

Hayward Tyler
PUMP COMPANY

P. O. Box 492
80 Industrial Parkway
Burlington, Vt. 05402
(802) 863-2351

March 12, 1982

Mr. Richard C. DeYoung
Director of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
4350 East West Highway
Bethesda, Maryland 20555

Dear Mr. Young:

I attach information requested by Mr. Harold W. Roberds on
4 March 1982.

The four (4) sheets represent the code parts supplied for code
pumps (classes 2 and 3). We have supplied non-code parts for these
code pumps and others as well. We understand you do not need to know
of these.

We request that this information be kept confidential.

Sincerely,

HAYWARD TYLER PUMP COMPANY


B.P. Lyons
Chief Executive

BPL/kgm
Attach.

8204080069

XA

5pp

Confidential Treatment Claimed

CUSTOMER NAME

PAGE 1 OF 2

TRACT #	CODE CLASS (1-2-3)	PUMP MODEL	PART NAME	PART NUMBER	PLANT/NAME LOCATION
-	3	-	Plug - Diffuser	01-200-271-001	-
-	-	-	Diffuser 1st Stage	71-400-570-001	-
-	-	-	Diffuser Last Stage	71-400-571-001	-
-	-	-	Stud - Diffuser	01-200-254-004	-
-	-	-	Hex Nut - Diffuser	01-200-253-004	-
-	-	-	Suction Bowl	71-420-226-001	-
-	-	-	Hex Nut - Suct Bowl	01-200-253-004	-
-	-	-	Stud - Suction Bowl	01-200-254-005	-
-	-	-	Down Plug - Suct Bowl	01-200-271-001	-
-	-	-	Split Gland	71-320-089-003	-
-	-	-	Hex Nut - Gland	01-200-253-001	-
-	-	-	Stud - Gland	01-200-254-003	-
-	-	-	Bolt - Gland Halves	1/4" 20UNC x 2" LG.	-
-	-	-	Hex Nut - Gland Halves	1/4" 20UNC	-
-	3	-	Plug - Column + Diffuser	01-200-271-001	-
-	-	-	Plug - Discharge Elbow	01-200-271-001	-
-	-	-	Hex Nut - Column	01-200-253-003	-
-	-	-	Bolt - Column	01-200-270-001	-
-	-	-	Cap Screw - Col to Elbow	01-200-269-001	-
-	-	-	Hex Nuts - Diffuser/Col	01-200-253-003	-

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Confidential Treatment Claimed
CUSTOMER NAME

Page 2 of 2

TRACT #	CODE CLASS (1-2-3)	PUMP MODEL	PART NAME	PART NUMBER	PLANT/NAME LOCATION
	3		CAPSCREWS-DIFF/COU.	01-200-264-002	-
"	"	"	STUD-DIFFUSER	01-200-254-004	"
"	"	"	HEX NUT-DIFFUSER	01-200-253-004	"
"	"	"	HEX NUT-SUCT. BOWL	01-200-253-004	"
"	"	"	STUD-SUCTION BOWL	01-200-254-005	"
"	"	"	GLAND HALVES	71-320-084-003	"
"	"	"	HEX NUT-GLAND	01-200-253-001	"
"	"	"	STUD-GLAND	01-200-254-003	"
"	"	"	BOLT-GLAND HALF	1/4"-20UNC x 2" LG.	"
"	"	"	HEX NUT-GLAND HALF	1/4"-20UNC.	"

~~Confidential Treatment Claimed~~

Page 1 of 1

CUSTOMER NAME

TRACT #	CODE CLASS (1-7-3)	PUMP MODEL	PART NAME	PART NUMBER	PLANT/NAME LOCATION
1	2		CASING STUDS	71-200-157-001	-
-	-	-	CASING NUTS	1"-3 UNC	"
-	-	-	GRAND FLOE CAPSCREW	3/4"-10 UNC x 2 1/2 LG.	"
1	2		CASING STUDS	71-200-237-001	-
-	-	-	CASING NUTS	71-200-203-001	-
-	-	-	CASING END C.R. STUDS	71-200-240-001	-
-	-	-	CASING END C.R. NUTS	1 1/2"-3 N	-
-	-	-	MECHANICAL SEAL HOUSING SEC. HO. CAPSCREWS	3/4"-10 UNC x 3 LG.	-
-	-	-	MECH SEAL GLAND STUDS.	71-200-148-002	-
-	-	-	MECH SEAL GLAND STUD NUTS	3/8"-11 UNC	-

Hayward Tyler

PUMP COMPANY

P. O. Box 492
80 Industrial Parkway
Burlington, Vt. 05402
(802) 863-2351

June 10, 1982

Mr. Roger Fortuna
Acting Chief of Investigations
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

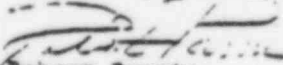
Dear Mr. Fortuna:

Subject: List of Spare Parts Supplied by the
Hayward Tyler Pump Company (HTPC)

In response to your letter of April 29, 1982 to Mr. B.P. Lyons, HTPC is sending the data you have requested. Attached are lists of all the spare parts, both Code and non-Code, supplied by HTPC for all pumps at nuclear generating facilities which HTPC knows to be Code pumps. For each contract number (HTPC's Order Number) calling for spare parts for such a Code pump, the attached lists show the quality level of each part and the quantity supplied. For those contracts where HTPC has supplied spare parts for units manufactured by this Company, the National Board Registration Number of the pumps are stated. HTPC is not aware whether these pumps are operating as yet.

As you can see, the information being provided here provides, at least in part, a customer list of HTPC and the specific parts needs of those customers. As such, this information is highly confidential commercial and business information and, if released, would be of substantial benefit to HTPC's competitors and detrimental to HTPC's competitive position. For this reason, each page has been stamped "Confidential Treatment Claimed". We expect that you and the other NRC officials who review this material will honor the confidentiality of these documents and there will be no publication, intentional or inadvertent, of these documents. Furthermore, this material is covered in all respects by the letter from Mr. John T. Boese, counsel to HTPC, to Mr. Uldis Potopovs dated January 28, 1982.

Very truly yours,


Robert Parrin
Vice President &
General Manager

RP/gm
Att.

cc: B.P. Lyons

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Exhibit 7

(62pp)

E-86

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Confidential Treatment Claimed

CUSTOMER NAME

PAGE 1 OF 1

TRACT	CODE CLASS (1-2-3)	PUMP MODEL	PART NAME	PART NUMBER	PLANT/NAME LOCATION
	2	4	GLAND PLATE	F-SP21861-14	
	2		1/2" NPT APE PLUG AND MECH. SEAL GLAND PLATE	1/2" NPT APE PLUG	

Customer Name _____ Cont. No. _____ Date 8-1-80

Pump Serial No _____ service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Hex Nut	01-320-253-004	8	1	
DIFF. Bushing	71-320-146-001	1	4	
O-Ring	BUNA-N	2	5	
Socks + Setcrew	ASTM-A316	4	4	
Hex Nut	01-320-253-004	12	1	
Stud	01-320-254-005	6	1	
Key	71-130-049-001	2	4	
FLANGE	71-320-134-001	1	5	
Cap screw	ASTM-A316	8	4	
Wear Ring	71-320-144-001	1	4	
Wt. Ring	71-320-103-001	2	4	
Wt. Ring	71-320-145-001	2	4	
Wt. Ring	71-320-144-001	2	4	
Cap screw	ASTM-A316	12	4	
Wt. Ring	71-320-104-001	1	4	
Cap screw	ASTM-A316	12	4	
Set screw	ASTM-A316	12	4	
Key	71-130-049-001	1	4	

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Customer Name _____ Cont. No. _____ Date 8-1-80

Pump Serial No. _____ Service 24 VSN Service Water Pump

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Coupling	71-400-101-001	1	5	
Coupling	71-400-102-002	1	5	
Thrust Ring	71-500-265-002	1	5	
Adj. SPACER	71-300-223-001	1	5	
CAPSCREWS	AKM-2572	4	5	
CAPSCREWS	AKM-2574	2	5	
Hex NUTS	AKM-A 94 32-2	2	5	
Lockwashers		12	5	
Plug	01-300-271-001	2	1	
Plug	01-300-271-001	1	1	
Hex NUTS	01-300-253-003	12	1	
BOLTS	01-300-270-001	12	2 1	
CAPSCREW	01-300-269-001	6	1	
O-RING	BUNA-N	6	5	
O-RING	BUNA-N	3	5	
Hex Nut	01-300-263-003	6	1	
CAPSCREW	01-300-269-002	6	1	
Stud	01-300-264-004	2	1	

Confidential *R*

Customer Name _____ Cont. No. _____ Date 8-1-80

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
KEY	01-3M-342-131	1	6	
Socket Setcrew	ASTM-A164	2	4	
O-Ring	BUNA-N	7	5	
BEARING	71-320-302-001	4	5	
Brg.	71-320-398-001	1	5	
SLEEVE	71-320-303-001	1	4	
Brg.	71-320-396-001	1	5	
Split Ring	71-320-380-001	3	4	
KEY	71-100-316-002	6	4	
Setcrew	ASTM-A164	6	4	
SLEEVE	71-320-199-001	4	4	
SLEEVE	71-320-192-001	2	4	
SLEEVE	71-320-102-001	1	4	
Ret. Pins	ASTM-A164	1/2	4	
Gland Packing	Graphite	8	5	
GLAND	71-320-089-003	2	1	
LANTERN Ring	71-320-138-001	1	4	
Hy. Hx. Nut	01-3M-263-001	4	1	

Confidential Treatment Claimed

Y. Stamper, Pump Tas/Me M.B. No. _____[illegible]

~~Confidential Treatment Desired~~

Cont. No. _____ Date 11/25/71

Pump Serial No.

Service SA 43N June 4th 1964

Plan c Name _____

Operating Yes/No Date

N. Stamped Pump Yes/No

N.B. No. _____

[illegible]

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date 11-28-80

Pump Serial No. _____ Service Inspection P.T.E. Sup

Plant Name _____ Operating Yes/No Date Make up!

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Washers	01-300-168-001	4	5	
Wtr. Ring	01-300-052-001	2	5	
Wtr. Ring Pin	stock	4	5	
Wtr. Ring	01-300-124-001	2	5	
Pins	stock	4	5	
Washer	Parker 2-130	4	5	
Screws	stock	2	4	
Locking Insert	2468-LEN0750	1	5	
Pins	stock	3	6	
Br.	GA-NU208	3	6	
Br.	SKF-7308 BSK	3	6	
Lockwasher	SKF-W08	3	6	
Locknut	SKF-N08	1	6	
Washer	BW-404	1	6	
Washer	01-300-091-001	4	6	
Oiler	EB-404	1	6	
Washer	stock	4	5	
Ring	01-300-149-001	3	6	
Sleeve	01-300-040-001	2	5	
Bushing	01-300-041-001	1	5	Confidential Treatment Claimed

[Signature]

3. Stamped Pump Yes/No N.S. Yes.

[illegible]

~~Confidential Treatment~~

Customer Name _____ Cont. No. _____ Date 11-21-80

Pump Serial No. _____ Service _____

Plane Name _____	Operating	Yes/No	Date _____
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N. Stamped Pump Yes/No N.B. No.

[illegible]

Continued on inside back cover

J. Scamped Pump Yes/No N.B. No. _____

[illegible]

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date 12-30-71
Pump Serial No. 61 21 Service ECCS
CCN 47 Jockey Pump N-3
Plant Name _____ Operating Yes/No _____ Date _____
N. Stamped Pump Yes/No _____ N.B. No. _____

[illegible]

Confidential Treatment Statute

Customer Name _____

Cont. No. _____

Date 8/5/81

Pump Serial No. _____

Service _____

Important to be done

Plant Name _____

Operating Yes/No _____

Date _____

N. Stamped Pump _____

Yes/No _____

N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Casing Gasket		12	5	
Split Ring Gasket		3	5	
Gasket Gasket Gasket	01-200-031-001	30	6	
Casing Retaining Ring	01-200-024-001	3	6	
Gasket Neck Seal		6	5	
Gasket (Csg. back cover)	01-300-168-005	6	5	
2.5" Wear Ring	01-200-168-001	1	5	
2.5" Wear Ring		3	5	
Gasket - Shaft Seal	Part 2-145	6	5	
Radial Bearing	SELF 24-211-C3	3	6	
2.5" Wear Ring		3	6	
Gasket Gasket Gasket	SELF 2-354	6	6	
Gasket Gasket Gasket	01-200-091-003	10	6	
Technical Seal	CF-SR 11553	7	5	
Blind Plate Gasket	01-200-166-001	1	5	
Gasket (Csg. Back Cover)	01-300-166-003	4	5	
Impeller Wear Ring	01-200-138-001	1	5	
Set Screen		3	5	

Confidential Treatment Claimed

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Socket - Shaft Drive	Order 2-128	4	5	
Radial Bearing	325-402209-C3	2	6	
127-Blower Pins		2	6	
Socket - Std. Gen. Co.	Order 2-2-19	4	6	
Socket (Coring - Backhoe)	Order 2-272	4	5	
2 - rollers 12 1/2" Dia	01-200-192-001	1	5	
Socket - Shaft Drive	Order 2-120	4	5	
Radial Bearing	602-40208-C3	2	6	
127-Blower Pins	01-200-54-001	2	6	
1/2" x 1/2" Retaining Pin		2	6	

~~Confidential - Treatment Related~~

Customer Name Cont. No. Date 10-24-80

Pump Serial No. Service

Plant Name Operating Yes/No Date

N. Stamped Pump Yes/No N.B. No.

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
O-Ring	2-249	3	5	
O-Ring	2-249	3	5	
O-Ring	2-249	3	5	
Brg. Sleeve	71-200-196-001	5	5	
Pkg. Cover	71-200-233-001	1	5	
Stud	71-200-142-001	4	5	
Nut		4	5	
Pin	71-200-207-001	2	5	
Nut	71-200-190-001	6	5	
Discharge	71-400-212-001	1	5	
Valute		12	5	
Plate	71-400-211-001	1	5	
Valute	71-400-210-001	1	5	
Valute	71-400-029-001	1	5	
Valute	71-420-261-001	1	5	
Valute	71-420-259-001	1	5	
Valute	71-400-213-001	1	5	
Valute	71-420-260-001	1	5	
Valute	71-400-214-001	1	5	

Plug.

2

5 Confidential Treatment Claimed

Date 6.29.8

Service

Operating	Yes/No	Date
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N.B. No.

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
O-Ring	2-416	1	5	
O-Ring	" 2-271	1	5	
O-Ring	" 1-265	1	5	
O-Ring	" 2-463	1	5	
O-Ring	" 2-272	1	5	
O-Ring	" 2-247	1	5	
O-Ring	" 2-247	1	5	
O-Ring	" 2-249	1	5	
O-Ring	" 2-248	1	5	
O-Ring	" 2-249	1	5	
O-Ring	" 2-277	1	5	
O-Ring		1	5	
Impeller	71-400-244-001	1	4	
Impeller	71-400-246-001	1	4	
Impeller	71-400-243-001	2	4	
Ring	71-200-195-001	6	5	
Key	71-100-195-001	1	6	

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date _____

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Brg.	465792	1	6	
Sleeve	71-200-272-001	1	6	
Sleeve	71-200-273-001	1	6	
Sleeve	71-200-273-001	1	5	
Key	71-200-277-001	1	5	
Sleeve	71-200-269-001	1	6	
Sleeve	71-200-270-001	2	5	
Ring	71-200-189-001	2	5	
W. Ring	71-200-189-001	2	5	
Key T	71-200-277-001	1	5	
Washer	71-200-197-007	2	5	
Lock Nut	71-200-196-001	2	5	
Brg.	71-420-269-001	3	5	
Spacer	71-200-249-001	5	5	
Brg. O-Ring	2-247	3	5	
Brg. O-Ring	2-247	3	5	
Cap screw		6	5	
Plug		2	5	
Hyd. Brg.	71-400-233-001	2	5	
Key	71-100-011-002	6	5	

Confidential Treatment Claimed

N. Scamped Pump Yes/No N.B. No. _____

~~Confidential Treatment Claimed~~

M. Stamped Pump Yes/No N.B. No. _____[illegible]

Confidential Treatment Claimed

W. Stamped Pump Yes/No N.B. No. _____

[illegible]

~~Confidential Treatment Guidelines~~

Customer Name _____ Unit. No. _____ Date 1/30/80

Pump Serial No. _____ Service Class III Component Soling Pump

Plant Name _____ Operating Yes/No Date _____

N. Stamped Pump Yes/No N.B. No. _____

[illegible]

~~Confidential Treatment Group~~

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Impeller	71-320-139	1	4	
Impeller Wear Rings	71-220-085	2	5	
Shaft	71-420-124	1	4	
Sleeve	71-220-084	2	5	
Key, Coupling	71-120-058	1	5	
Key, Impeller	71-120-019	1	5	
Collector Sleeve Nut	71-220-112	1	6	
Bearing, Antisound	SKF 3306A/C3	1	6	
Bearing, Inboard	SKF 6307	1	6	
Bearing Lockwasher	SKF W-06	1	6	
Bearing Locknut	SKF N-06	1	6	
Collector Sleeve Nut ^{Antisound}	71-220-113	1	6	
Mechanical Seal Crane	CP SP-5506-1	2	5	
"O" Ring	Parker 2-218	2	5	
Jet Screen Imp. W.P.		6	5	
Crane Wear Ring	71-220-095	2	5	
Crane Wear Ring Pin	71-120-052	2	5	
Black Photo Basket		2	5	

Confidential Treatment Claimed

Y. Stamped Pump Yes/No Y.B. No. _____[illegible]

~~Confidential Treatment Granted~~

Date 3/28/10

Service Compass Cooling Water Spray Pump

Operating	Tax/No	Date
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H.S. No.

Confidential Treatment Claimed

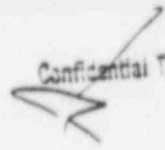
Customer Name _____ Cont. No. _____ Date 1/5/80

Pump Serial No. _____ Service Containment Sump Pump

Plant Name _____ Operating Yes/No Date _____

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Impeller	71-420-017-001	1	4	
Shaft	71-400-237-001	1	4	
Wear Ring, Impeller	71-200-176	2	5	
Wear Ring, Casing	71-100-215	2	5	
Wear Ring, Backsaver	71-100-220	2	5	
Shaft Sleeve, Mech Seal	71-100-217	2	5	
Impeller Nut	71-200-181	2	5	
Impeller Lockwasher	71-200-180	2	5	
10" ring, Jacket Cvr.	Parker 2-275	4	5	
10" ring, Jacket Cvr.	Parker 2-257	4	5	
10" ring Casing	Parker 20454	1	5	
Impeller Wear Ring	71-200-175	2	5	

 Confidential Treatment Claimed

Customer Name _____

Ord. No. _____

Date 12/3/81

Pump Serial No. _____

Service _____

Plant Name _____

Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____

N.S. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Gasket	Clare 888	12	5	
Gasket	" 888	3	5	
Gasket	01-300-121-001	30	6	
Ring	01-300-124-001	3	6	
Gasket	Clare 888	6	5	
Gasket	N-300-168-005	6	5	
W.R. Ring	N-200-168-001	1	5	
Set screw	Stock	3	5	
Gasket	Huber 2-135	6	5	
Bo.	SKT-N43211-23	3	6	
Pipe	Stock	3	6	
Gasket	SKS-2-254	6	6	
Gasket	01-300-191-003	10	6	
Mech. Seal	CE-SP-71353	7	5	
Bushings	01-300-166-001	1	5	
Gasket U	N-300-168-002	4	5	
W.R. Ring	N-200-168-001	1	5	
Set screw	Stock	3	5	

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date _____

Pump Serial No.	Service
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Plane Name _____	Operating Yes/No _____	Date _____
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Y. Stamped Pump Yes/No Y.B. No. _____[illegible]

~~Confidential Treatment~~

Customer Name _____ Cont. No. _____ Date 6-29-81

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No Date _____

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Rod	71-200-200-101	6	5	
Tie Rod	71-300-226-009	2	5	
Nut		4	5	
Nut	71-200-206-001	8	5	
Tie Rod	71-300-226-111	2	5	
Stud	71-200-149-102	2	5	
Nut		3	5	
Plate	71-200-206-111	6	5	
Stud	71-200-149-105	6	6	
Nut		6	6	
Plate	71-200-206-111	12	5	
Ring		6	5	
Screw		6	5	
Mech. Bushings	71-300-219-101	4	5	
Lockscrew	1-445-11034	4	5	
Pump Coupling		1	6	
Pump		1	6	
Coupling		1	6	

Confidential Treatment Claimed

Customer Name Cont. No. Date

Pump Serial No. Service

Plant Name Operating Yes/No Date

N. Stamped Pump Yes/No N.B. No.

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Brgs.	SKF-72/42A	4	6	
Chase	71-200-119-001	1	6	
Lockwasher	SKF-W14	2	6	
Locknut	SKF-N14	1	6	
Bushing	71-201-223-001	2	5	
Extruder		6	5	
W. Ring	71-200-017-001	4	5	
Casecrew		8	5	
Stud	71-200-151-001	12	1	
Nut		12	1	
Casecrew		4	1	
Qty. Housing		4	6	
Coupling	71-100-118-001	1	6	
Washer		4	6	
Washer		4	6	
Washer		8	6	
O-Ring	Parker 172	8	5	
O-Ring	" 275	8	5	
O-Ring	1" 2-470-56474	4	5	

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date 9-21-79

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Check	71-200-256-001	2	5	
Key	71-100-029-001	1	5	
Shaft	ASPH. A407-347	1	4	
Check	71-200-255-001	2	5	
Set screw	3/4 3/16	8	6	
Impeller	71-400-027-001	1	4	
O-Ring	Parker 2-840	5	5	
Mech Seal	ESP-21699	2	5	
Collar	ESP-21699	6	5	
O-Rings	ESP-21699	6	5	
O-Rings	ESP-21699	6	5	
V-Ring	SKF-V90-S	2	6	
Deflector	SKF-Y85S	1	6	
Brg.	SKF-6217	2	6	
Ring	71-200-030-001	2	6	
Plates	71-200-031-001	1	6	
Grease	Steel	1	6	
Lins	C1018	2	6	

Confidential Treatment Desired

Y. Scamped Pump Yes/No N.B. No. _____[illegible]

Confidential

N. Stamped Pump Yes/No N.B. No. _____

[illegible]

Confidential Treatment Claimed

Customer Name _____ Code No. _____ Date May 30 70

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No Date _____

8. Stamped Pump Yes/No 9.3. No. _____

[illegible]

~~Confidential Treatment Guidelines~~

N. Stamped Pump Yes/No H.B. No. _____

[illegible]

~~Confidential Treatment Required~~

Y. Stopped Pump Yes/No N.B. Yo. _____[illegible]

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date 11-2-81

Pump Serial No. _____ Service B+H 12/14/16 CE Auto

Plant Name _____	Operating Yes/No	Date _____
------------------	------------------	------------

N. Scamped Pump Yes/No N.B. No. _____[illegible]

Confidential Treatment Claimed

Date 11-27-81

12/14/16 DE Rung

Dacc

S.A. No.

[illegible]

~~Confidential Treatment Claimed~~

Date 11-23-77

Service NASH Cont. Sec'y Burd.

✓ Operating Yes/No Date

N.B. No. _____

[illegible]

Confidential Treatment Claimed

Customer Name _____

Cont. No. _____ Date _____

Pump Serial No. _____

Service _____

Plant Name _____

Operating Yes/No _____ Date _____

N. Scanned Pump Yes/No _____

N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
O-Ring	2-465	3	5	
O-Ring	2-262	3	5	
O-Ring	2-277	3	5	
O-Ring	2-247	3	5	
Mech. Seal	2-236	3	5	
Mech. Seal	2-239	3	5	
Wicket	71-200-253-001	30	6	
Wicket	71-200-262-001	2	6	
Thrust Pro.	SKF-7313 36	1	6	
Radial Pro.	SKF-4113/4	3	6	
Deflector	V-605	6	6	
Deflector	V-705	6	6	
O-Ring	2-273	2	5	
O-Ring	2-160	2	5	
O-Ring	2-169	2	5	
Mech. Seal	2-227	2	5	
Mech. Seal	2-236	2	5	
O-Ring	2-236	2	8	

Confidential Treatment Claimed

N. Stamped Pump Yes/No N.B. No.

[illegible]

~~Confidential Treatment Claimed~~

Date 11-19-51

Service DE 12/14/16

Operating Yes/No Date

N.B. No.

~~Confidential Treatment Claim~~

Customer Name _____, Cont. No. _____ Date 6-2-77

Pump Serial No. _____ Service Subsection NO-Class 3 Pump

Plant Name - 0 0 + Operating Yes/No Date _____

N. Stamped Pump Yes/No N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Impeller	500511-3	1	4	
Shaft ^{ASPH} 2122-4140	101231-4	1	4	
Ring	01-001-017-001	1	5	
Int. Ring	249021-1	2	5	
Sleeve	249022-1	1	5	
Pro.	SKF-6310	1	6	
Pro.	SKF-6310 NR1	1	6	
Locknut	SKF-N10	1	6	
Screw	01-001-016-001	1	4	
Ring	249020-1	1	5	
Masket	01-001-017-001	1	5	
Key	01-001-017-001	1	5	
Masket ^{CR} 200	SKF-V-405	1	5	
Deflector	SKF-V-405	1	6	
Key	301320-1	1	5	
Rings	107916-1	2	6	
Bushings	220207-1	1	5	
Lockwasher	SKF-W10	1	6	

Confidential treatment removed

N. Stamped Pump Yes/No N.B. No. _____

~~Confidential Treatment Claimed~~

Customer Name 0

Cont. No. _____

Date 10-22-80

Pump Serial No. _____

Service _____

Plant Name _____

Operating Yes/No Date _____N. Stamped Pump Yes/No

N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Pump Shaft ¹⁰⁰⁰ 71-500-244-001	71-500-244-001	1	4	
Studs	71-200-237-001	10	1	
Nuts	71-200-203-001	10	1	
Washers	SA-104-7	11	5	
Studs	71-200-240-001	3	1	
Nuts	SA-104-7	6	1	
Cap screws	SA-103-B7	6	1	
Studs	71-200-48-001	4	1	
Nuts	SA-104-7	4	1	
Locking Plate	71-200-254-001	2	5	
Split Ring	71-200-585-001	2	5	


Confidential Treatment Claimed

Customer Name _____

Cont. No. _____ Date 9-30-81

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Data _____

N. Stamped Pump Yes/No _____

N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Pump Shaft	ASTM-A564-XH25	1	4	
Shaft Sleeve	71-200-331-001	1	5	
Key	71-200-277-001	1	5	
Sleeve	71-200-233-001	1	5	
Key	71-200-277-001	1	5	
Washer	71-200-197-001	1	5	
Locknut	71-200-196-001	1	5	
Sleeve		2	5	
Washer	SKF-W12	1	6	
Locknut	SKF-N12	1	6	
Impeller	71-400-244-001	1	4	
Impeller	71-400-244-001	1	4	
Impeller	71-400-242-001	1	4	
Impeller	71-400-242-002	1	4	
Impeller	71-400-243-001	1	4	
Impeller	71-400-243-002	1	4	
Impeller	71-400-243-003	1	4	
Impeller	71-400-243-004	1	4	

Confidential Treatment Claimed

V. Stamped Pump Yes/No M.B. No. _____[illegible]

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date 10-31-80

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ M.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Wr. Ring	71-320-187-001	1	5	
IMPELLER	71-420-161-001	1	4	
SHAFT	71-420-161-001	1	2	
Nut	71-220-131-001	1	4	
Wr. Ring	71-320-126-001	1	5	
Wr. Ring	71-320-127-001	1	5	
KEY	71-120-073-001	1	5	
KEY	71-120-074-001	1	5	
FRAME	71-520-024-001	1	6	
Brq. Cover	71-320-179-001	1	6	
Brq. Cover	71-320-179-001	1	6	
FRAME SUPPORT	71-320-184-001	1	6	
RING	71-220-128-001	1	6	
RING	71-220-129-001	1	6	
OIL FLINDER	71-220-130-001	1	6	
DEFLECTOR	71-220-132-001	1	6	
DEFLECTOR	71-220-133-001	1	6	
Brq. INBrd.	KE-N322	1	6	

Confidential Treatment Desired

Customer Name _____ Cont. No. _____ Date 10-3-80

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.S. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
BEARINGS	SKF-7430LM	2	6	
Gasket	J. CRANE 888	1	5	
MURGE TIL LEVEL	71-220-157-001	1	6	
Mech. Seal	Frame E-SP21861	1	5	
GLAND PLATE	SCME E-SP21861	1	1	
SLEEVE	" "	1	5	
COUPLING	FALK 15 FL	1	6	
LOCKWASHER	71-120-123-001	1	5	
Gasket	J. CRANE 888	1	5	
Soc. Hd. Capscrews		2	6	
SETScrews		1	6	
Gasket		2	6	
Br. Lockwasher	SKF-W20	1	6	
LOCKNUT	SKF-AN20	1	6	
GLAND O-RING		1	5	
PIPE PLUG		2	1	
SETScrews		6	5	
Gasket		1	6	

Confidential Treatment Claimed

N. Stamped Pump Yes/No N.B. No. _____

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date 8-1-80

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Impellers	71-490-162-001	2	4	
Shafts	^{ASTM} 944 1A14-YM25	2	2	
Rings	71-320-126-001	4	5	
Rings	71-320-137-001	4	5	
Rings	71-320-135-001	4	5	
Rings	71-320-137-001	4	5	
BEARINGS	SKF-N322	6	6	
BEARINGS	SKF-7430XG	8	6	
Gaskets	J. CRANE 888	8	5	
Gaskets	J. CRANE 888	8	5	
Gaskets		8	5	
Gaskets		8	5	
SETSCREWS		24	5	
CAPSCREWS		12	5	
CAPSCREWS		12	5	
Lockwashers	71-120-123-001	2	5	
Gaskets	J. CRANE 999	2	5	
Gaskets	J. CRANE 888	2	5	

Confidential Treatment Claimed

N. Stamped Pump Yes/No N.B. No. _____

~~Confidential Treatment Claimed~~

Customer Name _____ Cont. No. _____ Date 2-1-40

Pump Serial No. _____ Service 12x14 DE Component Cooling Water
Make-up Pumps

Plant Name _____ Operating Yes/No Date _____

N. Stamped Pump Yes/No N.S. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Lockwasher	SKF-W-06	2	5	
Gasket Casing	Crane # 388	1	5	
Wear Ring-Casing	71-220-095-001	2	5	
Wr. Ring-Impeller	71-220-053-001	2	5	
O-Ring	Parker 1-118	4	5	
Sleeve Nut	71-220-112-001	1	5	
Bearing	SKF 3306A/CS	1	5	
Bearing	SKF-6307	1	5	
Gasket		4	5	
Sleeve	71-220-113-001	1	5	
Gasket		1	4	
Following for 12x14x10 DE Component & Auxiliary Component Cooling Water Pump				
S/N 72720-24				
Bushings	71-220-080-001	2	5	
Wr. Rin-Impeller	71-220-113-001	2	5	
Sleeve	71-220-105-001R	2	5	
Sleeve	71-220-106-001L	1	5	
Wr. Ring	71-220-115-001	2	5	
Gasket	Crane # 388	10	5	
Gasket	Crane # 388	6	5	

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date 4.11.72

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No Date _____

N. Stamped Pump Yes/No H.B. No. _____

PART NAME	PART NO.	QTY.	Q.A. LEVEL	REMARKS
Coupling	# 3-B model	1	5	
Pin/Csg.Wr.Ring	71-200-097-001	2	5	
Socket Setscrew	71-200-123-001	5	5	
Sleeve	71-300-160-002	1	5	
Collar	71-200-160-003	1	5	
Shaft Sleeve Locking Collar	71-200-092-001	2	5	
Shaft Sl.Locking Collar	71-200-093-001	2	5	
Brg.Spherical Roller	SKF # 32314	2	5	
Brg. Oil Sleeve	71-200-095-001	1	5	
Sock Setscrew for It. B	71-200-095-001	2	5	
Brg. Oil Sleeve	71-200-094-001	1	5	
Shaft A275-4140	71-400-164-001	1	4	

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date 11-26-10

Pump Serial No. _____ Service _____

Plant Name _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Diffuser Inlet Elv	71 330 297 001	1	2"	
" " "	71 330 103 001	3	3"	
Inlet Diffuser Pump	71 330 085 001	2	5"	
Impeller Pump	71 330 084 001	2	3"	
Impeller		12	3"	
Shaft Seal Pump	71 330 104 001	1	2"	
Shaft Seal		12	2"	
Shaft Seal Elv	71 330 104 001	1	4"	
" " "	71 330 104 001	1	4"	
" " "	71 330 104 001	2	4"	
Shaft Seal	71 330 103 001	1	2"	
Shaft Seal Elv		1	2"	
O. Pump	71 330 103 001	5	5"	
Bearing	71 330 103 001	4	5"	
Bearing	71 330 103 001	1	5"	
Shaft Seal	71 330 103 001	1	5"	
Shaft Seal	71 330 103 001	1	5"	
Shaft Seal	71 330 103 001	1	5"	
Shaft Seal	71 330 103 001	1	5"	

Confidential Treatment Claimed

Customer Name _____ Cont. No. _____ Date 11-26-80

Pump Serial # _____ Service _____

Plant No. _____ Operating Yes/No _____ Date _____

N. Stamped Pump Yes/No _____ N.B. No. _____

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
PLUG	01-300-271-001	1	1	
O-RING		4	5	
DIFFUSER	71-400-570-001	1	1	
DIFF. CVR.	71-320-116-001	2	5	
DIFFUSER	71-400-571-001	1	1	
O-RING		2	5	
STUD	01-300-254-004	32	1	
HEX NUTS	01-300-253-004	32	1	
DIFF. THROTTLE BUSHING	71-320-161-001	1	5	
O-RING		1	5	
Socket Set Screw		4	5	
Suction Bowl	71-420-226-001	1	1	
HEX NUT	01-300-253-004	32	1	
STUDS	01-300-254-005	32	1	
IMPELLERS	71-320-290-001	2	4	
IMP. KEYS	71-320-048-001	2	5	
RETAINING FLANGE	71-320-124-001	2	5	
CAPSCREWS		8	5	

Confidential Treatment Claimed

Customer Name Cont. No. Date 11-26-80Pump Serial No. Service Plant Name Operating Yes/No Date N. Stamped Pump Yes/NoN.B. No.

PART NAME	PART NO.	QTY.	O.A. LEVEL	REMARKS
Coupling	71-420-240-001	3	4	
Split Ring	71-320-289-001	3	5	
Comp. Key	71-100-516-002	6	5	
Set screw		6	5	
Sleeve	71-220-099-001	4	5	
Sleeve	71-220-192-001	2	5	
Sleeve	71-220-002-001	2	5	
Retaining Pin	Model A. 420	16	5	
Hand Pickings		4	5	
Hand held	71-220-189-003	2	1	
Lateral Ring	71-320-138-001	1	5	
Heavy Hex. Nut	CL300-253-001	4	1	
Studs	CL300-254-003	4	1	
Bolts	1/4"-20UNC-2 1/2"	2	1	
Hex Nut	1/4"-20UNC	2	1	
Pkg. Washer	71-200-377-001	2	5	

Confidential Treatment Claimed

Exhibits 8 through 16 are being maintained at the NRC Office of Inspection and Enforcement.

FRIED, FRANK, HARRIS, SHRIVER & KAMPELMAN

A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

SUITE 1000

600 NEW HAMPSHIRE AVENUE, N. W.

WASHINGTON, D. C. 20037

TELEX: 892406

TELECOPIER: 202-337-5867

RAPIFAX: 202-338-5192

FRIED, FRANK, HARRIS,

SHRIVER & JACOBSON

ONE NEW YORK PLAZA

NEW YORK, N. Y. 10004

202-657-6000

TELEX: 892406

1000 NEW YORK PLAZA

NEW YORK, N. Y. 10004

202-657-6000

TELEX: 892406

OUR REFERENCE

JOHN T. BOESE
202-342-3668

12 (Per Boese on 8/13)
August 20, 1982

Hand Deliver

Mr. Roger Fortuna
U.S. Nuclear Regulatory Comm.
4350 East-West Highway
East-West West Building
Room 568
Bethesda, Maryland

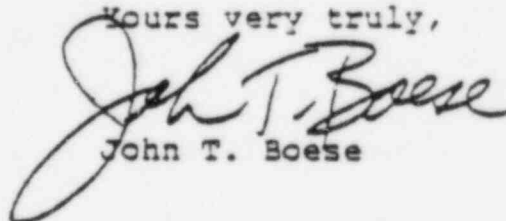
Re: Hayward Tyler Pump Co.

Dear Roger:

Enclosed are materials which were prepared by Hayward Tyler Pump Company ("HTPC") relating to the inspection and investigation of HTPC. As we have stated to you previously, these documents were generated by HTPC, and we consider them HTPC documents and not in any way Nuclear Regulatory Commission documents. We expect that these documents will be returned to us immediately after your review of them.

Please replace the enclosed for the material dated 7/28/82 re Equipment Drain Pumps forwarded to you by my letter of July 30, 1982.

Yours very truly,


John T. Boese

JTB:dlg
Enclosure

3-9-82

~~CONFIDENTIAL~~ R

Plant: Boston Edison Pilgrim Unit #2
Service: Equipment Drain Pumps
Pump Type: Hayward Tyler Type N3, Size 1-1/2 x 2 x 7 (3H1)

ABSTRACT

During 1977 Hayward Tyler developed a pump product line for nuclear auxiliary and radwaste system applications. This range of pumps, which comprises fourteen (14) sizes, was named "N3". The N3 range of pumps is an end suction, vertically split configuration with a cantilever shaft/bearing arrangement designed for low stress/deflection and high bearing life. The range of 14 pumps is subdivided into 3 groups, i.e., 3H1, 3H2 and 3H3, according to the bearing housing associated with each pump unit. See Figure 1.0 for a sectional view of the 3H1 group.

The first HTPC pumps of this range became available for testing during the second quarter of 1978. These pumps were of sizes 1-1/2 x 2 x 7 N3 (3H1) and 2 x 3 x 10 N3 (3H2), two of each size, and were to be shipped to the Boston Edison, Pilgrim 2 generating facility. (This analysis is limited to the 3H1 size.) The pumps were all hydrostatically and performance tested, during which vibration and bearing temperature readings were taken and recorded.

The initial 3H1 bearing design was comprised of a cylindrical roller radial bearing (NU208) and a single row deep groove split inner race thrust bearing (QJ308). During assembly of the Boston Edison 3H1 pumps, a considerable amount of radial displacement was observed at the impeller. HTPC determined that this excessive displacement was due to internal clearances at the anti-friction bearing. In an effort to remedy this problem, a number of different bearing configurations were tested. (See Hayward Tyler Report dated June 13, 1978, attached). As a direct result of these tests, the bearing design in the Boston Edison 3H1 pumps was changed to incorporate a single row deep groove ball radial bearing (SKF 6208). The thrust bearing (QJ308) remained unchanged from the original bearing design.

It was recognized that, although this new bearing combination was acceptable for the comparatively lightly loaded Boston Edison 3H1 pumps (1-1/2 x 2 x 7, which has the least load of all the 3H1 sizes), it was unlikely that such combination was acceptable for the full range of 3H1 pumps, especially not for such pump sizes with higher loads as the 1-1/2 x 3 x 8 or the 2 x 3 x 8 sizes. Accordingly, the Boston Edison pumps were shipped on August 1, 1978, but the bearing investigation regarding the 3H1 pump range continued thereafter.

After the Boston Edison pumps had been shipped, additional pumps of the initial 3H1 bearing configuration (including some of the 1-1/2 x 3 x 8 size) were manufactured for other contracts and became available for testing. The 1-1/2 x 3 x 8 pump size exhibits the second highest load conditions of the 3H1 group. During performance tests of these latter size pumps, contact of the rotating impeller and the stationary case ring was observed. As a result of the ongoing bearing investigation program, HTPC concluded that the initial design of a single row

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deep groove split inner race ball bearing (QJ308) for the thrust bearing did not provide the rotating element sufficient stiffness during the maximum design operating conditions. To overcome this insufficiency of stiffness, the BHL design was changed to incorporate a double row angular contact bearing as the thrust bearing, the same bearing configuration originally incorporated into the BH2 and BH3 designs. Again, based upon the relatively light hydraulic load of the Boston Edison BHL pumps, HIPC concluded that these pumps would operate satisfactorily with the bearing configuration as shipped.

This paper provides information concerning the Boston Edison 1-1/2 x 2 x 7 pumps in the form of additional technical detail to that generated at the time the redesign of those pumps' bearing configuration took place. The paper reconfirms HIPC's earlier determination that the bearing configuration as supplied in Boston Edison BHL pumps (SKF 6208 for the radial bearing and SKF QJ308 for the thrust bearing) is satisfactory for those pumps.

Boston Edison BHL Pumps

Service:	Equipment Drain
Pump Size:	1-1/2 x 2 x 7 (BHL)
Rating:	50 GPM at 135 FT
Speed:	3500 RPM
Seismic CBE condition and DBE condition	

The following analysis provides further justification for retaining the bearing configuration fitted in the 1-1/2 x 2 x 7 Boston Edison pumps. The factors considered in this analysis are those both necessary and sufficient for reaching such conclusion:

1. Shaft Displacement
2. Bearing Life and Temperature
3. Shaft Stress
4. Materials
5. Performance Test

1. Shaft Displacement

Shaft displacement is a result of the combination of deflection due to hydraulic and dead weight loads plus the displacement due to anti-friction bearing clearance. No shaft loads are transmitted from the motor to the pump, or vice versa, because a flexible coupling installed between these components precludes such transmission.

Hydraulic (i.e., dynamic) loads encountered within a centrifugal pump are both axial and radial. Axial loads add stiffness to the thrust bearing thereby reducing shaft displacement. See Fig. 3.0 for further clarification. Hydraulic radial loads result from pressure distribution around the periphery of the impeller within the volute section of the casing. When a pump's flow differs from its best efficiency point (BEP), this pressure distribution becomes unsymmetrical and shaft deflection is increased. Dead weight (static) loads are simply the result of the weight of the impeller and the shaft overhang.

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As noted above, hydraulic and dead weight loads are combined and the total becomes one element in computing total potential shaft deflection. Figure 2.0 sets forth the loads and deflections, at various percentages of BEP, of the Boston Edison BHL pumps compared to the more heavily loaded BHL unit. To compute total potential shaft displacement, this deflection (computed based on loads) is added to shaft displacement due to the bearing clearances.

The HTPC report of June 28, 1978 (copy attached) states that, in Configuration No. 4 (used in the Boston Edison BHL pumps), there are a static radial deflection of .005 - .010 inches. This range of measurement was sufficiently accurate for that testing program and, viewed as stating total deflection in the radial plane, allowed shipment of the Boston Edison pumps with the Configuration No. 4 bearing design following unit performance tests. HTPC later conducted more definitive and exacting testing on shaft displacement due to bearing clearance. These tests, undertaken in August 1978 (copy of report attached), used bearings identical^{*/} to those used in Configuration No. 4 and showed radial deflection of .004 inch up and .006 inch down. This result is reconfirmed by reference to the bearing manufacturer's own published data on the radial internal clearances of its bearings. Combining that data with the shaft length of the 1-1/2 x 2 x 7 pumps, HTPC has computed a maximum static radial displacement of .0054 inch (this computation appears in Figure 5.0, attached). The August 1978 testing and the computations using the bearing manufacturer's data make clear that the actual reading within the range obtained in the June 1978 testing must have been much closer to .005 inch than .010 inch. But, under operating conditions the .0054 inch displacement would be reduced to .0033" due to the effect of the axial load on the thrust bearing.

Figure 3.0 (attached) plots on curves both total deflection based on loads and total shaft displacement at the impeller (i.e., from all loads plus displacement due to bearing clearances), using the .0033 inch figure derived from the bearing manufacturer's data. Figure 3.0 shows that the Boston Edison BHL pumps should not exhibit contact of the rotating and stationary surfaces during operation. Furthermore, no such contact was observed in HTPC's in-house performance tests of those pumps.

2. Bearing Life and Bearing Temperature

The N3 range was designed for 50,000 hours L₁₀ bearing life as determined by the Anti-Friction Bearing Manufacturers' Association (AFBMA) Standard. As the hydraulic loads for the Boston Edison BHL pumps are low, the corresponding bearing life is high. As can be seen from Figure 4.0, bearing life for both radial and thrust bearings far exceeds this design criteria and will exceed all applicable industry requirements. Bearing temperature checks were performed on the Boston Edison BHL pumps at near to shut valve condition (bearings at highest loaded point). Maximum bearing temperatures were 125°F for the radial bearing and 139°F for the thrust bearing (see June 28, 1978 test report), which are well within acceptance standards.

^{*/} See column 2 of the test report. That configuration uses the same thrust bearing QJ308 as in the Boston Edison BHL pumps and a PRW 308S radial bearing. In accordance with AFBMA (Anti-Friction Bearing Manufacturers' Association) standards, the PRW 308S bearing type is identical dimensionally and in tolerances to the SKF 6208 bearing used as the radial bearing in the Boston Edison BHL pumps.

~~CONFIDENTIAL~~ *R*

3. Shaft Stress

No additional shaft stress results from the displacement due to bearing clearances. Design shaft stress levels, therefore, remain valid.

4. Materials

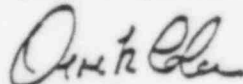
As a design precaution to minimize the effect of wear ring rubbing, all pumps are supplied with opposing rings made of materials with a high differential in hardness so as to resist galling.

5. Performance Test

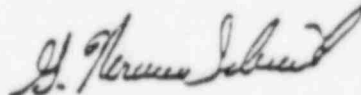
Full performance tests were conducted on the Boston Edison pumps in accordance with the Hydraulic Institute Standards and customer approved procedures. Performance tests were customer witnessed and included Head, Capacity, Horsepower, NPSH, Vibration and Temperature Checks. No unusual effects were encountered during these tests with the exception that, at one speed, one of the BHI pumps did not meet the applicable standard of acceptability for the vibration test. The customer's representative, who witnessed the testing and was given the results, accepted the pump. Since the Test Engineer recorded a note "no unusual noise or vibration", the problem most probably lay in the testing loop connection rather than in the pump. In any event, HTPC will recommend that both the BHI pumps be vibration tested again during commissioning, once they are installed and well prior to power-plant operations. Should commissioning tests confirm the validity of the high vibration reading obtained during performance testing, HTPC and its customer will take appropriate action to rectify the problem.

Conclusion

It is the opinion of HTPC that the Boston Edison BHI pumps will perform as required by the Design Specification when operated and maintained in accordance with Hayward Tyler's Operating and Maintenance Manual.



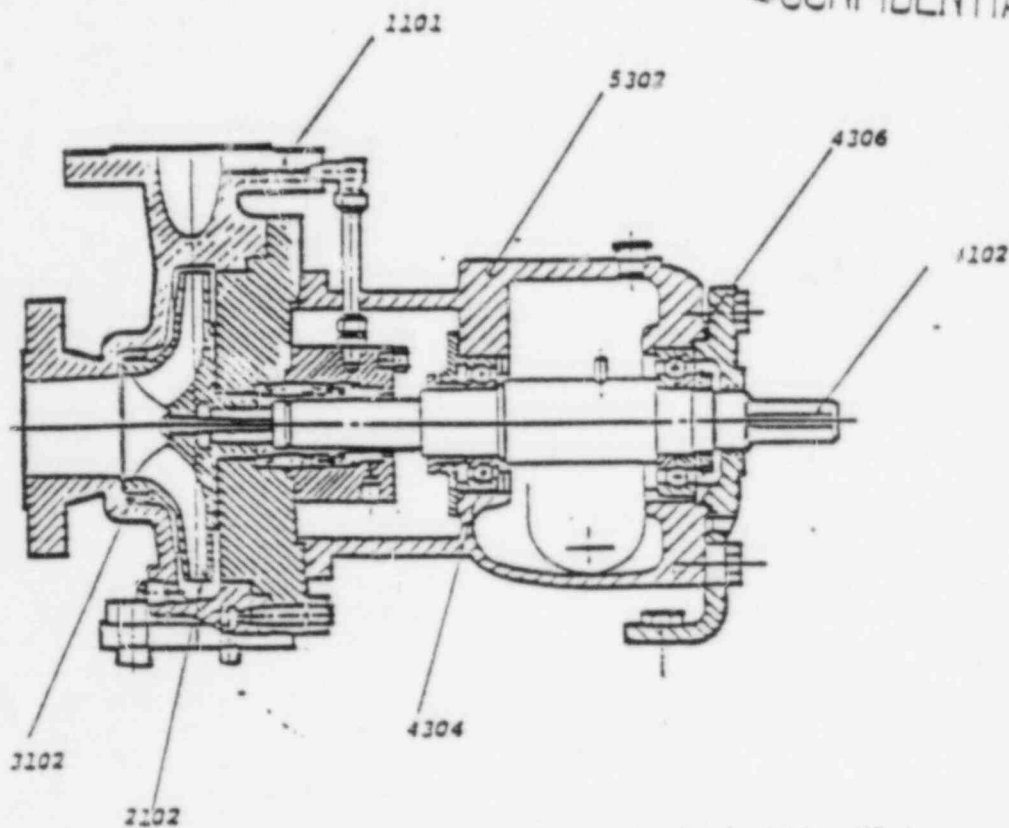
Derek Clare
Chief Engineer



Norm Schraib
Design Engineer

DC/gm

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ITEM NO.	PART NAME
1101	CASING
2102	IMPELLER
2102	CASE WEAR RING
4102	SHAFT
4304	RADIAL BEARING-SKF-6208
4306	THRUST BEARING-SKF-QJ308
5302	BEARING HOUSING (BHL)

BHL ASSEMBLY (Boston Edison 1 1/2 x 2 x 7)

FIGURE 1.0

NORMAL OPERATING CONDITIONS												
PUMP	IMPELLER DIA. (IN)	LOAD TYPE	LOAD AT IMPELLER (LBS)				DEFLECTION ($\times 10^{-3}$ IN)				DESIGN RADIAL CLEARANCE ($\times 10^{-3}$ IN)	
			20% BEP	65% BEP	100% BEP	120% BEP	20% BEP	65% BEP	100% BEP	120% BEP		
BOSTON EDISON	1½x2x7	6.71	RADIAL	39	16	2	32					
			AXIAL	419	350	293	256	2.13	0.79	0.27	2.02	7.00/8.00
MAX. LOADED PUMP ON DIII FRAME	2x3x8	8.27	RADIAL	227	111	47	124	12.02	6.59	2.60	7.41	11.50/12.50
			AXIAL	513	378	201	68					

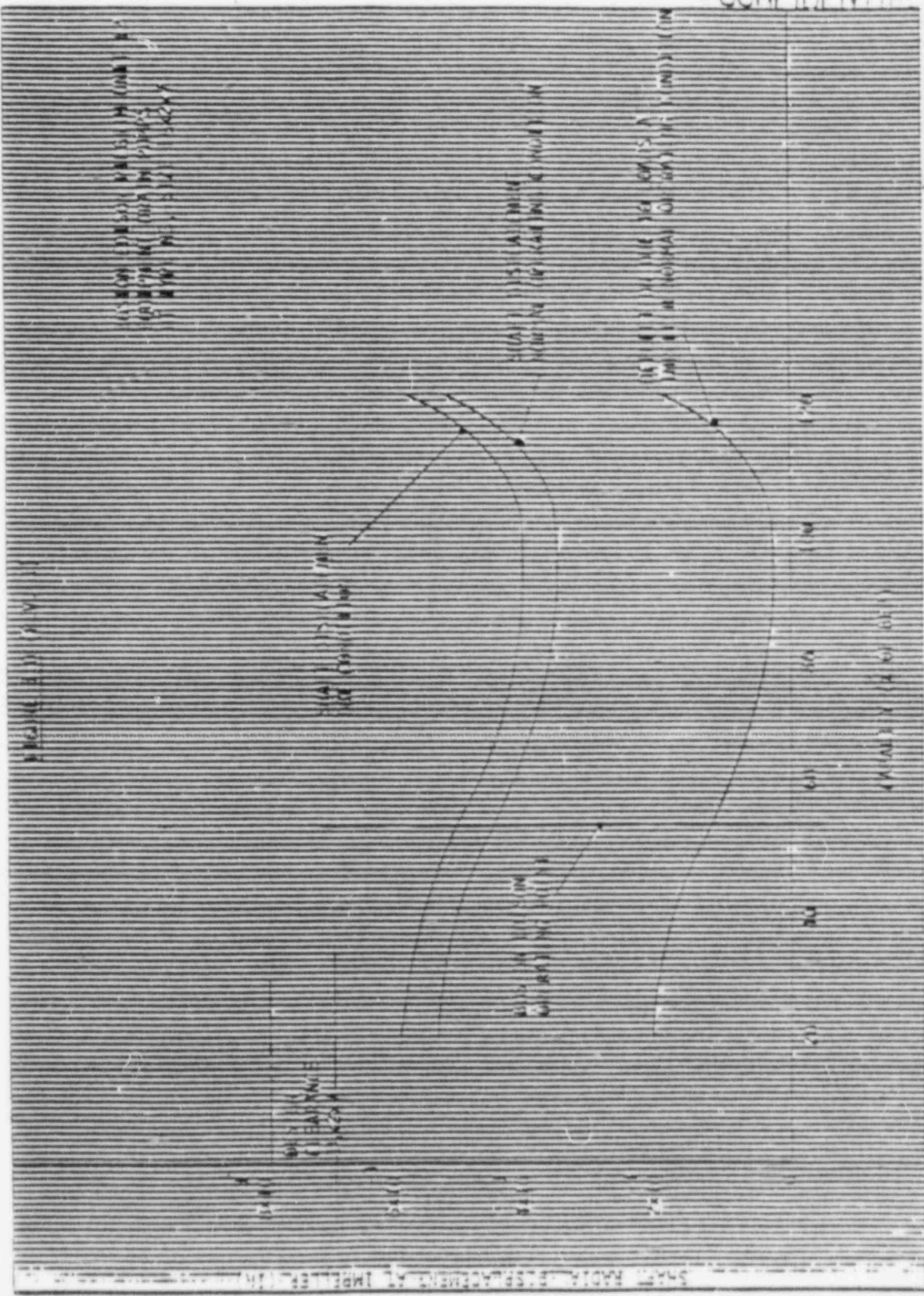
DBE CONDITION												
PUMP	IMPELLER DIA. (IN)	LOAD TYPE	LOAD AT IMPELLER (LBS)				DEFLECTION ($\times 10^{-3}$ IN)				DESIGN RADIAL CLEARANCE ($\times 10^{-3}$ IN)	
			20% BEP	65% BEP	100% BEP	120% BEP	20% BEP	65% BEP	100% BEP	120% BEP		
BOSTON EDISON	1½x2x7	6.71	RADIAL	48	25	7	41	2.66	1.32	0.79	2.55	7.00/8.00
			AXIAL	394	325	268	231					

- NOTE: 1. RADIAL LOAD AT IMPELLER INCLUDES HYDRAULIC LOAD AND IMPELLER WEIGHT.
 2. SHAFT DEFLECTION IS DUE TO RADIAL LOADS AT IMPELLER PLUS SHAFT WEIGHT AT OVERHANG.

FIGURE 2.0

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Hayward Tyler Pump Co. ENGINEERING CALCULATIONS

REF. NO.

DATE:

SHEET NO.
OF

SUBJECT:

PREPARED
BY:

REVISION

CHECKED
BY:

SECTION

Legend for Figure 3.01. SEAL DISPLACEMENT VALUES

ZERO POINT IS TAKEN AS THE OUTSIDE RADIUS OF
THE IMPELLER ROTATING WEAR SURFACES.

WAVE CLEARANCE IS THE AXIAL DISTANCE FROM THE
ZERO POINT TO THE INSIDE RADIUS OF THE STATIONARY
CASE WEAR RING.

SEAL AXIAL DISPLACEMENT VALUES ARE FROM ZERO
POINT TO A POINT NEXT AFTER DEPARTURE OF DISPLACEMENT
OF THE ROTATING IMPELLER WEAR SURFACES.

2. Boston Edison Operating Point

THE BOSTON EDISON PUMP OPERATES AT 50 GPM WHICH
IS AT 55% OF THE PUMP'S BEST EFFICIENCY POINT (BEP)

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Hayward Tyler Pump Co.
ENGINEERING CALCULATIONS

REP. NO.
FIG. 5.0

DATE:

SHEET NO. 1
OF 5

SUBJECT:

BOSTON EDISON - PILGRIM UNIT #2
EQUIPMENT DRAIN PUMPS - 1 1/2 x 2 x 7 1/2 (BH)

PREPARED
BY: D. CLARK

REVISION
1

CHECKED
BY:

SECTION

SUBJECT: TO REVIEW EXPECTED SHAFT DISPLACEMENT AT
IMPELLER DUE TO THRUST & RADIAL BEARING
INTERNAL CLEARANCES, PLUS DISPLACEMENT DUE
TO HYDRAULIC, DEADWEIGHT AND EISMIC LOADS

1. UNDER NON-OPERATING CONDITIONS
2. UNDER NORMAL OPERATING CONDITIONS
3. UNDER DFE CONDITIONS

BOSTON EDISON BEARINGS:

THRUST BEARING - SKF 62300, C3 INTERNAL CLEARANCE
(SINGLE ROW BALL BEARING)

RADIAL BEARING - SKF 6208, C3 INTERNAL CLEARANCE
(SINGLE ROW BALL BEARING)

1. NON-OPERATING CONDITION

THE PURPOSE OF REVIEWING SHAFT DISPLACEMENT UNDER
NON OPERATING CONDITION IS FOR VERIFICATION / CLARIFICATION
OF THE VALUES SHOWN IN THE H.T. BEARING INVESTIGATION
REPORTS DATED 28 JUNE 1978 AND 28 AUGUST 1978.

FROM SKF PRODUCT LITERATURE RADIAL INTERNAL CLEARANCE
FOR SINGLE ROW BALL BEARING, C3 LIMITS, RANGE
FROM .0006" TO .0012" = $d_1 + d_2$

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Hayward Tyler Pump Co.
ENGINEERING CALCULATIONS

REF NO.

FIG 5 CONT'D.

DATE:

SHEET NO.
OF

2
3

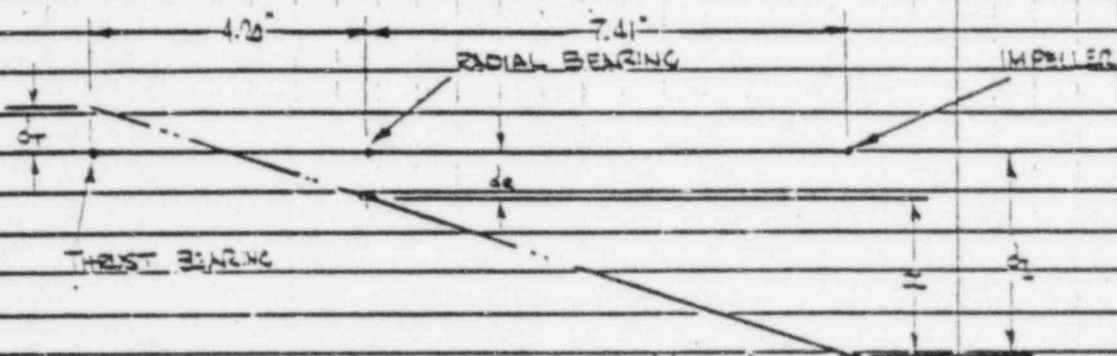
PREPARED
BY:

REVISION

CHECKED
BY:

SECTION

SUBJECT:



FROM SKE LITERATURE $d_1 = d_2 = .0006 / .0012$

DISPLACEMENT @ IMPELLER, $d_2 = X + d_2$

$$X = \frac{7.41}{1.70} (-d_1 - d_2)$$

$$= .0021 (\text{MIN}), .0042 (\text{MAX})$$

$$\text{THEN } d_2 = X + d_2$$

$$= .0027 (\text{MIN}), .0054 (\text{MAX})$$

ABOVE VERIFIES RADIAL DISPLACEMENT (DEFLECTION) AS INDICATED
IN TEST REPORT DATED 28 JUNE 1978 AND 28 AUG. 1978

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Hayward Tyler Pump Co. ENGINEERING CALCULATIONS

FIG. 5 Cont'd

DATE:

SHEET NO. 3
OF 5

SUBJECT:

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BY:

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1

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BY:

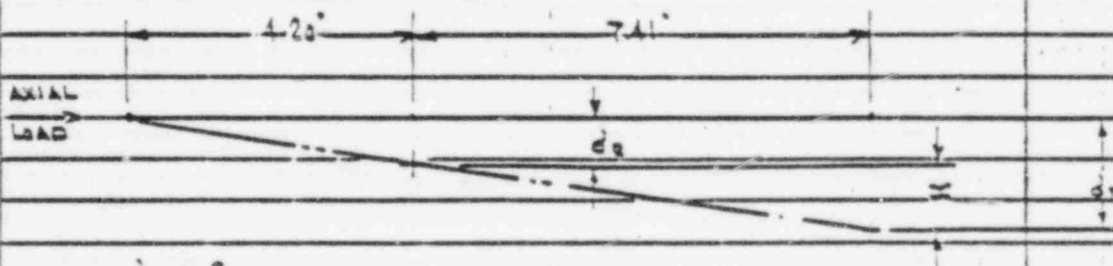
SECTION

2. UNDER NORMAL OPERATING CONDITIONS

UNDER OPERATING CONDITION SHAFT DISPLACEMENT MAGNITUDE DUE TO BEARING INTERNAL CLEARANCES IS NOT AS GREAT AS THE NON OPERATING CONDITION. THIS IS DUE TO THE EFFECT THE HYDRAULIC AXIAL LOAD HAS ON THE THRUST BEARING.

REFER FIG. 5.0 PAGE WHICH SHOWS THAT THE INTERNAL CLEARANCES WHEN PUMP IS OPERATING, IN THE THRUST BEARING IS TAKEN OUT AXIALLY AND NOT RADially. THE DESIGN OF THE PUMP HAS THE INNER AND OUTER RINGS OF THE THRUST BEARING FULLY SECURED, THEREFORE WHEN THE AXIAL LOAD IS IMPOSED BY THE IMPELLER THE ROTATING ELEMENT MOVES AXIALLY BY THE AMOUNT OF BEARING CLEARANCE. THE QJ303 THRUST BEARING HAS A 35° CONTACT ANGLE.

THEREFORE DURING OPERATING CONDITION SHAFT DISPLACEMENT IS AS FOLLOWS:



$$d_1 = 0$$

$$d_2 = .0006" / .0012$$

DISPLACEMENT AT IMPELLER, $d_1 = x = d_2$

$$x = \frac{7.41}{4.2} \cdot d_2$$

$$= .0011" (\text{MIN}), .0021" (\text{MAX}).$$

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Hayward Tyler Pump Co. ENGINEERING CALCULATIONS

REF. NO.

FIG. 5. Cnt's

DATE:

SHEET NO.

OF

5

PREPARED
BY:

REVISION

1

CHECKED
BY:

SECTION

SUBJECT:

$$\begin{aligned} \text{Then } \delta_2 &= \delta_1 + \delta_0 \\ &= .0017' (\text{MIN}) \quad .0033' (\text{MAX}) \end{aligned}$$

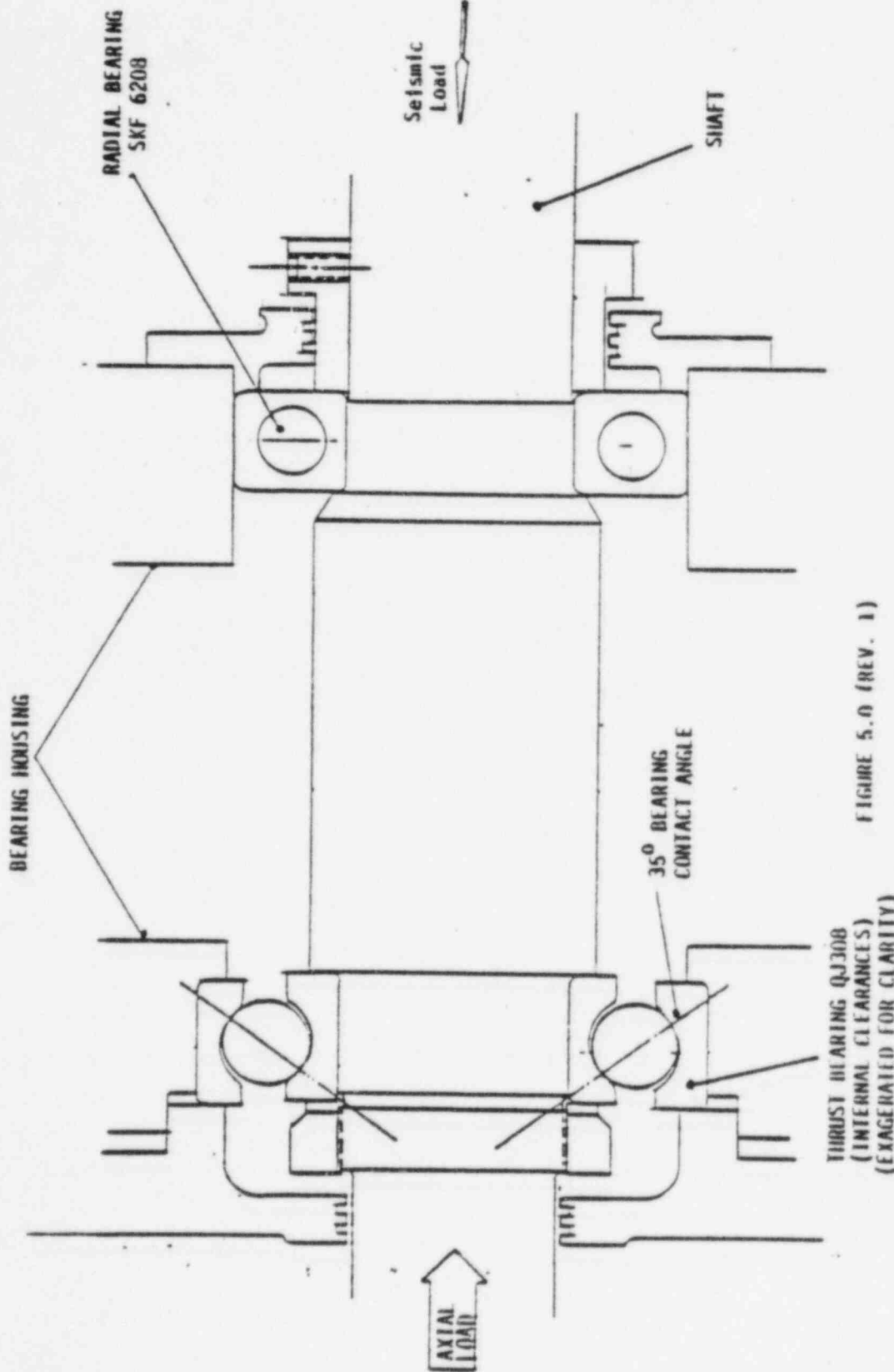
THE ABOVE MAX. DISPLACEMENT IS SUMMATED WITH THE DEFLECTION VALUES DUE TO RADIAL AND DEBOWEIGHT LOADS IS SHOWN IN FIGURE 2.0. THE SUMMATED VALUES ARE SHOWN IN CURVE FORM IN FIGURE 3.0.

3. UNDER DBE CONDITION

FOR THIS ANALYSIS WE HAVE ASSUMED THAT THE EFFECT OF THE DBE EISMIC WILL BE OPPOSITE IN DIRECTION TO THE HYDRAULIC AXIAL FORCE AS CAN BE SEEN THE MAGNITUDE OF THE AXIAL LOAD FOR SUCH THAT THE THRUST BEARING INTERNAL CLEARANCES WILL BE TAKEN OUT IN AN AXIAL DIRECTION. THEREFORE THE VALUES COMPUTED FOR SHAFT DISPLACEMENT DUE TO BEARING CLEARANCES UNDER NORMAL OPERATING CONDITION ALSO APPLY TO DBE CONDITION. THIS VALUE IS SUMMATED TO THE DEFLECTION VALUE AS SHOWN IN FIGURE 2.0 THE SUMMATED VALUE IS SHOWN IN CURVE FORM IN FIGURE 3.0.

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PAGE 5 OF 5



HAYWARD TYLER PUMP COMPANY

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Distribution	D.W. Chalmers D.J. Woodcock T. Graham M. Scialdone B. Liberty N. Sago G.W. Schreib D.A. Clare L. Truso		
Subject	NJ-841 BEARING FRAME ASSEMBLY INVESTIGATION		
Contents	Title	Purchase Order	H.T. Ref.
Location	Location	Prepared By GNS/SAC	
	Date	Date June 28, 1978	
	Time	Phone No.	Local
		File	
Distribution			

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1 1/2x2x7 N3 BNI BEARING FRAME

In the assembly of the BNI Bearing Frame, considerable amount of radial deflection (Bearing looseness) and axial movement was observed. A number of configurations of Bearings were tried in order to remedy the problem. The results are as follows:

Configuration 1: Radial Bearing - FAG NU208/C3
Thrust Bearing - SKF QJ308/C3

With Mechanical Seal Set, radial deflection was .010-.025 inches depending on position of Impeller. Axial movement was .003 inches. Maximum Bearing temperature after 1 hour of operation was 62.8°C.

Configuration 2: Radial Bearing - FAG NU208/C3
* Thrust Bearing - SKF QJ308/C3

*Thrust Bearing has .001 inches removed from each inner Split Ring Race.

With Mechanical Seal Set, radial and axial movement found to be tighter. No reading recorded. Maximum Bearing temperature found to be 60°C after 40 minutes running.

Configuration #3: Radial Bearing SKF 6208/C3
* Thrust Bearing QJ 308/C3

*Thrust Bearing has .0005 inches removed from each inner Split Ring Race.

With Mechanical Seal Set, radial deflection was .008 inch run out .002 inch and axial movement .002 inch. Maximum Bearing temperature of 58°C was recorded after 1 hour and 20 minutes of run time.

Configuration #4: Radial Bearing SKF 6208/C3
Thrust Bearing QJ 308/C3

With Mechanical Seal Set, radial deflection was .005-.010 inches, run out of .002 inches and axial movement of .003 inches. Maximum Bearing temperature after 1 hour and 5 minutes of operation was 59.5°C at thrust and 125°F at radial.

In all the above cases, no rubbing at Wearing Rings occurred. But it was concluded that above configurations were unacceptable.

* 7/82

This statement applied to the range of pumps as a whole. In actuality, certain sizes (e.g. Boston Edison Pumps 1 1/2x2x7) did not exhibit sufficient loading to cause interference and thus were acceptable.

Specifically, the subject of the Boston Edison 1 1/2x2x7 N3 pumps was discussed prior to shipment and it was determined that the relatively light loads of these pumps did not present a problem.

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The Following Test Program will be Initiated to Investigate Various Bearing Configurations:

<u>TEST NO.</u>	<u>RADIAL BEARING TYPE</u>	<u>THRUST BEARING TYPE</u>
1	6208/C3	5210/C3
2	5208/C3	QJ308/C3
3	5208/C3	9308/C3
4	NU208C2	QJ308/C2

Following Action is Required:

	<u>BY</u>	<u>REQUIRED</u>
1. Requisitions for Bearings	D.A.C.	6/28/78
2. Availability of C3 and C2 Clearance Bearings	L.T.	7/7/78
3. Coordination with Manufacturing for the Prototype Pump	GMS	7/17/78
4. Bearing Available	L.T.	7/17/78
5. Start Test	G.N.S./B.L.	W/07/17/78
6. Complete Test and Report	G.N.S.	W/07/24/78

HAYWARD TYLER PUMP COMPANY

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Distribution	D. W. Chalmers D. J. Woodcock T. Graham M. Scialdone B. Liberty M. Sagoo G. N. Schreible D. A. Clare L. Truso		
Subject	NJ-BRI Bearing Frame Assembly Investigation Investigation Report		
Contents	Title	Purchase Order	H.T. Ref.
Location	Location	Prepared By: GNS	
	Date	Date: August 28, 1978	
	Time	Phone No. Local File	
Distribution			

ASSEMBLY INVESTIGATION

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BMI BEARING FRAME

Purpose:

The purpose is to minimize the amount of NJ BMI pump shaft runout, radial deflection, and axial deflection by utilizing different bearing configurations.

Methods:

1. Bearings were mounted on shaft.
2. Shaft assembly then placed in pump bearing frame.
3. Deflection measurements taken at the impeller end of pump shaft with a dial indicator.

Bearings Used In Investigation:

SKF QJ308 CI Slip inner ring ball bearing
FAG NU208 CI Roller bearing
SKF 5308 E Double row ball bearing
PRW 208S Single row ball bearing
Torrington 40SD22 Spherical roller bearing
Torrington 40SD23 Spherical roller bearing

In some cases where bearing width exceeded bearing bore, depth cover was still bolted into place.

Results:

	<u>Standard</u>				
Radial	NU208	208S	208S	208S	40SD22
Thrust	QJ308	QJ308	5308	40SD23	40SD23
Runout	.001	.001	.0025	.002	.001
Radial Up	.007	.004	.003	.002	.002
Deflect Down	.003	.006	.002	.001	.001
End Play	.002	.003	.0005	.002	.0000

Conclusions:

1. The use of a double row bearing, whether ball or spherical roller, decreases the amount of radial and axial deflections.
2. A double row bearing requires modification to the bearing frame, bearing housing, and shaft.

Draft No. Date

MISCELLANEOUS Category 11 - Pumps - Hayward Tyler

Statement of Allegation: CPSES has four pumps manufactured by the Hayward-Tyler Pump Company which may have been improperly made.

See source documents marked on attached pages from allegation list.

Date Received: Late 1981

Group Leader	Name _____	Date Assigned _____
--------------	------------	---------------------

Team Members _____ Date Assigned _____

Date Assigned _____

Date Assigned _____

Date Assigned _____

FOIA-85-59
B/355

COMANCHE PEAK OPEN ISSUE ACTION PLAN

Task:

Ref. No.: AM-13

Characterization: CPSES has pumps in safety systems manufactured by Hayward-Tyler Pump Co. that may have deficiencies not identified due to poor QA program implementation.

Initial Assessment of Significance: Failure of the pump(s) during certain DBA situations could jeopardize plant safety.

Source: Workers at Hayward-Tyler

Approach to Resolution:

1. Review procedures, codes/standards, design requirements, NRC requirements, and licensee commitments for adequacy at time work was performed; were codes/standards, FSAR, contractor requirements, and other commitments met?
2. Review inspection report on docket 99900345.
3. Review sample of similar-type design/installation procedures for adequacy.
4. Refer any examples of wrongdoing or significant deficiencies to TRT manager.
5. Evaluate allegations for generic/safety implications.
6. Report on results of review/evaluation of allegations.

Related Open Issues

1. Review activities necessary to close or partially close related items, either based on inspection conducted above or reasonable additional inspection while the inspector is familiar with the areas.
2. While performing physical inspections above, examine surrounding systems, components, and structures for related apparent defects or indicators of faulty workmanship.
3. If workmen are still in the area of a physical inspection, interview them for any related knowledge of other potential deficiencies.
4. Complete portion of IE Module on pipe supports if it relates to effort made on allegations.

Status:

Review Lead:

Support:

Estimated Resources:

Estimated Completion:

CLOSURE:

Reviewed by: _____

MISCELLANEOUS ALLEGATION REVIEW CATEGORIES

<u>Category No.</u>	<u>Subject</u>	<u>Est. Mandays to Complete</u>	<u>Allegation Nos.</u>	<u>Package Prepared</u>	<u>Assigned to</u>	<u>Schedule Open Close</u>	<u>Remarks</u>
1.	Hearing - 19 issues		AM-1				
2.	Reactor fuel		AM-2				
3.	Reactor pressure vessel		AM-3, AM-23				
4.	FSAR error (10.2-11 & 12)		AM-4				
5.	Radioactive material release		AM-5				
6.	HP turbine		AM-6				
7.	Pressurizer		AM-7				
8.	Condenser		AM-8, AM-9, AM-10				
9.	Reactor/fuel bldg. liners		AM-11				
10.	CCW system		AM-12				
11.	Pumps - Hayward Tyler		AM-13				
12.	Diesel generator		AM-14				
13.	Polar crane - shimming		AM-15, AM-16				
14.	Containment doors		AM-17				
15.	Safeguards tunnel		AM-18				
16.	NRC form posting		AM-19				

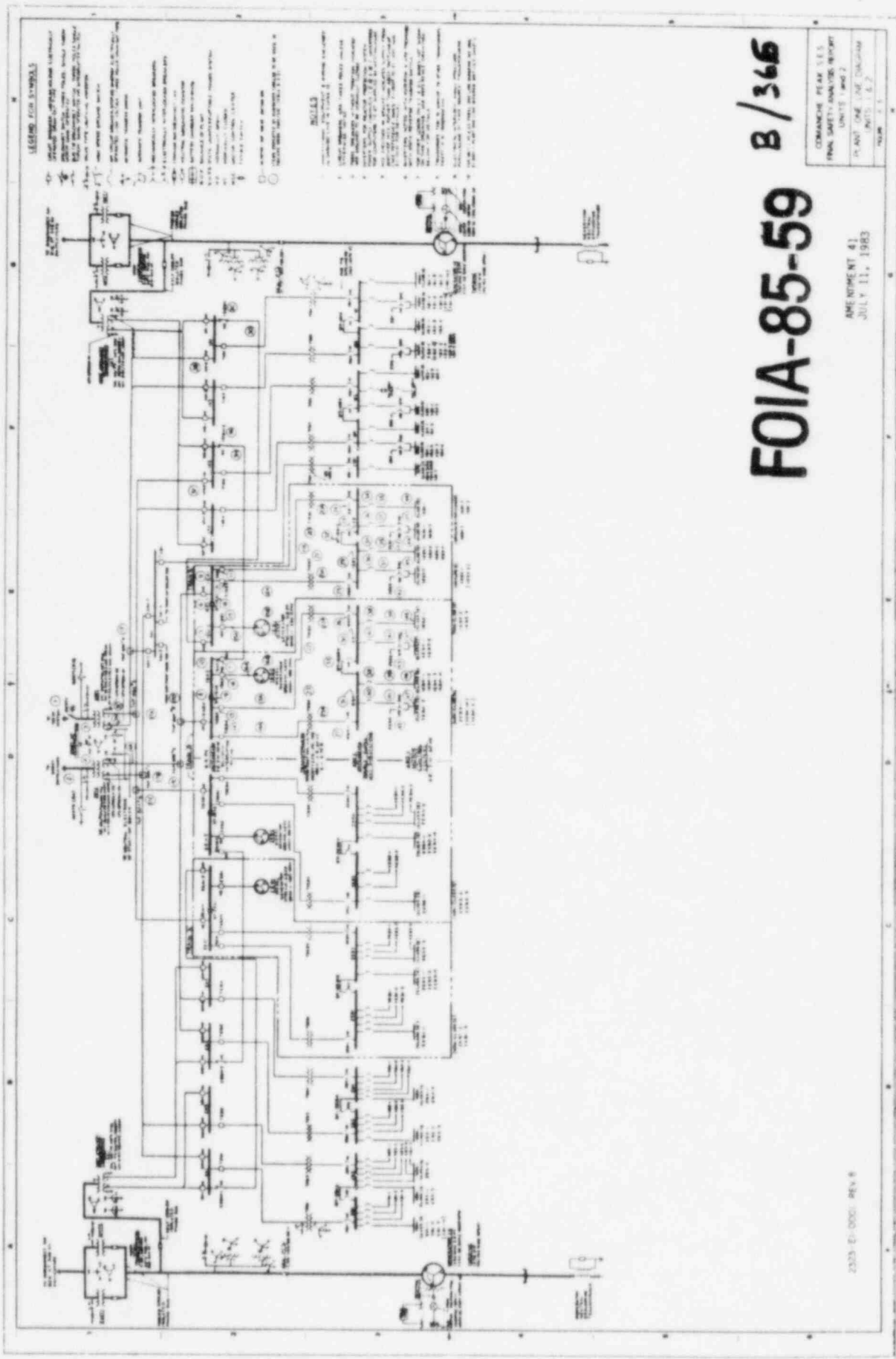
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COMANCHE PEAK NUCLEAR POWER PLANT
ALLEGATIONS AND/OR INVESTIGATION SUMMARY

TABLE NO.	ALLEGATION OR CONCERN	ACTION/STATUS	SOURCE	ADON COND ID	BN/DATE	CROSS REF /OR TRACKING SYSTEM NO.	COMPLETION CATEGORY 1-7**	SCHEDULE OPEN COMPLETE	ALLEGED DATE RECEIVED SOURCE DOCUMENT PAGE
AP-8	Improper installation of condenser tubes, upjacked tube sheets, damaged tubes						1		04-006 3/1/84 A-4, testimony, P. 22-26, 42, 44, 92
AP-9	Condenser tube support sheet discrepancies						1		04-006 3/1/84 A-4, testimony, P. 40
AP-10	Incorrect alignment between main turbine and condenser						1		04-006 3/1/84 A-4, testimony, P. 42, 48, 49, 50
AP-21	Incorrect fit on stair-less steel lines in reactor building and fuel building						1		04-006 3/1/84 A-4, testimony, P. 51, 52-55
AP-27	Installation discrepancies on surge tank						1		04-006 3/1/84 A-4, testimony, P. 61-66
AP-13	Problems in the manufacture under review of pumps by Hayward Tyler Pump Co.					ASIB Pre-filled testimony (Taylor)	1		Unknown 3/82 Testimony did. 5/24/82. P. 73, A. 64
AP-14	Transducer damaged diesel generator						1		04-006 3/1/84 A-4, testimony, P. 73
AP-15	Transformer shimming of polar crane						1		04-006 3/1/84 A-22, Statement P. 2
AP-16	Improper installation of initial dis-position of Peter Crane						1		Confidential

FOIA-85-59

8/356



FOIA-85-59
B/366

APPENDIX 41
 JULY 11, 1983

COMMANCHE PEAK S.E.S.
 FINAL SAFETY ANALYSIS REPORT
 PLANT ONE (SSE) TUNING
 UNITS 1 & 2
 UNITS 1 & 2

Draft No. Date

MISCELLANEOUS Category 12 - Diesel Generator

Statement of Allegation: Iron workers damaged a diesel generator unit.

See source documents marked on attached pages from allegation list.

Date Received: August 29, 1983

The above information prepared by D. M. Hunnicutt/R. G. Taylor 6/6/84

Group Leader _____

Name _____ Date Assigned _____

Team Members _____ Date Assigned _____

Date Assigned _____

Date Assigned _____

Date Assigned _____

FOIA-85-59

B 1367

COMANCHE PEAK OPEN ISSUE ACTION PLAN

Task:

Ref. No.: AM-14

Characterization: A diesel generator unit was damaged by iron workers. Sworn statement lacks specificity as to type and amount of damage or which unit was involved.

Initial Assessment of Significance: Such damage could have serious impact if undetected and/or uncorrected.

Source: Sworn statement by former iron worker

Approach to Resolution:

1. Research docket files and/or open items list for comparable item.
2. Inquire of the licensee.
3. Review licensee maintenance data on diesels.

Related Open Issues

Status:

Review Lead:

Support:

Estimated Resources:

Estimated Completion:

CLOSURE:

Reviewed by: _____

MISCELLANEOUS ALLEGATION REVIEW CATEGORIES

<u>Category No.</u>	<u>Subject</u>	<u>Est. Mandays to Complete</u>	<u>Allegation Nos.</u>	<u>Package Prepared</u>	<u>Assigned to</u>	<u>Schedule</u>		<u>Remarks</u>
						<u>Open</u>	<u>Close</u>	
1.	Hearing - 19 issues		AM-1					
2.	Reactor fuel		AM-2					
3.	Reactor pressure vessel		AM-3, AM-23					
4.	FSAR error (10.2-11 & 12)		AM-4					
5.	Radioactive material release		AM-5					
6.	HP turbine		AM-6					
7.	Pressurizer		AM-7					
8.	Condenser		AM-8, AM-9, AM-10					
9.	Reactor/fuel bldg. liners		AM-11					
10.	CCW system		AM-12					
11.	Pumps - Hayward Tyler		AM-13					
12.	Diesel generator		AM-14					
13.	Polar crane - shimming		AM-15, AM-16					
14.	Containment doors		AM-17					
15.	Safeguards tunnel		AM-18					
16.	NRC form posting		AM-19					