ENGINE SYSTEMS, INC.
1220 S. Washington St., Rocky Mount, NC 27801
P.O. Box 1928, Rocky Mount, NC 27802-1928
Telephone: 919/977-2720
Fax: 919/446-1134

January 26, 1998

USNRC
Attn: Vern, Hodge
Mail Stop 0 11A1
Washington, DC 20555

Subject: 10CFR21 Reporting of Defects and Non-Compliance -
Engine Systems, Inc. Report No. 10CFR21-0077
Graham-White Air Start Solenoid Valves #712-015 & #712-065

Dear Sir:

The enclosed report addresses a reportable defect and the corrective action to be taken by users of the subject air start solenoid valves.

Should you have any questions, please feel free to call.

Please sign below, acknowledging receipt of this report, and return a copy to the attention of Engineering Document Control at the address below (or, fax to number 919/446-1134) within 10 working days after receipt.

Yours very truly,

ENGINE SYSTEMS, INC.

Jo-Ann Mason

Jo-Ann Mason
Engineering Document Control

IE19 1/1

Please let us know if ANY of your mailing information changes - name of recipient, name of company/facility, address, etc. Mark the changes on this acknowledgment form and send to us by mail or FAX to the number above.

9802020122 980126
PDR PT21 E******
98 PDR
(91)

RECEIVED: _____

DATE: _____

0.0014

ENGINE SYSTEMS, INC.
1220 S. Washington St., Rocky Mount, NC 27801
P.O. Box 1928, Rocky Mount, NC 27802-1928
Telephone: 919/977-27 :0
Fax: 919/446-1134

Report No. 10CFR21-0077
January, 22, 1998

10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: Graham-White Air Start Solenoid Valves #712-065 &# 712-015

SYSTEM: Standby diesel generators with EMD diesel engines and air start systems.

CONCLUSION: Defect is reportable in accordance with 10CFR21.

PREPARED BY: _____ DATE: 1/23/98
Donald D. Galeazzi
Engineering Manager

REVIEWED BY: _____ DATE: Jan 22 1998
Michael Nuding
Quality Assurance Manager

SUMMARY:

MKW Power Systems, Inc. (former name of Engine Systems, Inc) issued Report No. 10CFR21-0055 on June 13, 1990 which provided a 10CFR21 reportable defect with the air start solenoid valve commonly used on EMD diesel generators (EMD #9513134 / Graham-White #712-051). The valves exhibited air leakage when maximum allowable inlet air (200 psig) was applied. This would not prevent the engine from starting; however, the leakage may cause the air compressor(s) to constantly cycle. After consulting with the valve manufacturer (Graham-White), MKW determined that a 275 psig valve was also available. The 275 psig valve was identical to the 200 psig valve except that it had a different spring. MKW made the recommendation to replace the valve's spring with a different spring which was rated for 275 psig. MKW also discontinued sale of the 200 psig valve for nuclear service and recommended the 275 psig valve as a replacement. The 275 psig valve is Graham-White #712-065 (without mounting bracket) or #712-015 (with mounting bracket).

Engine Systems, Inc (ESI) has recently learned that the 275 psig valve does not meet the minimum DC voltage requirement of most nuclear applications when inlet pressures below 200 psig are applied to the valve. The solenoid valve relies on system air pressure to assist the coil in overcoming the force of the spring and thus operating the valve plunger. The reduced system pressure combined with the reduced coil voltage results in the inability of the valve to operate satisfactorily. This problem is not applicable to the original 200 psig valve because it has a weaker spring and therefore less air pressure is needed to overcome the lower spring force.

COMPONENT:

Graham-White #712-065: Valve without mounting bracket, 125 VDC nominal coil.

Graham-White #712-015: #712-065 valve with mounting bracket.

Graham-White #1508-003 (#1508-3): Spring, 275 psig.

CUSTOMERS AFFECTED:

All nuclear users of EMD diesel engines with air start systems will be notified. ESI sales of the affected components to nuclear customers is provided in Exhibit 1.

DEFECT:

The valve does not meet the minimum DC voltage requirement of most nuclear applications (usually 90 VDC or 105 VDC is specified) when inlet pressures below 200 psig are applied to the valve. The solenoid valve relies on system air pressure to assist the coil in overcoming the force of the spring and thus operating the valve plunger (see valve literature contained in

Exhibit 2). For the EMD engine, 200 psig is the maximum allowable inlet pressure for the on-skid air start manifold piping and air starting motors. Minimum allowable starting pressure is 125 psig to 150 psig, depending upon the specific design of the diesel generator. To meet this criteria for all applications, the air solenoid valve must operate satisfactorily at 125 psig with 90 VDC applied to the coil. ESI tested three valves with the 275 psig springs. The following results were achieved:

Valve	Pressure	Pickup Voltage (VDC)
#1	200 psig	104
#2	200 psig	96
#3	200 psig	90
#1	175 psig	107
#2	175 psig	96
#3	175 psig	96
#1	150 psig	112
#2	150 psig	100
#3	150 psig	99
#1	125 psig	116
#2	125 psig	105
#3	125 psig	105

CORRECTIVE ACTION:

A. If the site minimum voltage is below 105 VDC, replace the valve's spring or replace the entire valve assembly. ESI consulted with Graham-White's spring supplier and obtained valve springs designed for 230 psig maximum inlet pressure. Eight (8) solenoid valves with the 230 psig springs installed were tested by ESI. All valves operated satisfactorily at 100 psig with 90 VDC applied to the coils. In addition, the valves did not experience leakage with inlet pressures up to 230 psig.

1. Replace the valve spring:

   Use the procedure contained in Exhibit 3. Replace the 275 psig spring with a 230 psig spring. Spring information is provided below.

Spring	Color	Part Number	Comments
275 psig	Red	#1508-003	Recommended by 10CFR21-0055.
230 psig	Blue	#1508-002(6.54#)	Recommended by this notification.
200 psig	Silver	#1508-001	Originally provided by EMD.

Parts required for spring replacement are as follows:

Item	Part Number	Qty
Spring	1508-002(6.54#)	1
Seal	1807-000	1
Seal	1469-000	1
Seal	2741-000	1
Nameplate	MKN50745-1	1

2. Replace the entire valve

Solenoid valve with mounting bracket: P/N MKN50745
Solenoid valve without mounting bracket: P/N MKN50746

Both valves have 125 VDC coils and 230 psig springs.

B. If the site minimum voltage is 105 VDC or above, test any installed or stocked solenoid valves. ESI testing of the 275 psig valve resulted in somewhat inconsistent results, especially for test valve #1. When testing the solenoid valve, use site specific minimum voltage and minimum allowable air inlet pressure expected at the solenoid valve. Apply the inlet pressure to Port 2 of the valve, energize the coil and verify the solenoid valve changes state by monitoring for air exiting the valve at Port 3. If the valve fails to change state at the minimum voltage and inlet pressure requirements, or if testing is not elected to be performed, replace the valve spring or replace the entire valve in accordance Corrective Action item A.

C. This notification is written specifically to address the minimum voltage issue of the 275 psig valve. If the original EMD supplied solenoid valve (200 psig) is still in use, the air leakage concern of MKW report 10CFR21-0055 can be corrected by replacing the valve spring or by replacing the entire valve as previously discussed in Corrective Action item A.

EXHIBIT 1

ESI SALES INFORMATION FOR

Graham-White #712-065: Valve without mounting bracket, 125 VDC nominal coil.

Graham-White #712-015: #712-035 valve with mounting bracket.

Graham-White #1508-003 (#1508-3): Spring, 275 psig.

(1 PAGE)

ESI SALES INFORMATION
10CFR21-0077

ESI S.O.	CUSTOMER	CUST P.O.	P/N	DESC	QTY	SHIP DATE
502711	ENTERGY OPERATIONS, INC	PO893592	1508-003	SPRING, COIL	8	11/26/90
503562	FLORIDA POWER & LIGHT CO	C91672 90204	1508-003	SPRING, COIL	4	4/15/91
515276	ILLINOIS POWER CO	PO705153	1508-003	SPRING, COIL	5	5/21/97
507999	SO. CALIFORNIA EDISON CO	6E2T2026	1508-003	SPRING, COIL	6	5/17/93
503166	DUQUESNE LIGHT COMPANY	D 096686	1508-3	SPRING, START-SOLENOID	25	4/16/91
500654	ILLINOIS POWER COMPANY	PO523787	1508-3	SPRING, START-SOLENOID	12	1/4/90
511035	CENTERIOR SERVICE COMPANY	S 058795 D94	712-015	SOLENOID VALVE, 125VDC	3	9/12/94
513305	CENTERIOR SERVICE COMPANY	S 070688 D96	712-015	SOLENOID VALVE, 125VDC	3	3/16/96
513831	CENTRAL TRUST DIVISION	JM-7657 (GFR2-84081	712-015	SOLENOID VALVE, 125VDC	6	7/1/96
507144	COMMONWEALTH EDISON CO	502307 RELXX338	712-015	SOLENOID VALVE, 125VDC	2	9/18/92
503166	DUQUESNE LIGHT COMPANY	D 096686	712-015	SOLENOID VALVE, 125VDC	5	1/10/91
510468	DUQUESNE LIGHT COMPANY	D 130843	712-015	SOLENOID VALVE, 125VDC	2	6/1/94
511974	DUQUESNE LIGHT COMPANY	D137969	712-015	SOLENOID VALVE, 125VDC	2	3/22/95
513240	DUQUESNE LIGHT COMPANY	D144157	712-015	SOLENOID VALVE, 125VDC	2	3/14/96
513240	DUQUESNE LIGHT COMPANY	D144157	712-015	SOLENOID VALVE, 125VDC	2	4/30/96
515375	DUQUESNE LIGHT COMPANY	D156992	712-015	SOLENOID VALVE, 125VDC W/B	1	7/9/97
507093	ENTERGY OPERATIONS	92-4-81925	712-015	SOLENOID VALVE, 125VDC	1	9/8/92
502460	ENTERGY OPERATIONS, INC	PO891791	712-015	SOLENOID VALVE, 125VDC	4	10/23/90
504132	ENTERGY OPERATIONS, INC	PO901285	712-015	SOLENOID VALVE, 125VDC	4	9/30/91
512119	ENTERGY OPERATIONS, INC	PO952190	712-015	SOLENOID VALVE, 125VDC	4	5/26/95
515028	ENTERGY OPERATIONS, INC	PO970965	712-015	SOLENOID VALVE, 125VDC	2	5/14/97
515391	ENTERGY OPERATIONS, INC	PO972229	712-015	SOLENOID VALVE, 125VDC W/B	2	7/21/97
503834	FLORIDA POWER & LIGHT CO	C91932 90511	712-015	SOLENOID VALVE, 125VDC	6	8/30/91
508999	KNOLLS ATOMIC PWR LABORATORY	PK0001933 KP	712-015	SOLENOID VALVE, 125VDC	0	
504461	MAINE YANKEE ATOMIC POWER CO	63232-00	712-015	SOLENOID VALVE, 125VDC	2	7/18/91
504461	MAINE YANKEE ATOMIC POWER CO	63232-00	712-015	SOLENOID VALVE, 125VDC	1	9/12/91
504962	MAINE YANKEE ATOMIC POWER CO	91-00004	712-015	SOLENOID VALVE, 125VDC	6	10/11/91
505974	MAINE YANKEE ATOMIC POWER CO	92-01279	712-015	SOLENOID VALVE, 125VDC	5	3/19/92
511400	MAINE YANKEE ATOMIC POWER CO	94-03565	712-015	SOLENOID VALVE, 125VDC	5	12/29/94
505501	NEW YORK POWER AUTHORITY	S 91 21077	712-015	SOLENOID VALVE, 125VDC	9	2/6/92
506655	NEW YORK POWER AUTHORITY	S 92 32416	712-015	SOLENOID VALVE, 125VDC	5	7/16/92
513499	NEW YORK POWER AUTHORITY	S9678786	712-015	SOLENOID VALVE, 125VDC	2	5/1/96
508645	NORTHEAST UTILITIES CONN	009967 008596	712-015	SOLENOID VALVE, 125VDC	4	7/28/93
508715	NORTHEAST UTILITIES CONN	273766	712-015	SOLENOID VALVE, 125VDC	3	8/10/93
512219	NORTHEAST UTILITIES CONN	371059	712-015	SOLENOID VALVE, 125VDC	2	5/24/95
502103	OMAHA PUBLIC POWER DISTRICT	C193857 Q	712-015	SOLENOID VALVE, 125VDC	5	1/10/91
506295	OMAHA PUBLIC POWER DISTRICT	C229049 Q	712-015	SOLENOID VALVE, 125VDC	3	4/27/92
509913	OMAHA PUBLIC POWER DISTRICT	C300350 Q	712-015	SOLENOID VALVE, 125VDC	4	2/23/94
512031	OMAHA PUBLIC POWER DISTRICT	C200088 Q	712-015	SOLENOID VALVE, 125VDC	4	5/11/95
515035	OMAHA PUBLIC POWER DISTRICT	C500310 Q	712-015	SOLENOID VALVE, 125VDC	4	5/12/97
503892	PORTLAND GENERAL ELECTRIC CO	NQ90744	712-015	SOLENOID VALVE, 125VDC	10	5/17/91
509794	TAIWAN POWER COMPANY+	882 / 10198	712-015	SOLENOID VALVE, 125VDC	4	7/23/94
502886	TENNESSEE VALLEY AUTHORITY	91NNA-75810A	712-015	SOLENOID VALVE, 125VDC	22	12/28/90
505277	TENNESSEE VALLEY AUTHORITY	92NNB-43289C	712-015	SOLENOID VALVE, 125VDC	4	1/29/92
503756	VIRGINIA ELECTRIC & POWER CO	SSY 340394	712-015	SOLENOID VALVE, 125VDC	2	6/28/91
506303	VIRGINIA ELECTRIC & POWER CO	CNT 383523	712-015	SOLENOID VALVE, 125VDC	2	5/28/92
509523	VIRGINIA ELECTRIC & POWER CO	CNT 448173	712-015	SOLENOID VALVE, 125VDC	1	2/14/94
514949	VIRGINIA ELECTRIC & POWER CO	CNT 546161	712-015	SOLENOID VALVE, 125VDC	2	3/25/97
505870	WISCONSIN ELECTRIC POWER CO	195981	712-015	SOLENOID VALVE, 125VDC	2	1/28/92
505936	WISCONSIN ELECTRIC POWER CO	PO206209	712-015	SOLENOID VALVE, 125VDC	2	4/1/92
514996	COMISION FED DE ELECTRICIDAD+#	97-2-21127-CNH	712-065	SOLENOID VALVE, LESS BRAC	4	5/27/97
501867	COMMONWEALTH EDISON CO	502307 RELXX139	712-065	SOLENOID VALVE 125VDC 3/8	6	10/25/90
502931	COMMONWEALTH EDISON CO	502307 REL LS63	712-065	SOLENOID VALVE, LESS BRAC	6	1/10/91
502205	COMMONWEALTH EDISON CO	502307 RELXX148	712-065	VALVE	3	2/25/91
503742	COMMONWEALTH EDISON CO	502307 RELXX199	712-065	SOLENOID VALVE, LESS BRAC	7	5/15/91
504590	COMMONWEALTH EDISON CO	502307 RELXX216	712-065	SOLENOID VALVE, LESS BRAC	2	8/24/91
505875	COMMONWEALTH EDISON CO	502307 XX257	712-065	SOLENOID VALVE, LESS BRAC	5	2/27/92
507534	COMMONWEALTH EDISON CO	502307 RELXX385	712-065	SOLENOID VALVE, LESS BRAC	1	12/4/92
50814	COMMONWEALTH EDISON CO	502307 RELXX404	712-065	SOLENOID VALVE, LESS BRAC	2	3/29/93
506317	ENTERGY OPERATIONS	92-D-72210	712-065	SOLENOID VALVE, LESS BRAC	2	6/26/92
507975	ENTERGY OPERATIONS	93-4-80141	712-065	SOLENOID VALVE, LESS BRAC	1	3/9/93
508413	ENTERGY OPERATIONS	93-4-80443	712-065	SOLENOID VALVE, LESS BRAC	1	5/10/93
512971	ENTERGY OPERATIONS	95-4-80602	712-065	SOLENOID VALVE, LESS BRAC	1	11/21/95
513556	FLORIDA POWER & LIGHT "TURKEY"	14820	712-065	SOLENOID VALVE, LESS BRAC	4	3/15/96
503611	FLORIDA POWER & LIGHT CO	C91869 90217	712-065	SOLENOID VALVE, LESS BRAC	2	3/25/91
507062	ILLINOIS POWER CO	541145	712-065	SOLENOID VALVE, LESS BRAC	2	8/24/92
503305	ILLINOIS POWER COMPANY	PO523724	712-065	SOLENOID VALVE, LESS BRAC	4	5/15/91
503204	KNOLLS ATOMIC PWR LABORATORY	91W42175KP	712-065	SOLENOID VALVE, LESS BRAC	4	5/17/91
504640	KNOLLS ATOMIC PWR LABORATORY	NPO 91K42845KP	712-065	SOLENOID VALVE, LESS BRAC	6	10/3/91
508064	NIAGARA MOHAWK POWER CORP	78142	712-065	SOLENOID VALVE, LESS BRAC	4	3/25/93
508064	NIAGARA MOHAWK POWER CORP	78142	712-065	SOLENOID VALVE, LESS BRAC	4	9/1/93
502278	SO. CALIFORNIA EDISON CO	6U070122	712-065	VALVE	8	10/18/90
502339	SO. CALIFORNIA EDISON CO.	6A080002	712-065	SOLENOID VALVE 125VDC 3/8	8	10/22/90
502036	SO. CALIFORNIA EDISON CO	6E100033	712-065	SOLENOID VALVE, LESS BRAC	8	1/10/91
505036	SO. CALIFORNIA EDISON CO	6A091019	712-065	SOLENOID VALVE, LESS BRAC	8	10/11/91
506167	SO. CALIFORNIA EDISON CO.	6E051040	712-065	SOLENOID VALVE, LESS BRAC	8	11/26/91
507755	SO. CALIFORNIA EDISON CO	6E012027	712-065	SOLENOID VALVE, LESS BRAC	4	3/12/92
507959	SO. CALIFORNIA EDISON CO	6N223001	712-065	SOLENOID VALVE, LESS BRAC	12	2/26/93
502152	TENNESSEE VALLEY AUTHORITY	90NLH-851488	712-065	SOLENOID VALVE, LESS BRAC	1	4/30/91
503899	TENNESSEE VALLEY AUTHORITY	91NLH-862488	712-065	SOLENOID VALVE, LESS BRAC	20	5/14/91
507813	TENNESSEE VALLEY AUTHORITY	92NJB-45185B/RD-330	712-065	SOLENOID VALVE, LESS BRAC	12	2/28/93
514045	TENNESSEE VALLEY AUTHORITY	P92NJB45185B001/113	712-065	SOLENOID VALVE, LESS BRAC	2	7/15/96
514397	TENNESSEE VALLEY AUTHORITY	P92NJB45185B001/114	712-065	SOLENOID VALVE, LESS BRAC	1	8/25/97
504551	WISCONSIN ELECTRIC POWER CO	193606	712-065	SOLENOID VALVE, LESS BRAC	2	7/23/91
514856	WISCONSIN ELECTRIC POWER CO	4500031217	712-065	SOLENOID VALVE, LESS BRAC	1	5/12/97

EXHIBIT 2

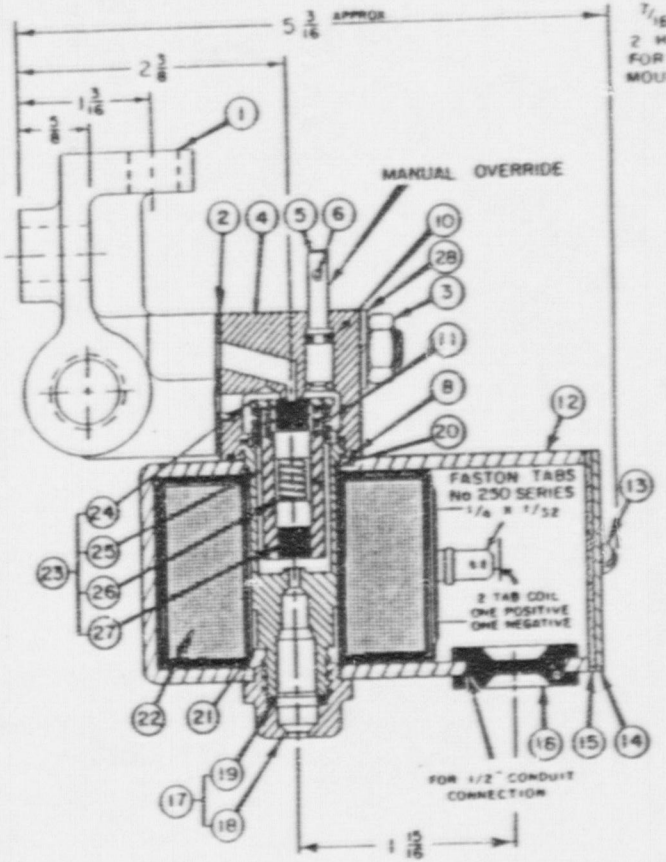
GRAHAM-WHITE DRAWING 712-015

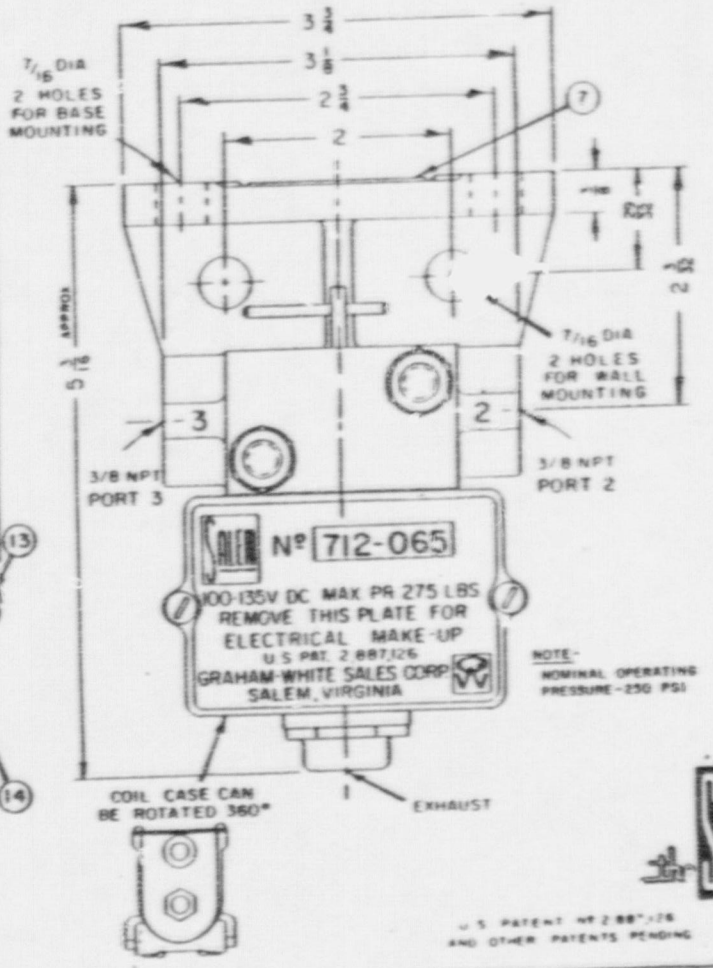
(1 PAGE)

PIPED FOR
NORMALLY CLOSED
(COIL DE-ENERGIZED)

PORT 2 = INLET
PORT 3 = OUTLET

NET WT. - 5 Lbs. Approx.





NOTE-
NOMINAL OPERATING
PRESSURE-250 PSI

U S PATENT Nº 2 887,126
AND OTHER PATENTS PENDING

PARTS LIST

ITEM	PART No.	DESCRIPTION	QTY
1	2899	MOUNTING BRACKET	1
2	1702	GASKET	1
3	1690	NUT	2
4	2515-1	VALVE BODY	1
5	2630	OVERRIDE PLUNGER	1
6	2089	ROLL PIN	1
7	1922-55	NAME PLATE	1
8	2741	SEAL	1
10	1476	SEAL	1
11	1508-3	SPRING (RED - 275 LBS)	1
12	1934-1	COIL CASE	1
13	1556	SCREW	2
14	2567120	COVER PLATE	1
15	1936	GASKET	1
16	1617	GROMMET	1
17	465	EXHAUST NUT ASBY	1
18	2126	EXHAUST NUT	1
19	1807	SEAL	1
20	1469	SEAL	1
21	1565	COIL POLE	1
22	1714 20	COIL (TWO TAB)	1
23	361-1	PLUNGER ASSEMBLY	1
24	1701	PLUNGER CAP	1
25	1700	PLUNGER BODY	1
26	3056	PLUNGER SPACER	1
27	3055	PLUNGER SEAT	2
712-065		VALVE ASBY LESS NUB INCLUDES ITEMS 6,8,10-27	
28	5193	LOCKWASHER	2

ELECTRICAL DATA

COIL - CLASS F AT CONTINUOUS DUTY
RATING - 100-135 VOLTS DC
OHMS - 1250 ± 5%
WATTS - 13 AT 125 VOLTS DC
INDUCTANCE - 2 HENRIES

AIR DATA

MAXIMUM PRESSURE 275 PSI
23 CFM AT 140 PSI

SYM	DATE	REVISION
A	6-14-85	ITEM 29 ADDED

SALEM SOLENOID VALVE
SINGLE UNIT - NORMALLY CLOSED
MANUAL OVERRIDE
125 VOLTS D C
DATE 4-28-83

GRAHAM-WHITE
SALES CORP.
1000 COLORADO STREET
SALEM, VIRGINIA 24153

No. 712-015

EXHIBIT 3

VALVE SPRING REPLACEMENT PROCEDURE

(1 PAGE)

VALVE SPRING REPLACEMENT PROCEDURE
10CFR21-0077

1. Place the valve assembly on a horizontal surface with the coil side up.

2. Remove the valve's exhaust nut and remove the coil assembly (item 3). Note orientation of coil body relative to the valve body for reassembly.

3. Use a wrench to unscrew the coil pole and remove the spring (item 4).

4. Remove seal (item 7) from the valve body and replace with #2741-000.

5. Remove seal (item 6) from the coil pole and replace with #1469-000.

6. Install blue spring #1508-002(6.54#) into the valve body cavity and around the plunger assembly (item 5).

7. Install the coil pole into the valve body. Push down on the coil pole to compress the spring and turn to engage the threads. Tighten the coil pole hand (snug) tight.

8. Install the coil assembly (item 3) over the coil pole. Maintain the same orientation of the coil assembly relative to the valve body as noted in step 2 above.

9. Remove seal (item 2) from the exhaust nut and replace with #1807-000.

10. Install exhaust nut onto the threaded end of the coil pole. Tighten the exhaust nut hand (snug) tight.

11. Remove protective film from the valve nameplate (if present). Clean nameplate surface. Remove backing from new nameplate #MKN50745-1 and install over existing nameplate.

12. Apply 230 psig to Port 2 and verify no air leakage from Ports 1 & 3. Apply 100 psig to Port 2 and then apply 90 VDC to the coil. Verify the valve changes state by monitoring for air exiting the valve at Port 3.