Public Service
Electric and Gas
Company

Stanley LaBruna
Vice President - Nuclear Engineering

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APR 18 1994

NLR-N94067

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

TRANSMITTAL OF GLOBE VALVE SUPPLEMENTAL INFORMATION
GENERIC LETTER 89-10
HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSE NPF-57
DOCKET NO. 50-354

In Letter NLR-N94015, dated March 11, 1994, we notified the NRC staff of changes to our Generic Letter 89-10 commitments relative to dynamic testing of small, low differential pressure globe valves. Subsequently, a telecon was conducted on March 31, 1994 between members of my staff and the NRC staff to discuss issues related to our proposed commitment changes.

The purpose of this letter is to formally transmit a copy of the supplemental information that was provided and discussed during the March 31, 1994 telecon. The supplemental information included a discussion of our review of the EPRI data, sample calculations for thrust margins and valve factor capability, and detailed information for the subject valve population. A copy of this supplemental information is contained in the attachment to this letter.

Sincerely,

S. LaBruna

Attachment

280030

A064 1/1

C Mr. T. T. Martin, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. J. C. Stone, Licensing Project Manager - Hope Creek
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. C. Marschall (S09)
USNRC Senior Resident Inspector

Mr. K. Tosch, Manager, IV
NJ Department of Environmental Protection
Division of Environmental Quality
Bureau of Nuclear Engineering
CN 415
Trenton, NJ 08625

REF: NLR-N94067

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

S. LaBruna, being duly sworn according to law deposes and says:

I am Vice President - Nuclear Engineering of Public Service Electric and Gas Company, and as such, I find the matters set forth in the above referenced letter, concerning the Hope Creek Generating Station, are true to the best of my knowledge, information and belief.

S. LaBruna

Subscribed and Sworn to before me
this 18th day of April, 1994

Sherry L Cagle
Notary Public of New Jersey

SHERRY L. CAGLE
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires March 5, 1997

My Commission expires on _____

ATTACHMENT

SUPPLEMENTAL INFORMATION TO SUPPORT GENERIC LETTER 89-10 COMMITMENT CHANGE

GENERIC LETTER 89-10
HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSE NPF-57
DOCKET NO. 50-354
NLR-N94067

EPRI Data Review Relative to Letter NLR-N94105

EPRI formal reports received to date do not include detailed information for valves #48 and #49, 2" Edwards globe and 2 1/2" Velan globe, respectively. These valves most closely relate to the design of those small globe valves within our MOV program. Our current reference information for the EPRI tests is limited to the data package issued in mid-December, 1993, requested supplementary test data from EPRI, and the recently released report #TR-103190 (Vol. 1-9). TR-103190 reports the work from the Wyle Labs. Cold Water Pumped Flow testing and does not include small globe valves. Supplementary test data for these valves #48 and #49 (Test Analysis Data Sheets) was obtained for the lower pressure tests. This data has not yet been published by EPRI, but provides a valid indication of the subject valves performance.

From the package issued by EPRI in mid-December, a brief discussion of the analysis methodology as performed by the analysis engineer at Wyle Labs. is provided. The formula used is Application Guide for MOVs (Report No. NP-6660-D). In the data package and the supplementary information, valve factors were determined for two parameters. One was based on the mean seat diameter and the other was based on the disc guide ring diameter. For the mean seat diameter case, the maximum thrust measured at flow isolation was used in conjunction with the corresponding differential pressure. For the guide ring diameter case, the greatest thrust measured prior to seat contact was used with its coincident differential pressure. These methods are appropriate for determining the limiting valve performance characteristics based on the effective disc pressure area.

A summary of the EPRI globe valve test data for valves #48 and #49 is provided by Attachment 1. The results indicate that the use of a valve factor of 1.1 in calculations to determine the required stem thrust will envelope all of the test conditions for valve #49 and up to 1970 psid at 100% flow for valve #48. The EPRI globe valve test data therefore supports the PSE&G position that globe valves, especially those within the class of Hope Creek valves included by letter NLR-N94015, will perform predictably and satisfy design basis operating requirements. This conclusion is based on the fact that the Hope Creek globe valve calculations are performed using a valve factor of 1.1 and the torque switches are set to achieve a thrust/torque of at least 130% of the calculated minimum required valve.

Prepared by: R. S. Lewis
Date: April 15, 1994

Attachment 1
EPRI Globe Valve Test Data Summary

Test Conditions (Nominal):

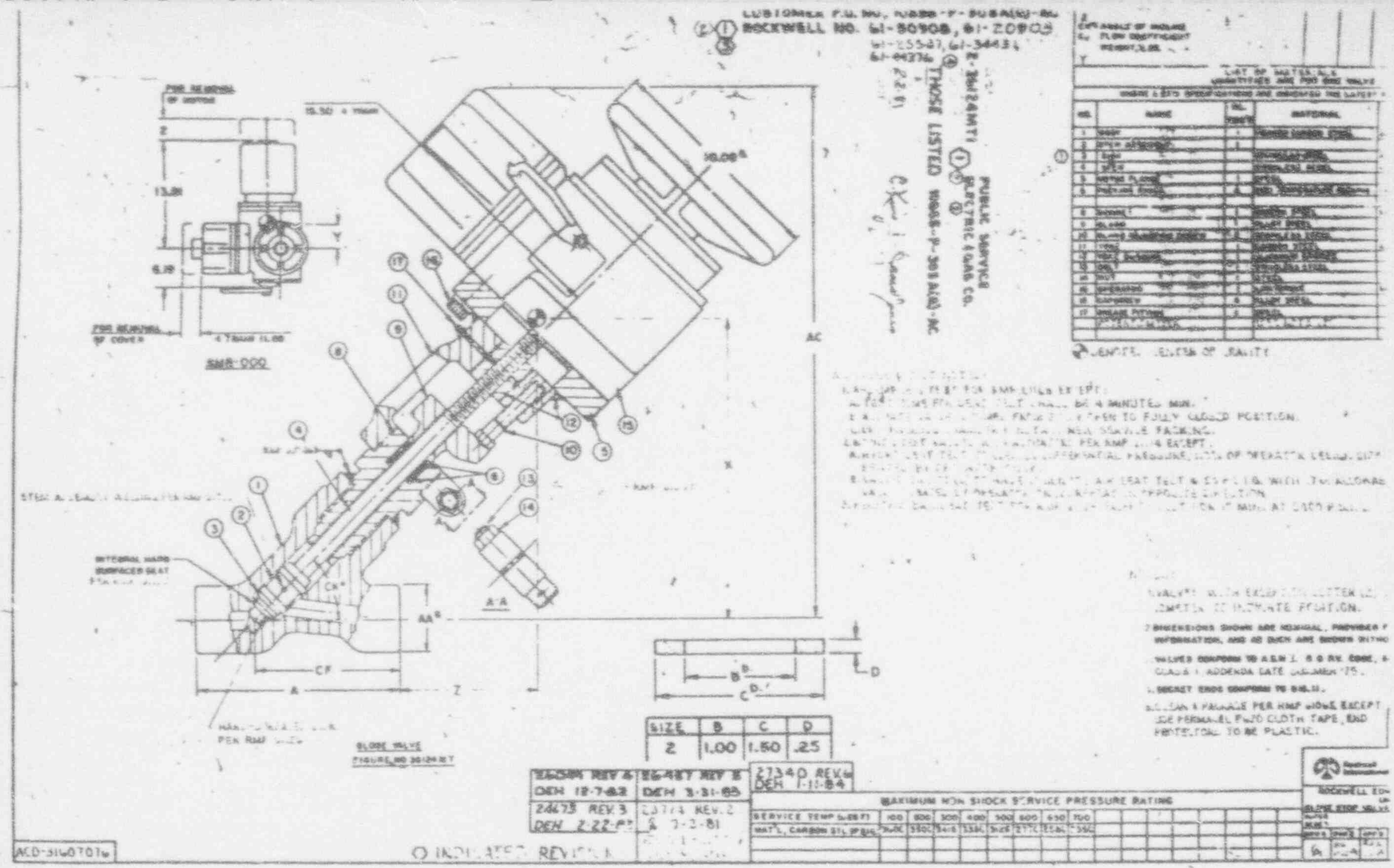
1. 625 psid at 15fps fluid velocity
2. 1,250 psid at 15fps fluid velocity
3. 1,875 psid at 15fps fluid velocity
4. 2,500 psid at 15fps fluid velocity
5. 625 psid at 50fps fluid velocity
6. 1,250 psid at 50fps fluid velocity or 6f 1,250 psid at 100% flow
7. 1,875 psid at 50fps fluid velocity or 7f 1,875 psid at 100% flow
8. 2,500 psid at 50fps fluid velocity
9. 2,500 psid at 530°F blowdown

Note: All data below is for open to close position strokes with flow under the seat.

Valve No.	Data Set	Test Condition	Guide Ring Case				Mean Seat Case			
			DP (psid)	Thrust (lbs)	Torque (ft-lbs)	FV	DP (psid)	Thrust (lbs)	Torque (ft-lbs)	FV
48	003	1	512.6	1618	41.5	0.966	536	1195	40.4	1.058
	006	2	1213	3703	41.7	0.938	1330	2715	41.7	0.991
	009	3	1674	5071	41.5	0.919	1920	3743	39.8	0.951
	012	3	1684	5084	39.7	0.905	1925	3748	39.3	0.954
	*	4				0.905				1.246
	002	5	630	2109	39.5	1.045	644	1565	39.3	1.166
	005	6f	1288	3957	39.9	0.963	1305	2820	39.9	1.052
	008	7	1933	5813	39.9	0.945	1971	4075	41.9	1.011
	011	7f	1934	5794	39.8	0.940	1969	4025	41.2	1.000
	*	8				0.922				1.417
	**	9				1.480				2.146
49	009	2	1291	4973	44.8	0.512	1295	4703	42.4	0.977
	012	7f	1916	6680	58.0	0.500	1922	6603	58.0	1.012
	015	7f	1896	6630	57.8	0.500	1910	6604	58.1	1.019
	*	8				0.514				1.039

* Data taken from December, 1993 package. The pressure case is not applicable to the purpose of the review and supplementary data sheets were not obtained from EPRI.

** Same per the note above. This valve did not fully close.



61-50908

ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
2.20 ↓ 2.24 ↓ 2.28	2-36124 MT	1	2"CBA-GB-(F)(N) 2-BB-HV-F001-B21 2-BB-HV-F002-B21 2-BB-HV-F005-B21 2"CBA-GB-(R) 2-AB-HV-F068-B21 2"CBA-GB-(B)(N)(Y) 2-BD-HV-F046-E51 2-BD-HV-F019-E51 2-FC-HV-F060-E51 2-BJ-HV-F059-E41 2-BJ-HV-4803 2-BJ-HV-4804 2-GS-HV-5056A 2-GS-HV-5056B 2-GS-HV-5058A

61-20903 (1)

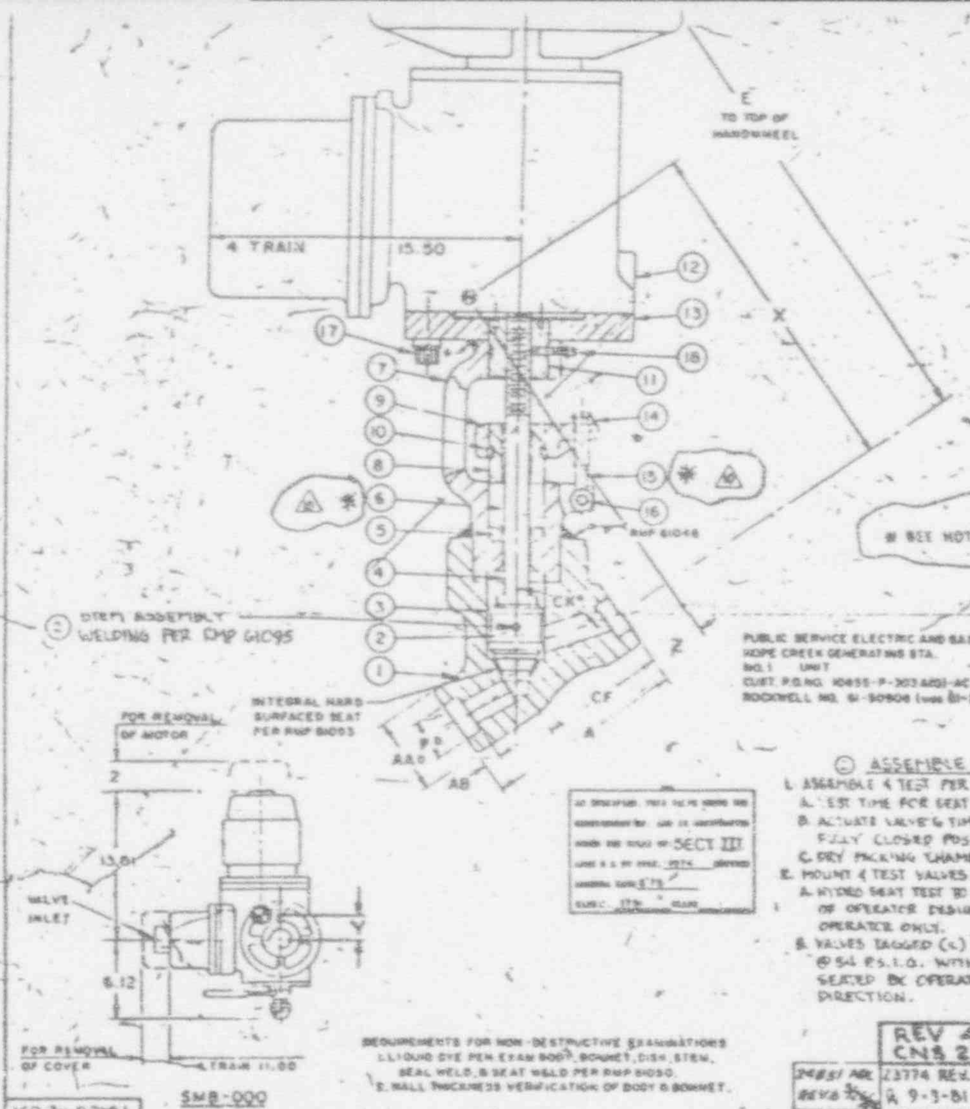
ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
2.28	2-36124 MT	1	2"CBA-GB-(E)(N)(Y) 2-BC-HV-4428 2-KL-HV-5172A 2-KL-HV-5172B

61-25537

ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
2.28	2-36124 MT	1	2"CBA-GB-(B)(N)(Y) 2-BJ-HV-4865 2-BJ-HV-4866

61-34431 (5)

ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
2.27	2-36124 MT	1	2"CBA-GB-(B)(N)(Y) 1-EG-HV-2446,2447



@ DENOTES CENTER OF GRAVITY

PACKING DIMENSIONS:

CAT ANGLE OF INCLINE
C - CENTER TO TOP OF HANDWHEEL
P - SOCKET DIAMETER
Cv - FLOW COEFFICIENT
WEIGHT, LBS

From Control Valve
Rockwell International
Sheffield, Texas

Certification for
2-3629MT Public Service E[illegible]
SIZE FIG. 61-20903
⑤④ 61-50908 2855-P-303A(G
ROCKWELL ORDER
11-28-79 J. J. McElaney
DATE

PUBLIC SERVICE ELECTRIC AND GAS CO.
HOPE CREEK GENERATING STA.
NO. 1 UNIT
CUST. P.O. NO. 10855-P-303 AG3-AC
ROCKWELL NO. 61-50908 (was 61-23422), 61-20903, 61-25537 ④ ⑤

REQUIREMENTS FOR NON-DESTRUCTIVE EXAMINATIONS
1. LIQUID DYE PEN EXAM BODY, BONNET, DISK, STEM, SEAL WELD, & SEAT WELD PER RMP 61050.
2. WALL THICKNESS VERIFICATION OF BODY & BONNET.

SECT III

① ASSEMBLE & TEST NOTES:

1. ASSEMBLE & TEST PER RMP 61057 EXCEPT:
   A. TEST TIME FOR SEAT TEST SHALL BE 4 MINUTES MIN.
   B. ACTUATE VALVE 6 TIMES FROM FULLY OPEN TO FULLY CLOSED POSITION.
   C. DRY PACKING CHAMBER & INSTALL NEW SERVICE PACKING
2. MOUNT & TEST VALVES WITH ACTUATORS PER RMP 61114 EXCEPT:
   A. HYDRO SEAT TEST TO (DESIGN DIFFERENTIAL PRESSURE) 110% OF OPERATOR DESIGN DIFFERENTIAL, VALVES SEATED BY OPERATOR ONLY.
   B. VALVES TAGGED (L) TO HAVE 10 MINUTE AIR SEAT TEST @ 54 P.S.I.G. WITH .TCC ALLOWABLE LEAKAGE. VALVES SEATED BY OPERATOR ONLY. REPEAT IN OPPOSITE DIRECTION.

	REV 4 CNS 23004	4-23-81 BS	REV. 2 10-19-79 GW
24881 ABR REV 8	23774 REV. 5 R 9-3-81	REV. 3 1-15-81 G	REV. 1 6-11-79 DW

LIST OF MATERIALS

QUANTITIES ARE FOR ONE VALVE

WHERE ASTM OR ASME SPECS ARE INDICATED THE LATEST REVISION APPLIES

NO	NAME	NO REQD	MATERIAL	SPECIFICATIONS	RWC NO.
1	BODY	1	FORGED CARBON STEEL	SA105	70007
2	STEM ASSEMBLY	1			
3	DISK	1	COBALT ALLOY	[illegible]	
4	STEM	1	STAINLESS STEEL	A582 T416	[illegible]
5	JUNK RING	1	CARBON STEEL	A108 GR 1213	
6	PACKING RINGS		HIGH TEMPERATURE PACKING	CRANE 187 [illegible]	
7	BONNET	1	FORGED CARBON STEEL	SA105	70007
8	GLAND	1	CARBON STEEL	A108 GR 1213	
9	GLAND FLANGE	1	ALLOY STEEL	[illegible]	
10	SPLIT RING	1	STAINLESS STEEL	A276 T410	
11	YOKE BUSHING	1	ALUMINUM BRONZE	B150 CA624	
12	LIMITORQUE	1			
13	MOTOR FLANGE	1	STEEL	A285 GR C	②
14	EYE BOLT NUTS	2	STEEL	A307 GR A	
15	EYE BOLTS	2	STAINLESS STEEL	[illegible]	
16	EYE BOLT PINS	2	ALLOY STEEL	[illegible]	
17	CAPSCREW	4	[illegible]	5/16 - 18 UNC	②
18	GREASE FITTING	1	STEEL	[illegible]	
	POTENTIOMETER	—	(SEE NOTE 8)		②
19	PACKING RINGS	[illegible]	CHESTERTON [illegible]	[illegible]	
20	PACKING RINGS	[illegible]	CHESTERTON [illegible]	[illegible]	
21	LIVE LOAD ASSY.	1	SPRING WASHERS (PARALLEL) [illegible] W/2 FLAT WASHERS EA.		
22	EYE BOLTS	2	A193 B7 (SEE DETAIL "[illegible]")	SHT. 2	

61-50908

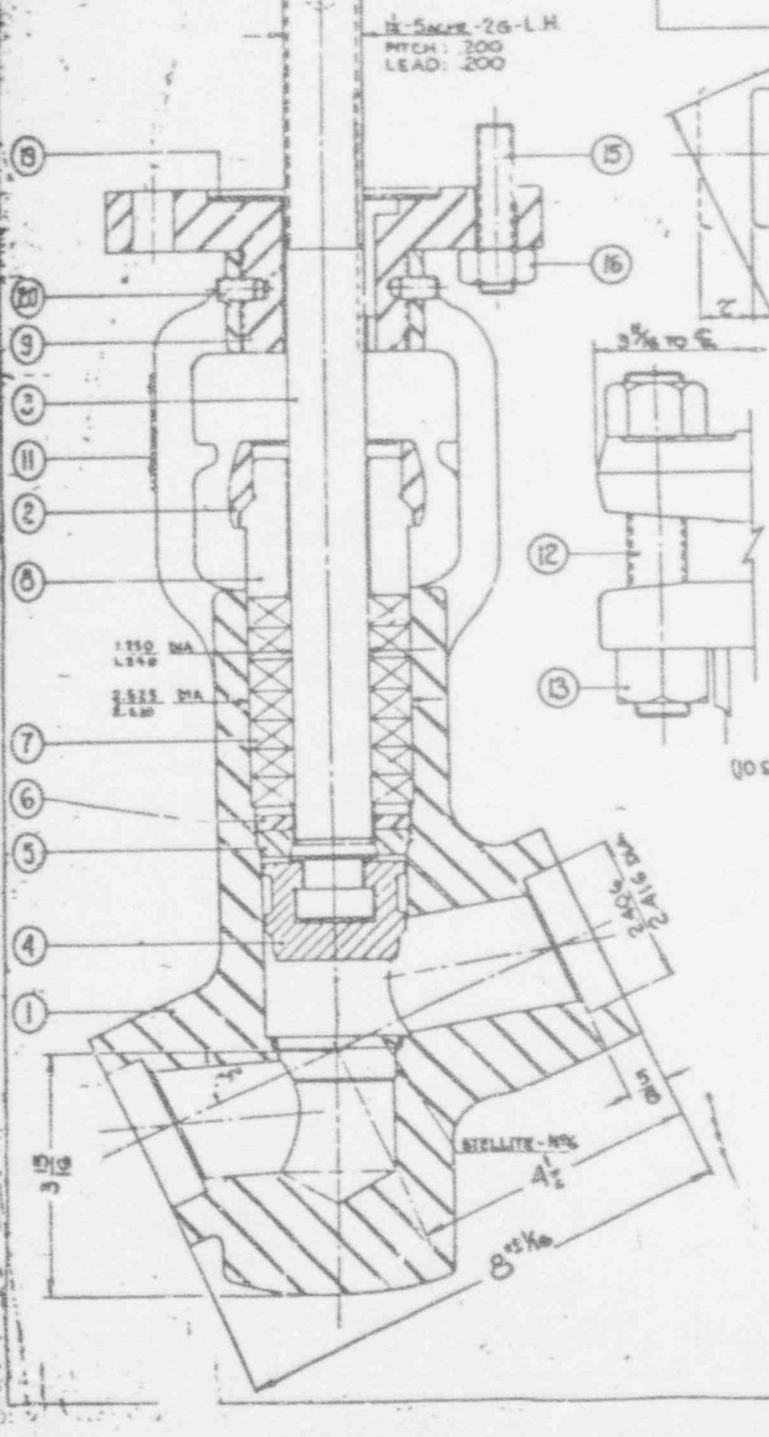
ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
2.19	2-3624 MT	1	2" CBA-GB-(F)(N) 1-BB-HV-F001-B21 1-BB-HV-F002-B21 1-BB-HV-F005-B21
~~2.20~~			~~2" CBA-GB-(F)(N)~~ ~~2-BB-HV-F001-B21~~ ~~2-BB-HV-F002-B21~~ ~~2-BB-HV-F005-B21~~
2.23			2"-CBA-GB-(B) 1-AB-HV-F016-B21
~~2.24~~			~~2"-CBA-GB-(B)~~ ~~2-AB-HV-F016-B21~~
2.27			2"-CBA-GB-(B)(N)(Y) 1-BD-HV-F046-E51

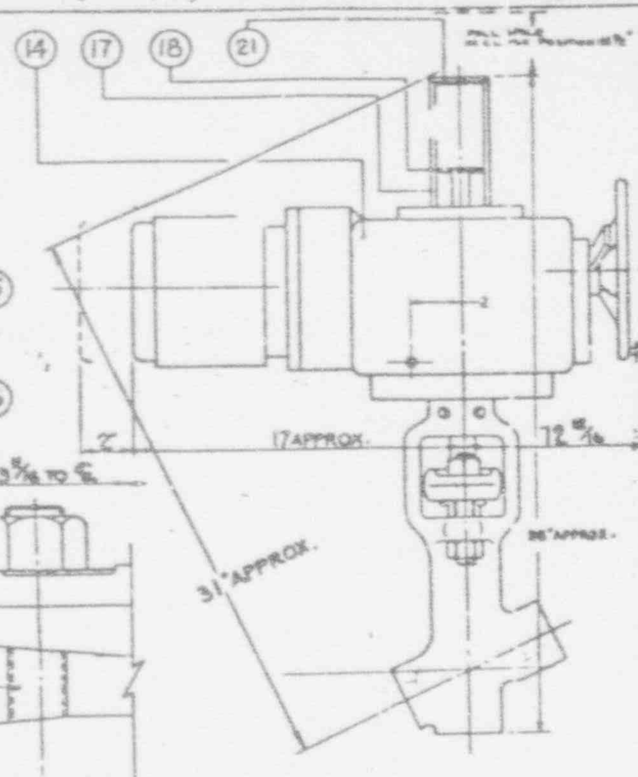
61-50908

ITEM NO.	SIZE & FIG. NO.	CLASS	TAG NO.
~~2.28~~	~~2-3624 MT~~	1	~~2-KP-HV-5897A~~ ~~2-KP-HV-5897 B~~ ~~2-KL-HV-5160 A~~ ~~2-KL-HV-5160 B~~ ~~2-EG-HV-2313 A~~ ~~2-EG-HV-2313 B~~ ~~2-EG-HV-2552 A~~ ~~2-EG-HV-2552 B~~ ~~2-EG-HV-2563 A~~ ~~2-EG-HV-2563 B~~
2.31			2"-CBA-GB-(B)(C)(N)(Y) ~~1-AB-HV-F067A-B21~~ ~~1-AB-HV-F067B-B21~~ ~~1-AB-HV-F067C-B21~~

61-50908

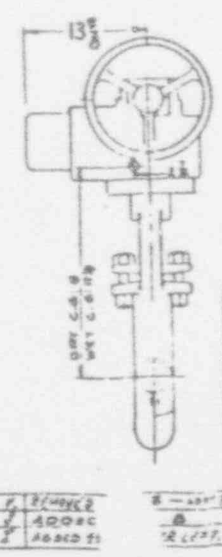
ITEM NO.	SIZE & FIG. NO.	CLASS
2.27	2-3624 MT	1
~~2.28~~		





VOLTAGE: 460 PHASE: 3 CYCLE: 60

OPERATOR SHALL OPEN OR CLOSE AT SPEED OF 10" (10 SEC) WITH A [illegible] PSIG ACROSS THE DISC.



MATERIAL LIST

ITEM	NAME	QTY	MATERIAL	SPEC.	DWG. NO.	PART NO.	REMARKS
1	BODY	1	ST.STL. GR.F316	ASTM-A182	1677.29	1677-29-13	
2	PACKING FLANGE	1	[illegible]	ASTM-A182	15375	1537-5-11	
3	STEM *	1	17-4PH	ARMCO	1547.48	1547-48-72	HARDENED
4	DISC *	1	STELLITE Nº6	*	1559.14	1559-14-121	INVEST. CAST
5	BACK SEAT	1	17-4PH	ARMCO	16095	1609-3-72	HARDENED
6	RETAINING RING	1	17-4PH	ARMCO	16192	1619-2-72	
7	PACKING RING ST	7	BRAID ASBESTOS	[illegible]	16292	1529-2-87	[illegible]
8	SPLIT GLAND BUSHING	1	ST.STL. 304	ASTM-A276	16396	1639-6-61	
9	UPPER FLANGE	1	C/S GR 1020	ASTM-A105	17284	1728-4-02	SEE NOTE 4
10	KEY	1	ST.STL. 440C	ASTM-A276	17370	1737-0-65	HARDENED
11	NAME PLATE	1	S/S 304 GR.3	ASTM-A137	17170		
12	GLAND STUD	2	ALLOY STL. GR.B8	ASTM-A193			[illegible]
13	GLAND NUT	4	ALLOY STL. GR.8	ASTM-A194			
14	MOTOR OPERATOR	1	LIMITORQUE	SMB-00-25			
15	OPERATOR STUD	4	CHR.MOLY GR.B7	ASTM-A193			[illegible]
16	OPERATOR NUT	4	C/S GR 2H	ASTM-A194			[illegible]
17	ACRYL PLAST TUBE	1	PLASTIC	COMMERC.	1687.38		
18	INDICATOR	1	C/S GR 1020	ASTM-A108	1687.32	2-91448	PARKERIZED
19	WASHER	1	ST.STL. 416	ASTM-A532	1687-26	1687-26-64	
20	SET SCREW	4	ST.STL. 316	ASTM-A276			[illegible]
21	COVER	1	ACR. PLASTIC	COMMERC.	91454		

NOTES.

1. VALVE TO BE MOUNTED HORIZONTAL WITH STEM VERTICAL MOTOR ABOVE THE VALVE.
2. PACKING IS 1¼ I.D. 2⅜ O.D AND ½ THICK.
3. C_v 50 WEIGHT 315 LB.
4. ALL CARBON STL. PARTS TO BE PARKERIZED.
5. ALL ITEMS MARKED THUS *; FOR SPARE PARTS.
6. ALL SHARP EDGES & CORNERS TO BE BROKEN.
7. THIS PART TO BE PAINTED BLUE.

MOTOR DATA			
VALVE I.D.	2TM58FB	2TM58FNH	2TM58FK
MOTOR	25	25	25
RATE VOLTS	460 V	460 V	460 V
FULL CURRENT	3.8 AMP	3.6 AMP	3.6 AMP
L.R. CURRENT	20 AMP	25.3 AMP	30 AMP
MAX TEMP	75°C	115°C	75°C
HEATER VOLTS	120	120	120
HEATER WATTS	25-40	25-40	23-40
H.P. MOTOR	1.6 HP	1.6 HP	1.6 HP
BRAKE	NO	NO	NA
SIZE	SMB-00	SMB-00	SMB-00

REV. H	[illegible]
REV. G	[illegible]
REV. F	[illegible]
REV. E	[illegible]
REV. D	REVISED [illegible]
REV. C	REDRAWN
REV. B	ADD. DWG Nº FOR ITEM-17, 18 & 21 - [illegible]
REV. A	CHANGE ITEM 2 DWG Nº 15375 WAS 15372 - 22-5-57

VELAN ENGINEERING COMPANIES
PLATTSBURGH-N.Y. MONTREAL LEICESTER

2" BONNETLESS GLOBE VALVE
MOTOR OPERATED
INCLINED-INTEGRAL SEAT SOCK.WELD.
FOR ASA CLASS 1500 LB.

DATE: 14 [illegible]
DRAWN: [illegible]
CHECKED: [illegible]

G 137116/1

PSE&G	TITLE METHODS FOR DETERMINING ASSUMED VALUES FOR PERCENT THRUST MARGIN AND EQUIVALENT VALVE FACTOR	ID NO.	SHEET
CALCULATION CONTINUATION SHEET		REFERENCE	OF
	ORIGINATOR / DATE / PEER REVIEW / DATE		

PERCENT THRUST MARGIN (ASSUMED)

$$\text{THRUST MARGIN}_{\text{ASSUMED}} = \frac{CAT - CRT}{CRT} \times 100$$

WHERE: 1. CAT = CALCULATED AVAILABLE THRUST (LBS.) IS DETERMINED AS THE RATIO OF AVAILABLE TORQUE TO STEM FACTOR BASED ON A STEM COF OF 0.15. WITH THE TORQUE SWITCH BYPASSED, THIS VALUE IS BASED ON THE MOTOR OPERATOR OUTPUT CAPABILITY UNDER DEGRADED VOLTAGE CONDITIONS.

2. CRT = CALCULATED REQUIRED THRUST (LBS.) IS DETERMINED AS THE DIFFERENTIAL PRESSURE THRUST (BASED ON A 1.1 VALVE FACTOR), PLUS AN AXIAL PACKING LOAD COMPONENT, PLUS A TORSIONAL PACKING LOAD COMPONENT (FOR RISING ROTATING STEM GLOBE VALVES.

THIS IS: $$\left[A_{SEAT}\left(DP + P_{MOM}\right)1.1\right] + SBL + \frac{\left[10 + \frac{(8 \times LP)}{1000}\right]\left(d_{STEM}\right)^{2.5}}{SF}$$

WHERE: A_{SEAT} = AREA OF THE SEAT BASED ON MEAN SEAT DIAMETER.
DP = DESIGN BASIS DIFFERENTIAL PRESSURE.
P_{MOM} = PRESSURE EQUIVALENT FOR FLUID MOMENTUM
SBL = STUFFING BOX LOAD (AXIAL COMPONENT)
LP = LINE PRESSURE
d_{STEM} = STEM DIAMETER
SF = STEM FACTOR BASED ON COF = 0.20

EQUIVALENT VALVE FACTOR (ASSUMED)

$$F_V = \left[\frac{MAT}{SF} - SBL - \left(LP \times A_{STEM}\right)\right] \Big/ A_{SEAT}\left(DP + P_{MOM}\right)$$

WHERE: 1. MAT = MAXIMUM ALLOWED TORQUE AS THE LESSER VALUE FOR VALVE, OPERATOR, SPRING PACK OR MOTOR DEGRADED VOLTAGE TORQUE. IF THE TORQUE SWITCH IS BYPASSED, THE SPRING PACK RATING IS NOT LIMITING FOR THE CAPABILITY EVALUATIONS.

2. ALL OTHER TERMS ARE THE SAME AS DEFINED ABOVE FOR CRT. FOR RISING ROTATING STEM GLOBE VALVES, MAT IS REDUCED BY TORSIONAL COMPONENT OF PACKING LOAD.

PSE&G

CALCULATION CONTINUATION SHEET

TITLE	ID NO.	SHEET
	REFERENCE	OF

	ORIGINATOR						
	DATE						
	PEER REVIEW						
	DATE						

1BJHV-4803

INPUTS: MAT = 25 FT-LBS. (MOTOR DEGRADED VOLTAGE TORQUE)

$SF_{0.15}$ = 0.0082 FT

$SF_{0.20}$ = 0.0102 FT

A_{SEAT} = 2.04 IN^2

DP = 33 PSIG (BASED ON LIMITORQUE SEL) ACTUAL IS 28 PSIG

P_{MOM} = 0 PSIG

SBL = 1000 LBS.

LP = 28 PSIG

d_{STEM} = 1 IN.

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{CAT - CRT}{CRT}$$

$$CAT = \frac{25}{0.0082} = 3049 \text{ LBS.}$$

$$CRT = [2.04 \times 33 \times 1.1] + 1000 + \frac{\left[10 + \frac{(8 \times 28)}{1000}\right]^{2.5}}{0.0102}$$

$$CRT = 74 + 1000 + \frac{10.2}{0.0102} = 2075 \text{ LBS.}$$

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{3049 - 2075}{2075} = 0.468 \quad \text{OR} \quad 46.8\%$$

$$F_V = \left[\frac{MAT - \left(\left[10 + \frac{8 \times LP}{1000}\right] d_{STEM}^{2.5}\right)}{SF_{0.20}} - SBL\right] \Big/ A_{SEAT}(DP + P_{MOM})$$

$$F_V = \left[\frac{25 - 10.2}{0.0102} - 1000\right] \Big/ (2.04)(33) = \frac{450.98}{67.32} = 6.7$$

PSE&G

CALCULATION CONTINUATION SHEET

TITLE	ID NO.	SHEET
	REFERENCE	OF

	ORIGINATOR				
	DATE				
	PEER REVIEW				
	DATE				

1BJHV-4804

INPUTS: MAT = 25 FT-LBS. (MOTOR DEGRADED VOLTAGE TORQUE)

$SF_{0.15} = 0.0082$

$SF_{0.20} = 0.0102$

$A_{SEAT} = 2.04\ IN^2$

$DP = 41$ PSIG

$P_{man} = 0$

$SBL = 1000$ LBS.

$LP = 41$ PSIG

$d_{STEM} = 1$ IN.

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{CAT - CRT}{CRT}$$

$$CAT = 25 / 0.0082 = 3049 \text{ LBS.}$$

$$CRT = [2.04 \times 41 \times 1.1] + 1000 + \frac{\left[10 + \frac{(8 \times 41)}{1000}\right]^{2.5}}{0.0102}$$

$$CRT = 92 + 1000 + \frac{10,328}{0.0102} = 2105 \text{ LBS.}$$

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{3049 - 2105}{2105} = 0.448 \text{ OR } 44.8\%$$

$$F_V = \left[\frac{MAT - \left(\left[10 + \frac{8 \times LP}{1000}\right] d_{STEM}^{2.5}\right)}{SF_{0.20}} - SBL\right] \Big/ A_{SEAT}(DP)$$

$$F_V = \left[\frac{25 - 10.3}{0.0102} - 1000\right] \Big/ (2.04)(41) = \frac{441.18}{83.64} = 5.27$$

PSE&G	TITLE	ID NO.	SHEET
CALCULATION CONTINUATION SHEET		REFERENCE	OF
	ORIGINATOR / DATE / PEER REVIEW / DATE		

1EGHV-2446

INPUTS: MAT = 34 FT-LBS. (MOTOR DEGRADED VOLTAGE TORQUE)

$SF_{0.15}$ = 0.0082

$SF_{0.20}$ = 0.0102

A_{SEAT} = 1.86 IN^2

DP = 121 PSIG

P_{MOM} = 0

SBL = 1000 LBS.

LP = 167 PSIG

d_{STEM} = 1 IN.

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{CAT - CRT}{CRT}$$

$$CAT = 34 / 0.0082 = 4146 \text{ LBS.}$$

$$CRT = \left[1.86 \times 121 \times 1.1\right] + 1000 + \frac{\left[10 + \frac{(8 \times 167)}{1000}\right]^{2.5}}{0.0102}$$

$$CRT = 248 + 1000 + \frac{11.336}{0.0102} = 2359 \text{ LBS.}$$

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{4146 - 2359}{2359} = 0.758 \quad \text{OR} \quad 75.8\%$$

$$F_V = \left[\frac{34 - 11.3}{0.0102} - 1000\right] / (1.86)(121) = \frac{1225.49}{225.06} = 5.45$$

1EGHV-2447

INPUTS: MAT = 33 FT-LBS. (MOTOR DEGRADED VOLTAGE TORQUE)

$SF_{0.15}$ = 0.0082 FT.

$SF_{0.20}$ = 0.0102 FT.

A_{SEAT} = 1.86 IN^2

DP = 121 PSIG

P_{MOM} = 0

SBL = 1000 LBS.

LP = 16.5 PSIG

d_{STEM} = 1 IN

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{CAT - CRT}{CRT}$$

$$CAT = 33 / 0.0082 = 4024 \text{ LBS.}$$

$$CRT = [1.86 \times 121 \times 1.1] + 1000 + \left[10 + \frac{8(16.5)}{1000}\right] \Big/ \underbrace{0.0102}^{2.5}$$

$$CRT = 248 + 1000 + \frac{11.32}{0.0102} = 2358 \text{ LBS.}$$

$$\text{THRUST MARGIN}_{ASSUMED} = \frac{4024 - 2358}{2358} = 0.707 \text{ OR } 70.7\%$$

$$F_V = \left[\frac{33 - 11.3}{0.0102} - 1000\right] \Big/ (1.86)(121) = \frac{1127.45}{225.06} = 5.01$$

HOPE CREEK 2" GLOBE VALVES

All globe valves in this list are ROCKWELL 2" 1500 # ANSI Class Globe Valves with SMB-000 Actuators and 1000# Stuffing Box Loads

MOV #	MODEL NO	APP. 7 PREDB	TEST ΔP	% DB ΔP	FLOW CUTOFF THRUST	VALVE FACTOR	BODY MATL	PLUG MATRL	STEM MATRL	OVRLL RATIO
AB-F071	D9624 M17	61.2					SA105	A567 GR1	A582 T416	100
AE-4144	D9624 MT1	46.9					-	-	-	100
BC-3055A	D96224 MLT1	63.1	319	73	304	0.566	-	A565 GR616	SA564 T630	69
BC-3055B	-	63.1	275	64	562	0.890	-	-	-	68
BD-F044	D9624 MT1	62.2					-	A567 GR1	A582 T418	100
BF-3800A	M224 (F316L) MT1	67.7					SA182 F316L	-	SA564 T416	82
BJ-3800B	-	47.2					-	-	-	82
BJ-4801	D9624 MT1	47.7					SA105	-	A582 T416	98
BJ-4804	-	47.7					-	-	-	98
BJ-4803	-	47.7					-	-	-	102
BJ-4806		47.7					-	-	-	102
BJ-F059	-	57.5					-	-	-	100
EC-4647	M224 (F316L) MT1	48.3					SA182 F316L	-	SA564 T630	82
EC-4648		48.3					-	-	-	82
EG-2320A	D9624 MT1	48.3					SA105	-	A582 T416	100
EG-2320B	-	48.2	83	67	312	1.500	-	-	-	100
EG-2321A	-	44.6	88	70	74	0.140	-	-	-	100
EG-2321B	-	44.6	83	66	124	0.870	-	-	-	100
EG-2446	M124 MT1	50.2					-	A565 GR616	SA564 T630	90.5
EG-2447	-	50.2					-	-	-	90.5
EG-2452A	D3624 MT1	48.3					-	A567 GR1	A582 T416	100

MOV #	MTR FT #	FLUID	MTR SPD	OVF	DB FLOW	DB VEL FT/SEC	DB °F TEMP	DB ΔP	MAT LBS	SEAT DIA.	TARGET THRUST	LIMIT THRUST	MTR TRQ @ DVS
AB-F071	3	STEAM	1700	0.68	30000 #/HR	8.5	547	1055	3323	1.61	4328	16584	122
AE-4144	2	WATER	-	0.53	20 GPM	3.6	80	118	1262	1.61	1445	18237	38
BC-3055A	3	-	-	0.68	10 GPM	1.7	80	440	1900	1.34	2470	16594	93
BC-3055B	3	-	-	0.62	10 GPM	1.7	80	425	1870	1.34	2431	-	79
BD-F044	3	-	1900	0.86	54 GPM	8.5	80	1507	4302	1.61	5697	21498	155
BF-3800A	3	-	1700	0.88	3 GPM	1.3	80	1534	3042	1.26	3955	11256	130
BJ-3800B	3	-	-	0.88	3 GPM	1.3	80	1530	3036	1.26	3947	-	130
BJ-4801	2	-	-	0.51	15 GPM	2.4	79	33	1074	1.61	1396	30640	23
BJ-4804	2	-	-	0.51	15 GPM	2.4	79	41	1092	1.61	1420	-	23
BJ-4803	2	-	-	0.53	15 GPM	2.4	79	33	1074	1.61	1396	-	34
BJ-4806	2	-	-	0.53	15 GPM	2.4	79	41	1092	1.61	1420	-	34
BJ-F059	3	-	-	0.84	70 GPM	11.0	80	391	1877	1.61	2440	21489	151
EC-4647	2	-	-	0.66	100 GPM	26.0	80	150	1177	1.26	1530	11256	39
EC-4648	2	-	-	0.67	100 GPM	26.0	80	156	1181	1.26	1535	-	40
EG-2320A	2	-	-	0.53	10 GPM	1.5	65	123	1276	1.61	1659	21489	38
EG-2320B	2	-	-	0.52	10 GPM	1.5	65	174	1278	1.61	1661	21489	37
EG-2321A	2	-	-	0.69	10 GPM	1.5	65	123	1276	1.61	1659	-	50
EG-2321B	2	-	-	0.88	10 GPM	1.5	65	124	1278	1.61	1661	-	49
EG-2446	2	-	-	0.37	30 GPM	8.5	80	121	1248	1.34	1622	21274	34
EG-2447	2	-	-	0.51	30 GPM	8.5	80	121	1248	1.34	1622	-	35
EG-2452A	2	-	-	0.53	10 GPM	1.5	65	127	1283	1.61	1671	21489	38

HOPE CREEK 2" GLOBE VALVES

All globe valves in this [illegible] are ROCKWELL 2" 1500 # ANSI Class Globe Valves with SMB-000 Actuators and 1000# Stuffing Box Loads

MOV #	MODEL NO.	APP. J PROG.	TEST ΔP	% DB ΔP	FLOW CUTOFF THRUST	VALVE FACTOR	BODY MATL	PLUG MATRL	STEM MATRL	OVRLL RATIO	MTR FT-#	FLUID	MTR RPD	DVP	DB FLOW	DB VEL FT/SEC	DB °F TEMP	DB ΔP	MRT LBS	SEAT DIA.	TARGET THRUST	LIMIT THRUST	MTR TRQ @ DVP
EG-2452B	"	48.3	80	60	188	0.791	"	"	"	100	2	"	"	0.52	10 GPM	1.5	65	124	1278	1.61	1881	"	39
EG-2451A	"	44.6	82	64	240	0.956	"	"	"	100	2	"	"	0.89	16 GPM	1.5	65	127	1285	1.61	1471	"	50
EG-2455B	"	44.8	92	68	21	0.030	"	"	"	100	2	"	"	0.67	13 GPM	1.5	65	124	1278	1.61	1881	"	48
FC-F080	"	47.7					SA105	A565 GR1	A182 T410	100	2	AIR	1900	0.85	17 SCFM	30	70	33	1074	1.61	1396	"	40
FD-4923	"	44.4					"	"	"	100	2	"	1700	0.85	15 SCFM	13.7	"	"	1074	1.61	1396	"	81
GS-4955A	M22A (F316L) MT1	55.1					SA182 F316L	"	A564 T630	82	3	"	"	0.68	10 SCFM	19.9	340	68.1	1064	1.24	1383	HD2A	101
GS-4955B	"	55.1					"	"	"	"	5	"	"	0.67	"	"	"	"	1064	"	1383	"	99
GS-4959A	"	55.1					"	"	"	"	5	"	"	0.67	"	"	212	33	1044	"	1357	"	99
GS-4959B	"	55.1					"	"	"	"	5	"	"	0.65	"	"	"	"	"	"	"	"	96
GS-4965A	"	55.1					"	"	"	"	5	"	"	0.89	"	"	"	48	"	"	"	"	132
GS-4965B	"	55.1					"	"	"	"	5	"	"	0.88	"	"	"	33	"	"	"	"	130
GS-4966A	"	55.1					"	"	"	"	5	"	"	0.66	"	"	"	"	"	"	"	HD2A	98
GS-4966B	"	55.1					"	"	"	"	5	"	"	0.67	"	"	"	"	"	"	"	"	99
GS-4974	D362A MT1	55.1					SA105	"	A182 T410	100	2	"	"	0.67	"	11.8	340	48	1109	1.61	1440	"	48
GS-4963A	M22A (F316L) MT1	55.1					SA182 F316L	"	A564 T630	82	3	"	"	0.70	"	19.9	"	68.1	1064	1.24	1383	"	104
GS-4963B	"	55.1					"	"	"	"	5	"	"	0.68	"	"	"	"	"	"	"	"	101
GS-4964A	"	55.1					"	"	"	"	5	"	"	0.69	"	"	"	"	"	"	"	"	102
GS-4964B	"	55.1					"	"	"	"	5	"	"	0.68	"	"	"	"	"	"	"	"	101
GS-5019A	"	55.1					"	"	"	"	5	"	"	0.67	"	"	"	"	"	"	"	"	99
GS-5019B	"	55.1					"	"	"	"	5	"	"	0.67	"	"	"	"	"	"	"	"	99
GS-5022A	"	55.1					"	"	"	"	5	"	"	0.66	"	"	212	33	1044	"	1357	"	102
GS-5022B	"	55.1					"	"	"	"	5	"	"	0.68	"	"	"	"	1044	"	1357	"	101
GS-5057A	D36[illegible] MLT1	46.5	319	75	510	0.453	SA105	A565 GR616	"	68	5	WATER	"	0.84	10 GPM	1.5	80	440	1800	1.54	2470	1050#	84

HOPE CREEK 2" GLOBE VALVES

All globe valves in this list are ROCKWELL 2" 1500 # ANSI Class Globe Valves with SMB-000 Actuators and 1000# Stuffing Box Loads

MOV #	MODEL NO.	APP. 2 PRIOR.	TEST ΔP	% DB ΔP	FLOW CUTOFF THRUST	VALVE FACTOR	BODY MATL	PLUG MATRL	STEM MATRL	OVRLL RATIO	MTR FT-#	FLUID	MTR SPD	DVF	DB FLOW	DB VEL FT/SEC	DB °F TEMP	DB ΔP	MRT LBS	SEAT DIA.	TARGET THRUST	LIMIT THRUST	MTR TRQ @ DVF
GS-9057B	-	46.5	275	64	239	0.230	-	-	-	88	5	WATER	-	0.86	-	1.5	-	425	1108	-	2431	-	83
KL-5124A	36024 (FINAL) MT1	44.8					SA182 F316L	A567 GR1	-	82	5	AIR	-	0.87	20 SCFM	30.7	325	115	1153	1.26	1499	30224	126
KL-5124B	-	44.6					-	-	-	82	5	-	-	0.85	-	30.7	-	-	1153	1.26	1499	-	126
KL-5126A	D3624 MT1	61.2					SA105	-	A582 T416	109	2	-	-	0.55	-	23.6	-	-	1258	1.41	1635	19792	38
KL-5126B	-	61.2					SA105	A567 GR1	-	109	2	AIR	1700	.71	20 SCFM	23.6	325	115	1258	1.41	1635	-	37
KL-5147	-	55.1					-	-	-	-	2	-	-	.69	-	-	340	48	1108	-	1440	-	50
KL-5148	-	55.1					-	-	-	-	2	-	-	.66	40 SCFM	47.2	-	-	1108	-	1440	-	48
KL-5152A	-	61.2					-	-	-	-	2	-	-	.66	20 SCFM	23.6	325	115	1258	-	1635	-	46
KL-5152B	-	61.2					-	-	-	-	2	-	-	.68	-	-	-	-	1258	-	1635	-	49
KL-5160A	-	55.1					-	-	-	-	2	-	-	.73	-	-	148	48	1108	-	1440	19792	38
KL-5160B	-	55.1					-	-	-	-	2	-	-	.52	-	-	-	-	1108	-	1440	-	37
KL-5162	-	55.1					-	-	-	-	2	-	-	.68	-	-	340	-	1108	-	1440	-	49
KL-5172A	D3624 MT1	61.2					-	-	-	90.7	2	-	-	.86	-	-	325	115	1258	-	1635	21409	45
KL-5172B	-	61.2					-	-	-	-	2	-	-	.59	-	-	-	-	1258	-	1635	-	44
KP-5829A	D36224 (ULT)	42.2					-	-	-	100	5	-	-	.65	2500 SCFH	39	-	-	1258	-	1635	16584	117
KP-5829B	-	42.2					-	-	-	-	5	-	-	.65	-	-	-	-	1258	-	1635	-	117
KP-5834A		55.1					-	[illegible]	-	-	5	-	-	.65	80 SCFM	115		25	6275	1.54	6275	19594	117
KP-5834B	-	42.2					-	-	-	-	5	-	-	.65	-	-	-		[illegible]	-	6275	-	117
KP-5835A		55.1					-	-	-	-	5	-	-	.65	-	-	-		6275	-	6275	-	117
KP-5835B	-	42.2					-	-	-	-	5	-	-	.65	-	-	-	-	6275	-	6275	-	117
KP-5836A	-	55.1					-	-	-	-	5	-	-	.64	-	-	-	-	6275	-	6275	-	115
KP-5836C	-	42.2					-	-	-	-	5	-	-	.65	-	-	-	-	6275	-	6275	-	117
KP-5837A	-	55.1					-	-	-	-	5	-	-	.66	-	-	-	-	6275	-	6275	-	119

HOPE CREEK 2" GLOBE VALVES

All globe valves in this list are ROCKWELL 2" 1500 # ANSI Class Globe Valves with SMB-000 Actuators and 1000# Stuffing Box Loads

MOV #	MODEL NO.	APP. 2 PRESS	TEST ΔP	% DB ΔP	FLOW CUTOFF THRUST	VALVE FACTOR	BODY MATL	PLUG MATRL	STEM MATRL	OVRLL RATIO	MTR FT #	FLUID	MTR SPD	DVP	DB FLOW	DB VEL FT/SEC	DB °F TEMP	DB ΔP	MST LBS	SEAT DIA.	TARGET THRUST	LIMIT THRUST	MTR TRQ @ DVP
KP-9077B	-	42.2					-	-	-	-	3	-	-	.65	-	-	-	-	4275	-	4275	-	117
SK-4953	36224 (F316L-MT)	55.1					SA182 F316L	A567 GR1	A564 T630	57	2	-	-	.86	10 SCFM	19.3	340	48	1064	1.24	1383	10224	28
SK-4957	-	55.1					-	-	-	82	3	-	-	.87	-	-	-	-	1064	-	1383	-	124
SK-4981	-	55.1					-	-	-	82	5	-	-	.88	-	-	-	-	1064	-	1383	-	130
SK-5018	-	55.1					-	-	-	57	2	-	-	.86	-	-	-	-	1064	-	1383	-	27

SALEM UNITS 1 & 2
2" GLOBE VALVES

All Globe Valves in this list have the following in common:

1) Velan 2", 1500# ANSI Class
2) Seat Material - A182 GR F316
3) Plug Material - Stellite NO. 6
4) Stem Material - 17-4PH
5) Seat Diameter - 1.87"
6) Stuffing Box Load - 1500#
7) Actuator - Limitorque SMB-00
8) Overall Unit Ratio - 31.9
9) Motor Size - 25 FT-LBS
10) Motor Nameplate Speed - 1750 RPM
11) Fluid - Water
12) Figure Number - 2" WO8-3076-13MS

MOV #	APP. 2 PRIOR	TEST ΔP	% DB ΔP	FLOW CUTOFF THRUST	APP 14 VALVE FACTOR	DB FLOW GPM	DB TEMP °F	DB ΔP PSID	DB VEL FT/SEC	MRT LBS	TARGET THRUST	LIMIT THRUST	DVF	MOTOR TORQ @ DVF
1CV139	53.5	2583	102	8427	0.868	150	35	2542	16	9190	11947	19600	0.79	227
1CV140	53.5	2583	102	8481	0.967	150	35	2542	16	9190	11947	19600	0.81	232
1CV175	52.6	85.1	71	2182	0.238	75	100	120	8	1863	2422	14000	0.78	224
11RH29	56.3	170	89	2693	0.948	500	140	192	53	2081	2705	14000	0.81	232
12RH29	56.3	142	74	2400	0.807	500	140	192	53	2081	2705	14000	0.74	212
1SJ67	50.8	1463	96	3707	0.790	60	35	1520	6.4	6098	7927	19600	0.74	212
1SJ68	50.8	1463	96	3730	0.804	60	35	1520	6.4	98	7927	19600	0.73	210
2CV175	52.6	86	73	1189	1.560	75	100	119	8	1860	2418	14000	0.73	210
22RH29	56.3	167	87	1629	0.332	500	140	193	53	2084	2709	14000	0.84	241
2SJ67	50.8	1400	92	4926	1.146	60	35	1520	6.4	6098	7927	14000	0.75	215
2SJ68	50.8	1390	91	5917	0.802	60	35	1520	6.4	6098	7927	14000	0.81	232