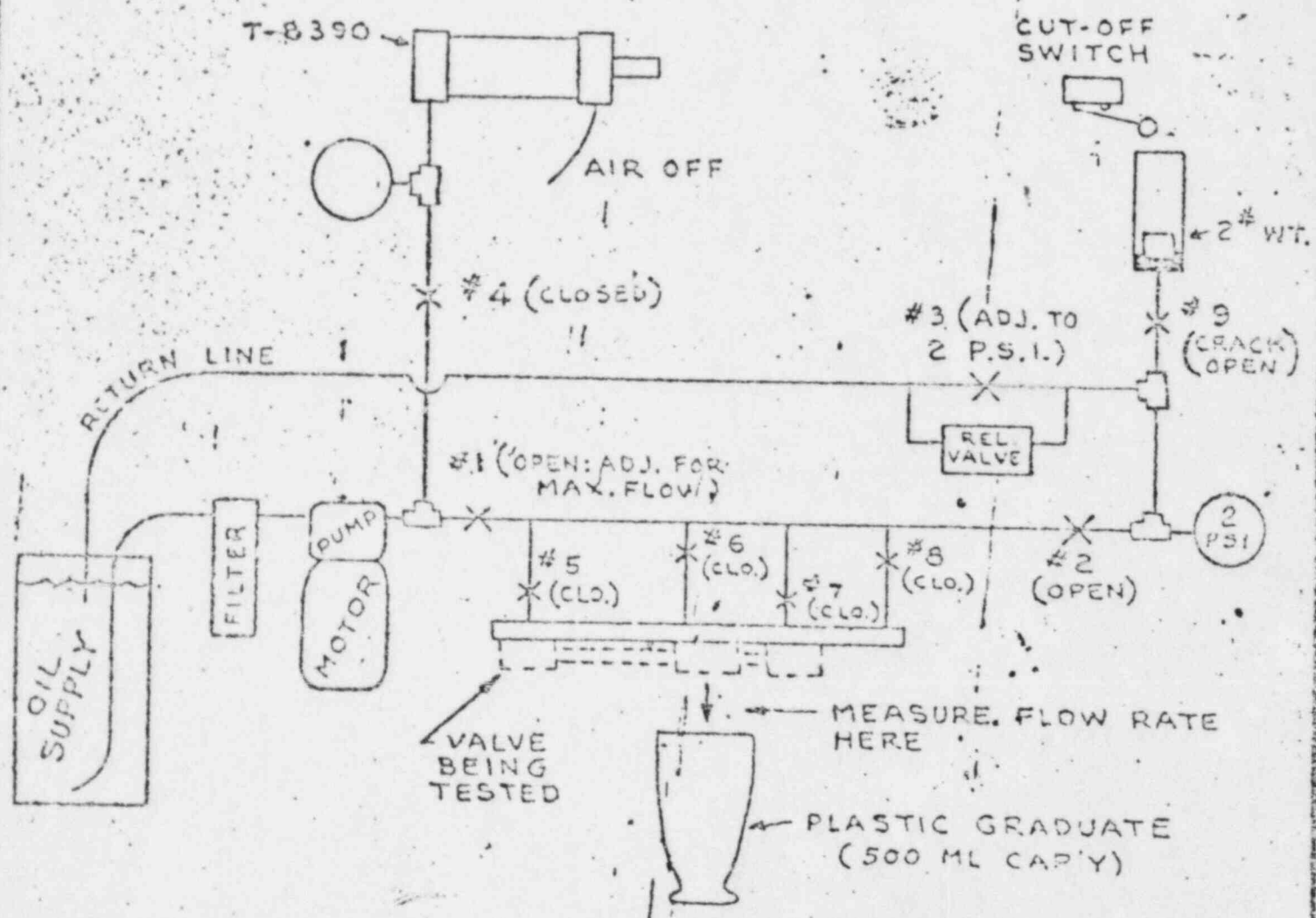
NOTE:
SEE ALSO SHEET NO. 1

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 CH 850
C.N. NO. 3838

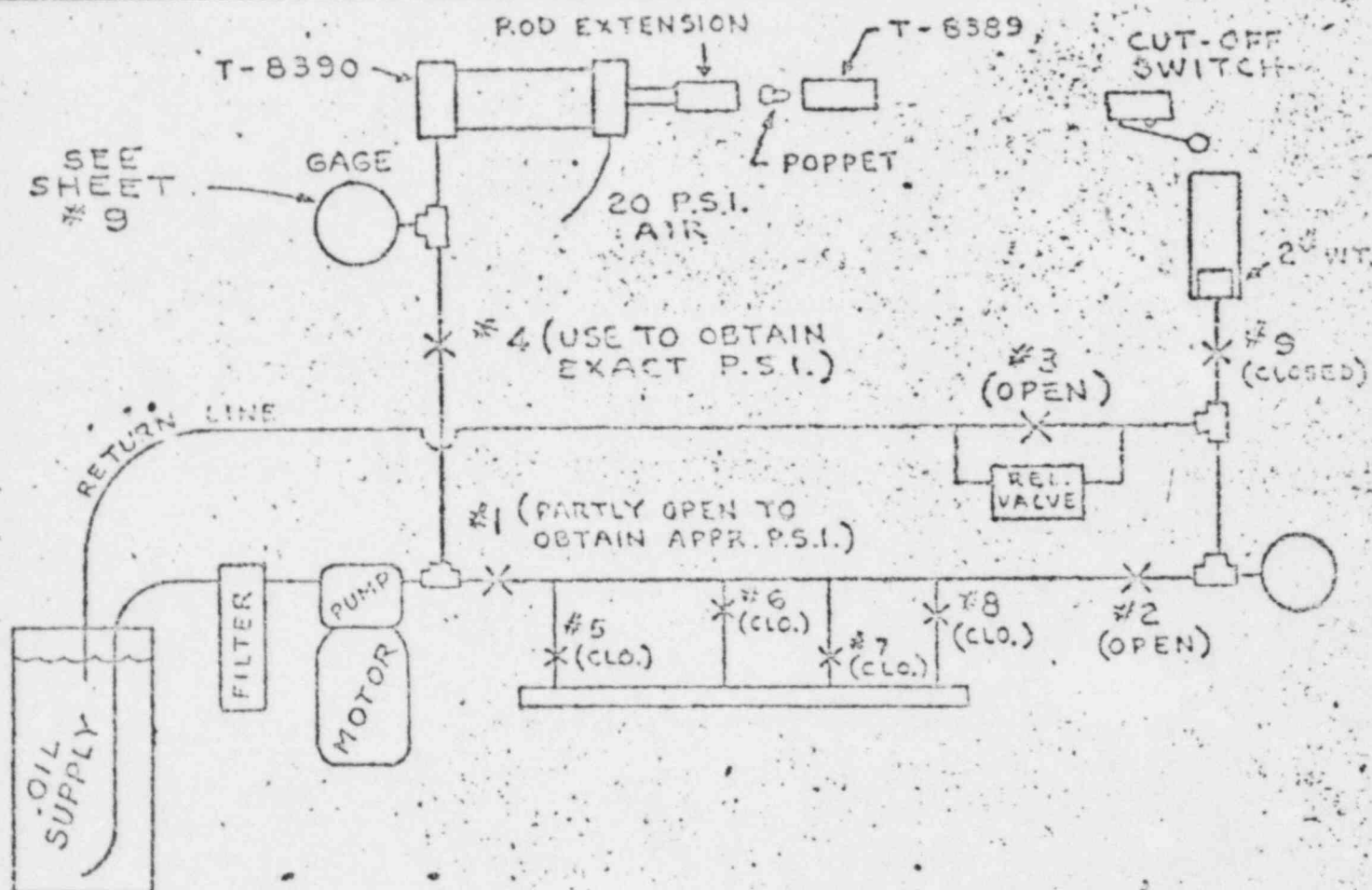
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NO. 3822

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.

SHEET 8 OF 10

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

APPROVED
G.F.K.

1

HANNA COMPANY
ATREX CHAINBELT COMPANY

NO. 3822

ENGINEERING PROCEDURE STANDARD

TITLE		ML/MIN.		ML/MIN.		
OIL TYPE	SCORE	POPPET NO.	APPR. * GROOVING PRESSURE	OPEN POPPET FLOW (APPR. 3 PSI)	SEATED POPPET FLOW (20 PSI)	POPPET SELECTION DRWG. NO.
MIL H 5606	2 1/2		PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3 1/4			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	2 1/2	D-27594 L	320 PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3 1/4	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	2 1/2	D-27594 S	160 PSI	650 TO 900	10.8 TO 16.3	D-27594 G
	3 1/4	D-27594 U	200	1,080 / 1,630	18.4 TO 27.2	D-27594 Q
	4	D-29908 A	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

APPROVED

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

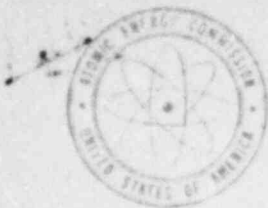
<u>ACCUMULATOR</u>	<u>2.50 BORE</u>	<u>3.25 BORE</u>	<u>4.00 BORE</u>
TIE RODS	100 IN-LB	100 IN-LB	100 IN-LB
PROTECTIVE TUBE NUT	216	216	216
PISTON ROD	EPOXY	EPOXY	EPOXY
MOUNTING SCREWS	125	125	125
ALEMITE FITTING	125	125	125
.25 TUBE FITTING	125	125	125
SEELSCREW	50	50	50

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



UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION I
970 BROAD STREET
NEWARK, NEW JERSEY 07102

July 30, 1973

Those Listed Below:

DEFECTIVE HYDRAULIC SHOCK SUPPRESSORS AND RESTRAINTS

The enclosed Regulatory Operations Bulletin (Enclosure 1) was forwarded to the Licensees listed in Enclosure 2.

James P. O'Reilly
James P. O'Reilly
Director

Enclosures:

1. Bulletin No. 73-3
2. List of Licensees Receiving Bulletin 73-3

Addressees:

Branch Chiefs, RO
Assistant Director for Procedures, RO
Assistant Director for Inspection & Enforcement, RO
Assistant Director for Plans and Programs, RS
Director, L
Deputy Director, L
Assistant Director for Boiling Water Reactors, L (3)
Assistant Director for Pressurized Water Reactors, L (3)
Assistant Director for Operating Reactors, L (3)
Assistant Director for Environmental Projects, L (3)
R. A. Fraley, ACRS
RO Files
DR Central Files
Central Mail & Files Unit
OGC

D. J. E.
8/8/1100289

50219

July 27, 1973

DEFECTIVE HYDRAULIC SHOCK SUPPRESSORS AND RESTRAINTS

Information contained in an abnormal occurrence report from the Millstone 1 reactor, supplemented by additional information obtained by Regulatory Operations from other licensees, revealed that 51 of 120 hydraulic shock suppressors and restraints inspected were defective due to loss of hydraulic oil supply. These suppressors and restraints were manufactured by the Bergen-Patterson Company.

In the light of this information you are requested to take the following specific actions:

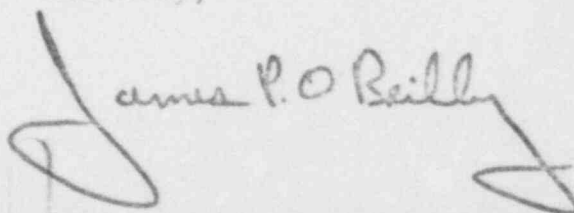
- A. Determine whether Bergen-Patterson hydraulic shock suppressors and restraints are utilized in safety systems within your facility. Report the results of this determination to this office by noon, Monday, July 30, 1973.
- B. If Bergen-Patterson suppressors and restraints are utilized in such systems:
 1. Inspect prior to noon, July 30, 1973, each suppressor and restraint for proper hydraulic fluid level.
 2. Report by telephone to this office by noon, Monday, July 30, 1973 the results of your actions to show:
 - a. Number of suppressors and restraints installed in safety related systems.
 - b. Number inspected.
 - c. Number defective by model number and location of installation and failure mode.
 - d. Confirmation of operability of defective suppressors and restraints. If repairs are not completed, your justification for continuing operation of your plant and your schedule for completion of repairs.
 - e. Existing or planned surveillance schedule for suppressors and restraints.

Dupe
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3. For plants with existing surveillance of suppressors and restraints, if your inspection has been performed within the last 30 days and there is no history of defective suppressors and restraints or if all were repaired, this request for inspection prior to noon July 30, 1973, does not apply.
- C. Reports made in response to A and B, above, should be confirmed in writing within 10 days.
- D. For facilities with no Bergen-Patterson suppressors and restraints or with existing surveillance inspections of suppressors and restraints:
 1. At the next reactor shutdown, inspect all hydraulic suppressors and restraints in safety related systems. Inform this office of your schedule for this inspection by noon, July 30, 1973.
 2. When the inspection is performed, if defective suppressors and restraints are identified, the results of your inspection should be reported immediately by telephone to this office and confirmed in writing within 10 days. This report should include:
 - a. Number of suppressors and restraints inspected, identified by manufacturer.
 - b. Number of defective suppressors and restraints.
 - c. For each defective suppressor and restraint report:
 - (1) manufacturer (2) model number (3) location of installation
 - (4) failure mode
 - d. Confirmation of operability of defective suppressors and restraints. If repairs are not completed, your justification for operation of your plant and your schedule for completion of repairs.
 - e. Surveillance schedule.
 3. If no defective suppressors and restraints are identified a report should be submitted within 10 days of completion of the inspection to show the number of suppressors and restraints inspected identified by manufacturer and model number.

If you have any questions concerning this request, please contact this office.

Sincerely,



Director, Region I
Directorate of Regulatory Operations

<u>Licensee</u>	<u>Docket No.</u>
Boston Edison Company	50-293
Connecticut Yankee Atomic Power Company	50-213
Consolidated Edison Company of New York, Inc.	50-3 50-247
Jersey Central Power & Light Company	50-219
Maine Yankee Atomic Power Company	50-309
Millstone Point Company	50-245
Niagara Mohawk Power Corporation	50-220
Philadelphia Electric Company	50-171
Rochester Gas & Electric Corporation	50-244
Vermont Yankee Nuclear Power Corporation	50-271
Yankee Atomic Electric Company	50-29