PP&L

CALCULATION COVER SHEET

CALC. NO. M-VLV-418
FILE NO. R2-1M
SUPERSEDED BY (N/A)

SAFETY-RELATED [X]
ASME III OR XI [ ]
OTHER QUALITY [ ]
NON QUALITY [ ]

PROJECT SSES MOV Program

ER/CTN NO. 402288

DESIGN ACTIVITY/PMR NUMBER

PAGE 1 OF 26

TITLE/DESCRIPTION MOV Data Detail, Limit Switch Settings and Torque Switch Settings for: HV 255 F003

SYSTEMS AFFECTED 52

STATEMENT OF PROBLEM

NRC Generic Letter 89-10 required establishment of a program to provide for the testing, inspection and maintenance of safety-related motor-operated valves. This calculation provides the data details for the valve identified above which will be used to prepare the Data Detail Drawing which will support the testing, inspection and maintenance activities.

DESIGN BASIS (EPM-QA-208 OR EPM-QA-400)

See Section 2.0 for Methodology.

This calculation serves as the Design Input For drawing M-1420

REFERENCES/FORMULAE

See Section 3.0 for Inputs/References.

SUMMARY/CONCLUSIONS

See Section 6.0 for Results/Conclusions.

Available Motor Start Torque = 44 ft-lbs

Rev 2 added page 22C

ENGINEERING TURNOVER
(ETO) BINDER AFFECTED? [ ] YES-If Yes enter: Binder # _____ Vol. _____
Calc. File _____ Pgs. _____
[ ] NO

REV. NO.	DATE	PREPARED BY	REVIEWED/CHECKED BY	DATE	APPROVED BY	DATE
0	3/15/91	CDAtkula	DHHunt	3.21.91	KWAnderson	3/30/91
1	9-16-91	DHHunt	JMLancaster	9/21/91	KWAnderson	9/21/91
2	10-1-91	DHHunt	RWMcNutt	10.2.91	KWAnderson	10/3/91

FORM EPM-QA-216A REV.1

mls/frb0061(12)

CA 3/14/91
DAH 3-22-91

Calculation Contents

CA 3/19/91
DNH 3-21-91

1.0 Purpose/Scope

The purpose of this calculation is to develope all of the information necessary to create a Motor Operated Valve Data Detail Drawing for the subject MOV. In order to meet this end the following specific activities will be performed in this calculation to complete the MOV Detail Drawing for the subject MOV:

1.1 Research existing design documents and records for the MOV to determine best available configuration data. This data will be used as input to the MOV Data Detail Drawing as well as to the calculations to be performed herein.

1.2 An actuator sizing calculation will be performed to determine the required actuator parameters (e.g.actuator size, motor size, spring pack, torque switch settings, etc.).

1.3 Using the results of Item 1.2, diagnostic test acceptance criteria will be established.

1.4 Based on the design function of the MOV, geared limit switch settings will be determined. For the purposes of this calculation, the limit switch functions to be considered will be limited to:

a.) Torque switch bypass (open and close direction)

b.) Full open limit switch

c.) Valve position indication

1.5 A review of previously approved spring pack Replacement Item Equivalency Evaluations (RIEE's or RIE's) will be performed for the particular MOV being evaluated. Changes to these RIE's will be processed as necessary based on the results of this calculation.

CA 3/11/91
DHW 3-21-91

2.0 Methodology

Existing design documents, modifications and field work authorizing documents will be reviewed to identify required inputs to the MOV Data Detail Drawing. Lists of the required inputs as well as a cross reference to the data source are provided in Section 3.0 of this calculation.

2.1 Actuator Sizing Calculations: These will be performed using the software version of Mechanical Design Standard (MDS) Number 01 (Input a.). The following methods will be used to compliment the techniques used in the software package:

a.) The active valve stroke length is a required program input which allows the program to calculate a design valve stroke time. The active stroke length will be calculated based on the following expression:

$$\text{ACTIVE STROKE LENGTH} = Z * FSL$$

Where:

Z = The setpoint of the full open limit switch in percent open (typically 97%)

FSL = Full Valve Stroke Length from the closed position to the fully open (backseated) position. If FSL is not specifically known it can be calculated using the following expression:

$$FSL = \frac{HWT * SL}{HGR}$$

Where:

HWT = The number of handwheel turns required for the valve to travel from fully closed to fully

open.

SL = The valve stem lead.

HGR = The overall handwheel gear ratio.

b.) Program overrides will be used to allow the calculation to reflect the current configuration of the MOV.

c.) Once an expected motor run torque is calculated, a typical motor curve will be consulted to determine an estimated midstroke loaded motor speed (RPM). The calculation will be rerun using this value as an override, the result being a more representative design stroke time.

d.) For gate valves the calculation will be run using a valve factor of .3.

e.) The calculation will be run with various acceptable spring packs to allow for flexibilty in future replacement. Only spring packs approved on spring pack equivalencies will be included on the MOV Data Detail Drawing.

2.2 VOTES Diagnostic Thrust Acceptance Criteria: Once the actuator sizing has been completed diagnostic test thrust acceptance criteria will be established using the following methodology:

a.) The Minimum Allowable Thrust will be established as 115% of the design calculated required thrust. This allows for at least 10% error in the diagnostic test results and 5% variation in torque switch repeatability.

b.) The Maximum Allowable Running Thrust will be established as the Stuffing Box Friction load used in the actuator sizing calculations.

c.) The Maximum Allowable Thrust will be established as the thrust corresponding to the minimum of the following:

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1.) Actuator thrust rating,

2.) 120% of the equivalent thrust at maximum allowable actuator output torque,

3.) Maximum allowed valve thrust (if available).

d.) The acceptance criteria at each torque switch setting will be specified as the expected thrust +/- 20% .

e.) In all cases items a.) and c.) shall take precedence over item d.).

2.3 Limit Switch Settings: This section of the calculation will determine the appropriate geared limit switch settings for valve control and position indication. The limit switch settings will be established per the requirements of MDS-03 (Input b.). The switch settings will be specified in percentages of physical stem travel from either full open or full closed.

2.4 Other Items

CA 2/18/91
AWH 3-21-91

3.0 Inputs/References

3.1 The principle design inputs for this calculation are:

a.) MDS-01 "Design Standard for the Sizing of Limitorque Actuators Including Thrust Calculation, Actuator Sizing, Spring Pack Selection and Torque Switch Setting Determination." Revision 1.

b.) MDS-03 "Design Standard for Determining and Setting Valve Motor Actuator Limit Switches." Revision 0.

3.2 Information required for entry on the MOV Data Detail Drawing and as input to this calculation is provided on pages 9 through 11 of this calculation. Reference Numbers are provided for each of the entries. A listing of all references is provided on Page 12 (Note: Copies of references not readily available are provided as attachment to this calculation).

CA 3/10/11
DLM 3-21-91

General Valve Design

	Data Value	Reference No.
Valve Manufacturer	Anchor Darling	1
Vendor Drawing Number	93-13802	1
Valve Serial Number		
Valve Quality Class	Q	1
Valve ASME Section III Edition and Class	1971 W/winter '72 Addenda 1	1
Valve Location (Inside/Outside Containment)	OUTSIDE	8
Valve Type	GATE	1
Valve Pressure Class	600	1
Valve Size (Inches)	10"	1
Valve Seat Area (Inches Squared)	66.33	2
Stem Information:		
Stem Diameter (Inches):		
At Stuffing Box Location	1.875	13 ✓
At Threaded Portion	1.875	13
Thread Pitch/Lead	0.333 | 0.667	13
Stem Material	A276-410	1
Original Design Stroke Time (Seconds)	50	3 ✓

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DM 3-21-91
⚠ DM 9-16-91
9/19/91

General Valve Design (Cont.)

	Data Value	Reference No.
Process Parameters:		
Flow Medium	STEAM	3
Design/Maximum Pressure (PSIG)	1250 / 1350	7
Design/Maximum Temperature (F)	585 / 585	7
Design/Maximum Flow (~~GPM~~ CA or LB/HR)	LATER	
Throttled Flow (GPM or LB/HR)	N/A	
Max. Operating Differential Press. (PSID):		
Opening Direction	0	12
Closing Direction	1146	12 ⚠
Additional Physical Parameters:		
Valve Max. Thrust Capability (LBS)	NOT AVAILABLE	
End Connections/Rating	BW Sch 80	1,3
Body Material	A 216 WCB	1
Disc Trim Material	STELLITE	1,3
Body Seat Trim Material	STELLITE	1,3
Guide Rib Facing (Gate Valves Only)	A216 WCB	1
Drain/Bypass Required (Y/N)	N | N	3 ✓

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DKR 3-21-91
JHH 9-16-91
GMP 9-21-91

Actuator Design

	Data Value	Reference No.
General:		
Actuator Quality Class	Q	8
Safety Function (Open/Close)	C	~~Page 6~~ (2.4.c) 4
Actuator Manufacturer	LIMITORQUE	1
Main Unit (e.g. SMB):		
Actuator Order Number	381264-H	11
Actuator Serial Number	205546	11
Actuator Size	SMB-1-40	1
Gearing Information:		
Motor Pinion Number of Teeth	33	11
Worm Gear Number of Teeth	39	11
Worm to Worm Gear Ratio	66:1	11
Overall Actuator Ratio	78 *	11
Lost Motion Drive Sleeve (Y/N)		
Auxilary Worm/Bevel Gear Unit:		
Unit Order Number	N/A	
Unit Serial Number	N/A	
Unit Type/Size	N/A	
Unit Gear Ratio	N/A	
Overall Handwheel Ratio	49 :1	10
Handwheel Orientation (Top or Side Mount)	SIDE	1
Handwheel Efficiency	25.0	10

* $\frac{39}{33} \times 66 = 78$

Electrical/Motor Design Information

	Data Value	Reference No.
Motor Class (1E/Non1E)	1E	14
Power Supply Type (AC/DC)	DC	11
Power Source	2D264031	12
Voltage Supply/Phase/Frequency	250/NA/NA	11
Motor Manufacturer	RELIANCE	11
Motor Serial Number		
Design Motor Speed (RPM)	1900	11
Motor Start/Run Torque (ft-lbs)	40 | 8	11
Motor Horsepower	2.9	5
Service Factor	1.0	5
Motor Type/Frame Size	/ L186A	5
Motor Frame Design/Enclosure Type		
Winding Type (DC Motors)		
Motor Duty Rating	5	5
Insulation Class	B	5
Temp. Rise/Ambient Temp. (C)	| 40	5
Full Load/Locked Rotor Current (Amps) or KVA Code (LRIC) at Supply Voltage (See Note 3)	11.1 | 85.4	5
DC Motor Field Current (Amps)		
Limit Switch Comp/Motor Spaceheaters (Y/N)		

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DNH 9-21-91 JMP 9/19/9

REFERENCES:

1. VALVE VENDOR DRAWING NO: 93-13802 Rev F
   (FF 110100 6101)
2. VALVE VENDOR DESIGN REPORT NO: 8856-P-10A-102 REV: 1 (Attached)
   (FF 110101 0201)
3. VALVE SPEC. NO: 8856-P-10 PAGE 9 OF 15. REV: 4 (Attached)
   DATA SHEET
4. DESIGN BASIS DEVELOPMENT PRIORITY 2 MOVs:SEA-238, REV: 0 (9/19/91)
5. MOTOR OPERATOR'S INFORMATION SHEET FOR ORDER NO: 381264-H (Attach.
6. DESIGN STROKE TIME CALC NO: M-VLV-029, REV. 0
7. SEIS PIPE INDEX Rev 6
8. P&ID NO: M-2155 REV NO: 23
9. IN SERVICE TESTING OF PUMPS AND VALVES M-1437.REV. NO: (NOT USED)
10. LIMITORQUE STANDARD HANDWHEEL RATIO CHART (SEL-11). (Attached)
11. WORK AUTHORIZATION NOS: V80063 and V 60388 (Attached)
12. ~~VALVE DESIGN BASIS DOCUMENT NO: SEA-M-127, REV: 0 (Attached)~~ 1A
13. Anchor Darling letter dated 2-20-1990 (Attached)
14. Schematic Diagram E-152 Sheet 31 Rev 11
15. Anchor Darling Telecopy dated 3/28/91 (copy attached) 1A
16. E-AAA-619 Rev 3 (Applicable Sheet Attached)

OWH 9-16-91
QMP 9/19/91

4.0 Assumptions

1. For the purposes of this calculation, attempts have been made to verify design information against actual as-installed information as documented in Plant Work Authorizations. Where actual as-installed information is unavailable the original design information will be used. Upon completion of field as-built verification, any discrepencies will be reconciled and this calculation shall be revised as appropriate.

2. Stuffing box friction values will be consistent with the empirical values listed in MDS-01 unless otherwise noted herein.

3. Unless noted otherwise, the stem factor used herein will be based on a coefficient of friction of 0.15 (Reference /5). This is consistent with the original design seismic analysis. The SSES MOV preventative maintenance and trending program will ensure the valve stems/stem nuts are maintained in a manner which supports this assumption. △1

4. The minimum voltage available will be assumed to be 80% unless noted otherwise. If the electrical voltage drop calculations show this to be unconservative a lower value will be used. If the use of 80% initially produces unacceptable results the electrical voltage drop calcs will be consulted in an attempt to remove some of the conservatism.

5. Gate valve sizing calculations will be run using a valve factor of .3.

6. During the initial preparation of this calculation, the valve maximum thrust capability may not yet be available. In these cases, the maximum thrust/torque shall be based on the following:

   Maximum Torque

   The maximum allowed torque shall be the lesser of the maximum torque calculated by the MDS01 software or the torque corresponding to the original design maximum torque switch setting.

   Maximum Thrust

   The maximum allowed thrust shall be the lesser of the actuator thrust rating or 120% of the equivalent thrust at the maximum allowable actuator output torque. △1

CK 3/18/91
DKH 3-21-91

5.0 Calculations

5.1 Actuator Sizing Calculation

The results of the actuator sizing calculations are provided as follows:

Run #	Conditions	Calc. Pages
1.	Sp. pack 60n600-0007-1 Valve factor 0.3	21-21A
2.	SPRING PAC 0068 VALVE FACTOR .3	22-22A
3.		
4.		

5.2 VOTES Diagnostic Thrust Acceptance Criteria

The calculation of the thrust acceptance criteria was performed per the method outlined in 2.2.

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5.3 Limit Switch Settings

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F 21

Geared Limit Switch Settings

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	Data Value		Reference No.
Electrical Schematic & Connection Diagram No.	E-152 SH3	E38014	14
Full Stroke Length & Number of Handwheel Turns	9.95	750	Page 6 Ref 11

Limit Switch Number	Function	Setpoint (See Note 4)	Equivalent No. of Handwheel Turns	
ZS-1				
ZS-2				
ZS-3	CLOSE LIMIT	3% C		
ZS-4	OPEN L/S	97%O		
ZS-5				
ZS-6				
ZS-7	[illegible] LIMIT	3 % Open		
ZS-8	OTS BYPASS	97% close		
ZS-9				
ZS-10				
ZS-11				
ZS-12				
ZS-13				
ZS-14				
ZS-15				
ZS-16				

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DNH 3-13-91 JMP 9/21/91

Spring Pack/Torque Switch Settings

	Data Value	Reference No.
Minimum Required Torque (ft-lbs)	577	Page 22
Maximum Allowable Torque (ft-lbs)	850	

	Original Design	Replacement 1	Replacement 2	
Spring Pack Number	60-600-0068-1	60-600-0068-1		5
Limitorque B/M Number		0701-212		
Lowest Allowed Torque Switch Setting	3.0*	2.25		
Corresponding Expected Actuator Output Torque (ft-lbs)	641	638		
Highest Allowed Torque Switch Setting	3.75**	2.75		
Corresponding Expected Actuator Output Torque (ft-lbs)	845	838		
RIE Number		91-0154		

* USED PER Computer Selection

** 3.75 is used as the maximum setting per computer selection. The original limiting setting of 3.5 / 780 ft-lbs given on Ref. 5 is no longer applicable because Limitorque based it on the reduced voltage pullout with the OAR = 103.7. Using the current OAR of 78 and the pullout calculated on page 22B, a limit of 850 ft-lbs is acceptable.

VOTES Thrust Acceptance Criteria

CR 3/18/91
DWJ 3-21-91

	Data Value		Reference No.
Minimum Thrust Required (lbs)	32740	1.15	Page 21A
Maximum Total Thrust Allowable (lbs)	45000	$\leq 850/.2225 \times 1.2$	5
Maximum Allowable Running Thrust (lbs)	2500		Page 21A

Torque Switch Setting	Acceptable Thrust Range at Torque Switch Trip (lbs) Original Design Spring Pack Installed	Replacement 1 Spring Pack Installed	Replacement 2 Spring Pack Installed	
1.0				
1.25				
1.5				
1.75				
2.0				
2.25	632	32740 - 37650		
2.50	757	32740 - 44330		
2.75	838	33030 - 45000		
3.0	641	32740 - 37890		
3.25	709	32740 - 41910		
3.50	775	32740 - 45000		
3.75	845	33300 - 45000		
.0				

CA 3/14/91
DAN 3-21-91

CALCULATION SHEET **ACTUATOR SIZING**	PP&L CALC NO. PAGE 19 OF 26 **MDS-01-03 Rev. 1 [5 OF 7]** Valve tag number HV255F003

CALCULATION:

(AS INSTALLED)

~~SELECTED~~ ACTUATOR & OVERALL ACTUATOR RATIO	SMB-1	78.00 (SEE SECTION 2.4)

Select UNIT EFFICIENCIES based on actuator & overall actuator ratio [APPENDIX D]

Unit PULLOUT Efficiency	35	SEE NOTE 1 BELOW
Unit RUN Efficiency	45	
Unit STALL Efficiency	45	

Revise UNIT RPM, STEM SPEED, and STROKE TIME based the selected OVERALL ACTUATOR RATIO:

Revised UNIT RPM		[eqn.10]
= Motor Design Speed (rpm)* (SEE NOTE 2) / Overall Actuator Ratio	$\frac{2140}{78}$ = 27.44 RPM	

Revised STEM SPEED (in/min)		[eqn. 11]
= Revised Unit RPM x Stem Lead	27.44 x 0.67 = 18.38 IN/MIN	

DESIGN STROKE TIME (min)		[eqn.12]
= Design Stroke Length (in) / Revised Stem Speed (in/min)	$\frac{9.95}{18.38}$ (See section 2.4) = 0.5412 MIN = 32.47 Seconds. ~~MIN~~ CA (See Para 6.3.2) Page 23	

* If motor curves are available, motor speed should be determined based on actual Motor Run Torques (Eqn. 15). If this option is chosen, the results of equations 10,11,& 12 cannot be determined until the results of equations 13 & 15 are known.

NOTE: 1. Units efficiencies are based on actual installed worm gear sets. 78 OAR is not used for unit effecing selection ref 6 (Page 4.87).

2. BASED ON MOTOR RUN TORQUE of 2.81 and the Motor curve DRWG # 4100 82-1643 dated 1/18/68 for VLV HV-E41-F003 (Ref 6 Page 11), The motor RPM = 214.0

CA-3/19/91 ⚠ DAH 9-16-91 DAH 7-31-91 RMD 9/4/91

CALCULATION SHEET
ACTUATOR SIZING

PP&L CALC NO. M-VLV-418 Rev 1
PAGE 19 OF 26
MDS-01-03 Rev.1 [6 OF 7]

Valve tag number
HV255F003

Select APPLICATION FACTORS [APPENDIX E]

Selected APPLICATION FACTORS	0.9 Standar
Resultant Application Factor	0.9

Calculated MOTOR START Torque = Stem Torque / (Overall Actuator Ratio x Unit Pullout Efficiency x Application Factor)	~~567.3~~ 577 / (78 x .35 x 0.9) = ~~23.1~~ 23.5 DAH FT-LBS	[eqn. 13] ⚠
Calculated MOTOR RUN Torque = Trun x FS / (Overall Actuator Ratio x Unit Run Efficiency)	~~4846.24~~ 5664.3 x 0.0203 / (78 x 0.45) = ~~2.83~~ 3.3 DH FT-LBS	[eqn. 15] ⚠

Reduced Voltage Requirements (if applicable):

Revised MOTOR START Torque (AC) = Calculated Motor Start Torque / (% Voltage Available)^2	N/A FT-LBS	[eqn. 16]
Revised MOTOR START Torque (DC) = Calculated Motor Start Torque / % Voltage Available	~~23.1~~ 23.5 / 0.8 = ~~28.87~~ 29.4 DH FT-LBS	[eqn. 17] ⚠

Δ DJH 9-16-94 GMP 9/21/94 · CA-3/15/91 DJH 3-21-94

CALCULATION SHEET **SPRING PAC SELECTION** **MOTOR SIZE SELECTION**	PP&L CALC NO. M-VLV-418 Rev 1 PAGE 20 OF 26 **MDS-01-03 Rev.1 [7 OF 7]** Valve tag number 1HV255F003

MOTOR SIZE SELECTION:

~~Select MOTOR SIZE based on criteria stated in MDS-01 section 5.2.8.2~~

INSTALLED
~~Selected~~ MOTOR SIZE: 40 FT-LB per ref 11 (V800063 with 4)

MOTOR SIZE CHECK:

Selected Motor Size		Criteria
40 FT-LBS	>	~~23.1~~ 23.5 DH Calc. MOTOR START torque
40 FT-LBS	>	~~28.87~~ 29.4 DH Revised MOTOR START torque
40 FT-LBS	>	5 x ~~2.83~~ (33) = ~~14.15~~ (16.5) DH 5 x Calc. MOTOR RUN torque

Δ

MOTOR STALL:

Stall Torque (ft-lbs) = Selected Motor Size (ft-lbs) x Overall actuator ratio x Stall Efficiency x 1.1	40 x 78 x 0.45 x 1.1 = 1544.4 FT-LBS [eqn. 19]

Stall Thrust (Tstall) lbs = Stall Torque/FS	1544.4 / 0.0203 = 76079 LBS [eqn. 18]

MOTOR STALL CHECK:

Stall Thrust (Tstall)		CRITERIA
76079 LBS	<	112500 LBS ~~MAX Valve Thrust Rating or~~ 2.5 x Actuator Thrust Rating

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PP&L REVISION 1.90226 DATED 08-14-90 - TODAY IS 09-16-1991 12:13:42

VALVE Info (Input) (TABLE # 1) - FILE: 155F003

Calculated by: Checked by:

Valve MANUFACTURER:	ANCHOR DARLING
Valve TYPE (GATE or GLOBE):	GATE
Valve SIZE:	10
Valve TAG Number:	HV255F003
Valve VENDOR DRAWING number:	93-13802
Valve PP&L Drawing number:	
Valve LOCATION:	
Valve SYSTEM:	
Valve LINE (ie. PIPE LINE I.D.):	
Valve MAXIMUM Design THRUST:	0

VALVE Data (Input) (TABLE # 2) - FILE: 155F003

ANCHOR DARLING GATE Tag: HV255F003

Valve STEM DIAMETER (Inches):	1.875
Valve STEM PITCH:	.333
Valve STEM LEAD (Inches):	.667
Valve SEAT AREA (Sq-Inches):	66.33
Valve STEM AREA (Default = 0 Sq-Inches):	2.761172
Req'd STEM SPEED (0 or 3-6=Globe or 12-14=Gate):	0
Valve STROKE LENGTH (Inches):	0
Req'd STROKE TIME (Seconds):	0 (0 Min.)
Valve INLET PRESSURE (PSIG):	1146
Valve PRESSURE DROP (PSIG):	1146
Valve Factor (.2 or .3=Gate 1.1=Globe):	.3
Valve STUFFING BOX FRICTION (Default = 0 Lbs):	2500
Valve STEM/NUT Coeff. FRICTION (0 .15 or .2):	.15
Manual ACTUATOR RATIO Selected:	92.4 : 1
Manual ACTUATOR Selected:	18
Manual SPRING PAC CURVE Selected:	27

MOTOR Data (Input) (TABLE # 3) - FILE: 155F003

ANCHOR DARLING GATE Tag: HV255F003

Motor TYPE (AC or DC):	DC
Motor RPM (900 1800 or 3600):	1800
Motor REDUCED VOLTAGE Percent (Default=0.8):	.8
HIgh TEMPerature application (Y or N):	N
COMPound motor GEAR application (Y or N):	N
AIR MoToRs (Y or N):	N
MODULTRONIC MoToRs (Y or N):	N
HILO Applications (Y or N):	N
Non-Rising Stem - OPERator thrust (Y or N):	N
Non-Rising Stem - VaLVe thrust (Y or N):	N
Manual MOTOR Selected:	16

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PP&L REVISION 1.90226 DATED 08-14-90 - TODAY IS 09-16-1991 12:13:42

Calculation RESULTS (TABLE # 4) - FILE: 155F003

Calculated by: Checked by:

ANCHOR DARLING GATE Tag: HV255F003

Valve STEM FACTOR:	0.0203
STUFFING BOX FRICTION:	2500 Lbs
THRUST:	28468.56 Lbs
STEM TORQUE:	576.943 Ft-Lbs
STEM SPEED:	~~13.71537 Inches/Min.~~
UNIT RPM:	~~20.56277 RPM~~
Design STROKE TIME:	0 Seconds
OVERALL ACTUATOR RATIO:	92.4 ACTUAL IS 78.3

* SMB-1 ACTUATOR selected having a 92.4 - 171.6 Ratio RANGE (IACT= 18)
* SMB-1 92.4 - 171.6 UNIT Efficiencies: PULLOUT= 35 RUN= 45 STALL= 45
* * USER Selected ACTUATOR
* * USER Selected ACTUATOR Ratio

used 1800 Rpm 'DC' Motor ~~OPERATING~~ at 1900 Rpm

APPLICATION FACTOR:	.9
Calc. MOTOR START TORQUE:	19.82213 Ft-Lbs
MIDSTROKE RUN THRUST:	5664.303 Lbs
Calc. MOTOR RUN TORQUE:	2.760765 Ft-Lbs (5 X RUN= 13.80382)

40 Ft-Lbs SMB-1 MOTOR with 106 Maximum Ratio Selected (IMTR= 16)
* * USER Selected MOTOR

Revised MOTOR START TORQUE:	24.77767 Ft-Lbs
STALL TORQUE:	1829.52 Ft-Lbs
STALL THRUST:	90275.46 Lbs (2.5 X Rated= 112500)

* * USER Selected Motor SIZE

* SPRING PAC Curve: SMB-1 OBSOL Selected (ISPG= 27)
* * USER Selected SPRING PAC Curve
SPRING PAC No: 60-600-0007-1
BILL of Materials No: NONE

* Calc. SPRING PAC SETTING:	2.764496		
* Set SPRING PAC to:	3	Normal TORQUE:	641 Ft-Lbs
Max. SPRING PAC SETTING:	3.75	Max. TORQUE:	845 Ft-Lbs

MOTOR SIZE Checks:	40	Ft-Lbs vs	19.82213 Ft-Lbs Calc. Start TORQUE
	40	Ft-Lbs vs	24.77767 Ft-Lbs Revised Start TORQUE
	40	Ft-Lbs vs	13.80382 Ft-Lbs 5 X RUN TORQUE

MOTOR STALL Check: 90275.46 Lbs vs 112500 Lbs 2.5 X Actuator THRUST

TORQUE SWITCH Checks:	845	Ft-lbs vs	850 Ft-Lbs Actuator RATING
	41695	Lbs vs	45000 Lbs Max. Actuator THRUST
	845	Ft-Lbs vs	1829 Ft-Lbs Stall TORQUE
	3.75	SETTING vs	5 Max. SPRING PAC Setting

* CAUTION - Check MDS-01 if this application operates at 340 DEG.F

DHH 9-16-91 GMP 9/21/91

PP&L REVISION 1.90226 DATED 08-14-90 - TODAY IS 09-16-1991 12:12:36

VALVE Info (Input) (TABLE # 1) - FILE: 155F003

Calculated by: Checked by:

Valve MANUFACTURER:	ANCHOR DARLING
Valve TYPE (GATE or GLOBE):	GATE
Valve SIZE:	10
Valve TAG Number:	HV255F003
Valve VENDOR DRAWING number:	93-13802
Valve PP&L Drawing number:	
Valve LOCATION:	
Valve SYSTEM:	
Valve LINE (ie. PIPE LINE I.D.):	
Valve MAXIMUM Design THRUST:	0

VALVE Data (Input) (TABLE # 2) - FILE: 155F003

ANCHOR DARLING GATE Tag: HV255F003

Valve STEM DIAMETER (Inches):	1.875
Valve STEM PITCH:	.333
Valve STEM LEAD (Inches):	.667
Valve SEAT AREA (Sq-Inches):	66.33
Valve STEM AREA (Default = 0 Sq-Inches):	2.761172
Req'd STEM SPEED (0 or 3-6=Globe or 12-14=Gate):	0
Valve STROKE LENGTH (Inches):	0
Req'd STROKE TIME (Seconds):	0 (0 Min.)
Valve INLET PRESSURE (PSIG):	1146
Valve PRESSURE DROP (PSIG):	1146
Valve Factor (.2 or .3=Gate 1.1=Globe):	.3
Valve STUFFING BOX FRICTION (Default = 0 Lbs):	2500
Valve STEM/NUT Coeff. FRICTION (0 .15 or .2):	.15

Manual ACTUATOR RATIO Selected: 92.4 : 1
Manual ACTUATOR Selected: 18

MOTOR Data (Input) (TABLE # 3) - FILE: 155F003

ANCHOR DARLING GATE Tag: HV255F003

Motor TYPE (AC or DC):	DC
Motor RPM (900 1800 or 3600):	1800
Motor REDUCED VOLTAGE Percent (Default=0.8):	.8
HIgh TEMPerature application (Y or N):	N
COMPound motor GEAR application (Y or N):	N
AIR MoToRs (Y or N):	N
MODULTRONIC MoToRs (Y or N):	N
HILO Applications (Y or N):	N
Non-Rising Stem - OPERator thrust (Y or N):	N
Non-Rising Stem - VaLVe thrust (Y or N):	N

Manual MOTOR Selected: 16

M-VLV-418 Rev 1
Page 22 of 26
DHH 9-11-91 GMA 9/11/91

PP&L REVISION 1.90226 DATED 08-14-90 - TODAY IS 09-16-1991 12:12:37

Calculation RESULTS (TABLE # 4) - FILE: 155F003

Calculated by: Checked by:

ANCHOR DARLING GATE Tag: HV255F003

Valve STEM FACTOR:	0.0203
STUFFING BOX FRICTION:	2500 Lbs
THRUST:	28468.56 Lbs
STEM TORQUE:	576.943 Ft-Lbs
STEM SPEED:	~~13.71537 Inches/Min.~~
UNIT RPM:	~~20.56277 RPM~~
Design STROKE TIME:	0 Seconds
OVERALL ACTUATOR RATIO:	92.4 ACTUAL IS 76.9

* SMB-1 ACTUATOR selected having a 92.4 - 171.6 Ratio RANGE (IACT= 18)
* SMB-1 92.4 - 171.6 UNIT Efficiencies: PULLOUT= 35 RUN= 45 STALL= 45
* * USER Selected ACTUATOR
* * USER Selected ACTUATOR Ratio

used 1800 Rpm 'DC' Motor OPERATING at 1900 Rpm

APPLICATION FACTOR:	.9
Calc. MOTOR START TORQUE:	19.82213 Ft-Lbs
MIDSTROKE RUN THRUST:	5664.303 Lbs
Calc. MOTOR RUN TORQUE:	2.760765 Ft-Lbs (5 X RUN= 13.80382)

* 40 Ft-Lbs SMB-1 MOTOR with 106 Maximum Ratio Selected (IMTR= 16)
* * USER Selected MOTOR

Revised MOTOR START TORQUE:	24.77767 Ft-Lbs
STALL TORQUE:	1829.52 Ft-Lbs
STALL THRUST:	90275.46 Lbs (2.5 X Rated= 112500)

* * USER Selected Motor SIZE

* SPRING PAC Curve: SMB-1 HEAVY Selected (ISPG= 12)
SPRING PAC No: 60-600-0068-1
BILL of Materials No: 0701-212

* Calc. SPRING PAC SETTING: 2.076543
* Set SPRING PAC to: 2.25 Normal TORQUE: 638 Ft-Lbs
Max. SPRING PAC SETTING: 2.75 Max. TORQUE: 838 Ft-Lbs

MOTOR SIZE Checks: 40 Ft-Lbs vs 19.82213 Ft-Lbs Calc. Start TORQUE
40 Ft-Lbs vs 24.77767 Ft-Lbs Revised Start TORQUE
40 Ft-Lbs vs 13.80382 Ft-Lbs 5 X RUN TORQUE

MOTOR STALL Check: 90275.46 Lbs vs 112500 Lbs 2.5 X Actuator THRUST

TORQUE SWITCH Checks: 838 Ft-lbs vs 850 Ft-Lbs Actuator RATING
41350 Lbs vs 45000 Lbs Max. Actuator THRUST
838 Ft-Lbs vs 1829 Ft-Lbs Stall TORQUE
2.75 SETTING vs 2.75 Max. SPRING PAC Setting

* CAUTION - Check MDS-01 if this application operates at 340 DEG.F

PP&L Form 2454 (10/83)
Cat #973401

Dept. _____
Date 9-16 1991
Designed by [illegible]
Approved by _____

PENNSYLVANIA POWER & LIGHT COMPANY
CALCULATION SHEET

PROJECT MOV Data Detail, Limit Switch Settings, and Torque Switch Settings for HV-255F003

ER No. M-VLV-418 Rev
Sht. No. 22B of 26

PULLOUT TORQUE CALCULATION: (100% Voltage)

Pullout Torque (ft-lbs) = Motor Start Torque x Overall Actuator Ratio x Pullout Efficiency x Application Factor

Pullout Torque (ft-lbs) = 40* x 78 x .35 x .9

Pullout Torque (ft-lbs) = 982.8

Equivalent Thrust (lbs) = $\frac{982.8}{.0203}$ = 48 414

TORQUE SWITCH SETTING CHECK (cont'd):

Torque (ft-lbs) at Max Torque Switch Setting	vs.	Voltage Pullout Torque (ft-lbs)
845	vs.	982

* Per E-AAA-619 Rev 3 available torque = 44 ft-lbs

PP&L Form 2454 x10'83)
Cat. #973401

Dept. _____
Date 10-1 19 91
Designed by DRR/RWA
Approved by _____

PENNSYLVANIA POWER & LIGHT COMPANY
CALCULATION SHEET
PROJECT
HV 255E003

ER No. M-VLV-418 Rev 2
Sht. No. 22C of 26
QNM 10.2.91

Check for Limiting Valve Factor in closing direction:

$$LVF = \frac{RVT\ stall - F - (A_{ss} \times P)}{A_{se} \times \Delta P}$$

[MDS-01 Rev 2 Eqn. 23]

Where: F = 2500 OAR = 78
A_{ss} = 2.76 Unit Stall Eff. = .45
A_{se} = 66.33 FS = .0203
P = 1146
ΔP = 1146 Reduced Voltage =

Actual motor start torque = 44 at reduced voltage (Ref. 16)

Reduced Voltage Stall Torque = Reduced Voltage Motor Start Torque × OAR × Unit Stall Eff. × Appl. Factor

= 44 × 78 × .45 × .9

= 1390

Reduced Voltage Stall Thrust = $\frac{RV\ Stall\ Torque}{FS} = \frac{1390}{.0203} = 68472$

Thus:

$$LVF = \frac{68472 - 2500 - (2.76 \times 1146)}{66.33 \times 1146}$$

= .83

CR 3/16/91
DHH 3-21-91

6.0 Results/Conclusions

6.1 All available MOV Data Detail Drawing input has been researched and documented herein. Where it was determined that information was unavailable from existing records, the field has been left blank. This information will be determined during the as-built walkdown.

6.2 The results of the actuator sizing calculations, VOTES diagnostic acceptance criteria calculations and limit switch setting determination are provided within the body of the calculation.

6.3 The following anomolies have been identified through the performance of this calculation:

1.) With sp.pack 60-600-0007-1 use 3.0 T/S Setting instead of 2.5 as recommended by Limitorque. Thrust Value at TS Setting of 2.5 is less than the minimus required. Therefore TS setting of 3.0 per computer is applicable/Suitable Value.

2. Stroke time of 32.47 seconds differes with the stroke time 31.865 32 Second. ~~of the difference~~ to Calculated in M-VLV-029. This difference in not a significant issue with respect to the operation of the VLV. The difference is due to the fact that M-VLV-029 based the valve stroke length on the average of four valve's full stroke handwheel turns. Herein, the strokelength is based on full stroke handwheel turns for HV-255F003 only.

CA 3/18/91
QAM 7-22-91

DESIGN INPUTS CHECKLIST

Title & No. M-VLV-

A. DESIGN INPUTS

		APPLICABLE YES	APPLICABLE NO
1.	APPLICABLE CODES Codes: ASME, ASTM, AISI. Standards: ANSI, IEEE, AWS, ANS Regulatory Requirements.	[X]	[ ]
2.	PERFORMANCE REQUIREMENTS		
	A. Input Requirements - For services such as air, water, electricity, lube oil, etc.	[X]	[ ]
	B. Output Requirements - Physical output such as: capacity, pressure, temperature, voltage, velocities of fluids, pressure drops separation and isolation both system and unit, and redundancy requirements of structures systems and components.	[X]	[ ]
	C. Operational requirements under various conditions, such as plant startup, normal plant operation, plant shutdown, plant emergency operation, special or infrequent operation and system abnormal or emergency operation. This includes the overall effect on the plant (i.e., the potential loss of generation).	[X]	[ ]
	D. Failure effects requirements of structures, systems and components, including a definition of those events and accidents which they must be designed to withstand.	[ ]	[X]
3.	COMPATIBILITY		
	A. Compatibility and suitability of material selection, such as chemical and physical characteristics, radiation and heat resistance protective coatings and corrosion resistance.	[ ]	[X]
	B. Operational interface requirements including definition of the functional interface involving structures, systems and components.	[ ]	[X]
4.	INSTALLATION (ITEMS MAY APPLY TO ANY DISCIPLINE)		
	A. Transporting and Storing - Includes environmental conditions anticipated during storage, construction and operation and handling storage and shipping requirements.	[ ]	[X]
	B. Civil - Plant layout and arrangement requirements, escape from enclosures, anchor bolts, penetrations, equipment foundations.	[ ]	[X]
	C. Piping - Thermal expansion or heat restriction requirements, vibration or dynamic loading considerations, stress, shock, reaction forces and pipe supports.	[ ]	[X]
	D. Electrical - Voltage, source, grounding conduit/raceway requirements.	[X]	[ ]
	E. Instrumentation - Instrumentation and control requirements including indicating instruments, control and alarms required for operation, testing and maintenance and calibration.	[X]	[ ]
	F. Chemistry - Water chemistry considerations, including sampling provisions.	[ ]	[X]
5.	MAINTAINABILITY		
	A. Accessibility - Maintenance, ISI and ALARA accessibility requirements.	[ ]	[X]
6.	TEST REQUIREMENTS - Including pre-OPS, ISI and LLRT tests.	[ ]	[X]
7.	SAFETY - Personnel and public safety including special blocking, radiation exposures, ALARA environmental concerns, effluents and noise.	[ ]	[X]
8.	SECURITY - Physical security plant considerations.	[ ]	[X]
9.	DESIGN CONSIDERATIONS - Form EPM-QA-208B2 and B3.	[X]	[ ]
10.	OTHER - _____	[ ]	[X]

dhc/lie0071(11)

CALC # M-VLV- 418 .

INPUTS
Page 25 of 26
File R35
CR 2/15/91
DNM 3.21.91

DESIGN INPUTS CHECKLIST

Title & No. _____

B. DESIGN CONSIDERATIONS

SUBJECT		APPLICABLE YES	APPLICABLE NO	REFERENCE PROCEDURE	NPE LEAD	ISSUED GUIDANCE
1.	Dynamic Qualification	[ ]	[X]	EPM-QA-222	CIV Vernarr	
2.	Environmental Qualification	[X]	[ ]	EPM-QA-222	CIV Derkacs	GDG-03
	2.1 Relay Qualified Life	[ ]	[X]		ELC Nudge	SEA-EE-170 SEA-EE-171
3.	Electrical Separation	[ ]	[X]		ELC Akus	E-1012
4.	II over I, Safety Impact	[ ]	[X]	EPM-QA-211	CIV Rose	
5.	Fire Protection	[ ]	[X]	NDI-QA-15.3.1 EPM-QA-440	EP Kohn	Fire Protection Manual
6.	Appendix R -				ELC Backenstoe	EDS-01
	6.1 Safe Shutdown Analysis	[ ]	[X]			
	6.2 Combustible Loading Anal.	[ ]	[X]		CIV Delgado	CDS-03 & Dwg. C-1929
7.	Flooding Protection	[ ]	[X]		MCH	
8.	Jet Impingement	[ ]	[X]		MCH	
9.	Missile Protection	[ ]	[X]		CIV Reinsmith	
10.	Radiation Exposure, ALARA	[ ]	[X]	NDI-6.4.2	CIV Matchick	Memo AM-151 DG-G-100
11.	Physical Separation	[ ]	[X]		CIV Rose	Dwg. C-1804
12.	HVAC Requirements	[ ]	[X]		MCH Agnew	
13.	Electrical Load/Voltage Study	[X]	[ ]		ELC Sleva/Nudge	EDG-02 EDS-02
14.	Human Factors Engineering	[ ]	[X]	NDI-15.3.12	EP Patnaude	Human Factors Specifications & Guidelines Manual
15.	Inservice Inspection Requirements	[ ]	[X]	NDI-QA-15.3.7	EP Lindberg	ISI Manuals
16.	Materials Compatibility	[ ]	[X]		EP Willertz	
17.	ASME Code Compliance (See Note 1)	[ ]	[X]		MCH Sattar	
18.	Design Assessment	[ ]	[X]		SE Detamore	PLI-59437 dated 3/31/89
19.	Fuel/Core Effects	[ ]	[X]	NDI-QA-7.2.2	NFE Kulick	

DESIGN INPUTS CHECKLIST CA/3-16-91 DHH 3-21-91

Title & No. _____

B. DESIGN CONSIDERATIONS

SUBJECT	APPLICABLE YES	APPLICABLE NO	REFERENCE PROCEDURE	NPE LEAD	ISSUED GUIDANCE
20. Heavy Loads	[ ]	[X]	M-1435	MCH Kostelnick	
21. Radwaste Minimization	[ ]	[X]		MCH	NDPL85-003
22. Approved Materials	[ ]	[X]	NDI-QA-15.3.9	EP Morgan	Susq. Approved Matl's PLI-37573 of 1/10/85 PLI-45673 of 5/22/86
23. Secondary Containment, Control Structure, Ventilation Zone Boundary Penetrations	[ ]	[X]		MCH Agnew	
24. Electrical Load Tracking	[ ]	[X]		ELC Sleva/Nudge	EDS-02
25. Computer Program Change including Display Formats	[ ]	[X]	EPM-QA-401	CPU	
26. Environmental Protection	[ ]	[X]	NDI-QA-6.3.2	(Nuc. Svcs.- J. S. Fields)	
27. Station Blackout	[ ]	[X]		ELC Sleva	GDS-08

NOTE 1: For modifications to ASME III systems/components (both paperwork only and physical changes) request in the installation instructions that Plant Staff prepare the required documentation package per NDI-QA-5.3.4 and AD-QA-522.

dc/a186i(11)

PP&L DESIGN INPUTS (con't)

2. TITLE M-VLV-418

4. ITEM	5. DISCUSSION
1.	Applicable Codes: Calculation shall address requirements of NRC Generic Letter 89-10
2. A,B,C	Performance Requirements: Electricity input requirements are given by Limitorque Data Sheets, SEA-ME-237 and the MDS-01 Torque and Thrust calculation. Output requirements for the actuator are given by the MDS-01 calculation. Operational requirements when the actuator is required to function, including ΔP, are given in SEA-ME-237.
4 D	Installation - Electrical: Electrical voltage, current and source requirements are given in the calculation data tables. (Table: Electrical/Motor Design Information).
4 E	Instrumentation: Geared Limit Switch Settings and Spring Pac/Torque Switch Settings are given in tables in the calculation.

(2)

CALC # M-MLV-418
Attach. # Ref #2

ANCHOR/DARLING VALVE

MOTOR OPERATOR DATA SHEET

Customer: Bechtel SF P.O. No. 8856-P-10-A

Prepared by: RHM Approved by: OVK 3-5-95 Sht 3 of ___

Form Line Number		
	S.O. No.	E5853
	Vlv. Size, Press. & Type	10" 600 Gate
	No. Req'd & (Item No.)	21, 22, 62, 63

1	Seat Mean Dia. In. & Area In.^{2}	= A = .7854 x d^2 = .7854(9.19)^2	66.33
2	System Design Press. PSI	= Line Pressure = p	1230
3	Design Diff. Press. PSI	= Δ P	1000
4	Disc Thrust LBS	= Td = A x P (Line 1 x Line 3)	66330
5	Stem Thrust Tent. LBS	= $T_t = T_d$ x f (Line 4 x Coeff Friction)*	19899
6	Stem End Thrust	= T_e = .7854 x D_s^2 x P1 (stem area x Line 2)	3396
7	Stuff Box Load LBS	= T_s	2500
8	Total Stem Thrust LBS	= F = $T_t + T_e + T_s$ (Stem of Lines 5,6 & 7)	25,795

$D_S = 1\frac{7}{8}$ Dia ✓

*Coefficient of Friction: Double Disc .2

Flex Wedge .3 ✓

Globe Valve 1.1

5

CALC # M-VLV-418
Att Ref #3

(3)

FOR M-VLV-029

VALVE NO.	10"-EBA-6T-MO-F003	6"-EBA-6T-MO-F001-F	6"-EBA-6T-MO-F004
SERVICE	MAIN STEAM	REACTOR RECIRCULATION	REACTOR RECIRCULATION
TYPE	GATE	GATE	GATE
LINE OR EQUIPMENT REF.	DBA-102	DBA-101	DBA-101
Motor Type	D.C.	A.C.	D.C.
SIZE	10"	6"	6"
COMMODITY	STEAM	DEMINERALIZED WATER	DEMINERALIZED WATER
DESIGN/MAX. PRESS. (PSIG)	1230 / 1350	1250 / 1375	1250 / 1375
DESIGN/MAX. TEMP. (°F)	565 / 565	565 / 565	565 / 565
FLOW Normal/Max.	184.5x10³ #/hr / SAME	352 GPM / 358 GPM	352 GPM / 358 GPM
VALVE RATING	600 # ASME	600# ASME	600# ASME
TYPE ENDS/RATING	B.W. / SCH. 80	B.W. / SCH. 80	B.W. / SCH. 80
BODY MATERIAL	SEE APPENDIX 3	SEE APPENDIX 3	SEE APPENDIX 3
TRIM MATERIAL	See A/DV Dwg →		
SEAT FACINGS	STELLITE	STELLITE	STELLITE
PACKING	CRANE 187-I	CRANE 187-I	CRANE 187-I
TYPE BONNET	PRESSURE SEAL	PRESSURE SEAL	PRESSURE SEAL
TYPE OF SEATS	SEE APPENDIX 3	SEE APPENDIX 3	SEE APPENDIX 3
TYPE OF DISC	FLEXIBLE (NOT SPLIT)	FLEXIBLE (NOT SPLIT)	FLEXIBLE (NOT SPLIT)
BYPASS SIZE & TYPE	—	—	—
HANDWHEEL PULL-BREAKAWAY LBS	80	70	70
Act. Op. DIFF. PRESS. (Max.)	△ 1172 PSID	1000 PSID	1000 PSID
PORT DIAMETER (seat)	8.88	5.38	5.38
PRESS. DROP (PSI)	0.047 / 0.040	0.016 / 0.017	0.016 / 0.017
VELOCITY (FPS) (seat)	43 / 38	6.9 / 7.0	6.9 / 7.0
VALVE WEIGHT LBS incl. OPER.	1530	570	565
MOTOR OPER (TYPE/SIZE/SPD)	SMB 1-40/1900	SMB 00-10 / 3600	SMB 00-15 / 1900
OPER. SPEED FT/MIN/HP	1.1 / 2.9	1 / 1.3 △	1 / 1.1
TIME TO OPEN	△ 50 SECS.	~28 sec	~28 sec
TIME TO CLOSE	△ 50 SECS	~28 sec	~28 sec
FULL LOAD CURRENT (440V, 3Ø, 60C)	11.1	2.3	4
STALLED MOTOR CURRENT	85.4	11.9	25
MOTOR OPERATOR WEIGHT	430	210	215
COST - EACH VALVE			
BYPASS			
FURN & INSTALL LIMIT SWS.			
TESTS - MAGNAFLUX			
TESTS - X-RAY			
NO. REQUIRED Unit 1 / Unit 2	1 / 1	1 / 1	1 / 1
TOTAL COST			
MANUFACTURER	Anchor / Darling →		
MODEL OR FIG. NO.			
VENDOR	Anchor / Darling →		
P/O (& ITEM) NO. 8856-P-10	4.3 + 4.4	4.5 + 4.6	4.7 + 4.8
FOREIGN PRINT NO.	93-13802	93-13748	93-13668
WELD END DWG. REFERENCE 8856-M-199	SHTS. 366 + 400	SHTS 366 + 400	SHTS 366 + 400
P & I DIAGRAM REF. 8856-M-	155	144	144
LOCATION DWG. REF.			
Seismic Class 1 (Yes/No)	YES	YES	YES
Active Valve (Yes/No)	YES	YES	YES

REV.	DESCRIPTION
4	REVISED DIFF'L PRESS & OPER. TIMES PER ITEM 93.9.4
3	ADDED ACTIVE VALVE DESIGNATION
2	[illegible]

BECHTEL CORPORATION
POWER DIVISION ENGINEERING

VALVE DATA SHEET MOTOR OPERATED △ 9-2-82 RH A/DV

SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 AND 2
PENNSYLVANIA POWER & LIGHT COMPANY

JOB NO. 8856

ATTACHMENT NO. 2
8856-P-10

REV. 4

SHEET 9 OF 15

Attachm

CALC # M-VLV-418 Rev # 5

(4)

MOTOR OPERATOR INFORMATION SHEET

LIMITORQUE ORDER NO.: 381264 ITEM: H

OPERATOR SERIAL NOS.: 205545 & 546

OPERATOR TYPE: SMB OPERATOR SIZE: 1

DESIGN UNIT RPM (AS DEFINED IN LIMITORQUE SEL-3): (A) 33.5

SPRING PACK NUMBER: 60-600-0007-1

NORMAL TORQUE SWITCH SETTING: 2 1/2

CORRESPONDING INPUT TORQUE (LB-FT): 42 FT. LBS.
(SEE NOTE 1)

CORRESPONDING OPERATOR OUTPUT TORQUE (LB-FT): 516 FT. LBS.

CORRESPONDING OPERATOR OUTPUT THRUST (LBS): 25,240 LBS.

MAXIMUM TORQUE SWITCH SETTING: 3 1/2

CORRESPONDING INPUT TORQUE (LB-FT): 64 FT. LBS.
(SEE NOTE 1)

CORRESPONDING OPERATOR OUTPUT TORQUE (LB-FT): 780 FT. LBS

CORRESPONDING OPERATOR OUTPUT THRUST (LBS): 38,128 LBS.

GEAR RATIO INFORMATION

MOTOR PINION NUMBER OF TEETH: (A) 33 WORM SHAFT GEAR NO. OF TEETH: (A) 39

WORM TO WORM GEAR RATIO: (A) 66:1

OVERALL ACTUATOR RATIO: (A) 77.9:1

NOTE 1: INPUT TORQUE IS TORQUE FROM WORMSHAFT ON SMB-00 & 000 AND FROM HANDWHEEL ON SMB-0 AND LARGER.

LIMITORQUE SIGNATURE: Bradley Stone

(A) 9/14/88 REVISED KWA 9/28/88

Attachment 3

Cals # M-VLV-418
Ref 5

(5)

LIMITORQUE MOTOR NAMEPLATE

DATA SHEET

ORDER NUMBER: 381264 H SERIAL NUMBER: 205545 & 546

MOTOR NAME PLATE DATA

IDENTIFICATION NUMBER: (A) 1KA576887

START TORQUE (LB-FT): (A) 40 HORSEPOWER: (A) 2.9

RUN TORQUE (LB-FT): (A) 8 S.F.: 1.0

TYPE: — FRAME: (A) L 186A PHASE: D.C.

MOTOR SPEED (RPM): 1900 HZ: C.P.D.

VOLTS: (A) 250 DC CODE — AMPS: (A) F.L.A. 11.1 / L.A.A. 85.4

AMB. C: 40° INSULATION CLASS: B DUTY: 5 MIN.

LIMITORQUE SIGNATURE: Bradley Stone

(A) 9/14/88 REVISED

Stroke Length = Stem Lead × Handwheel Turns × $\frac{1}{HWR}$

STANDARD HANDWHEEL RATIOS FOR SMB & HMB UNITS

UNIT SIZE	HANDWHEEL RATIO	UNIT RATIO	EFF.%
SMB-000	1:1	All	100
SMB-00	1:1	All	100
	*4.38:1	All	95
SMB-0	8.93:1	11.2-26.1	60
SB-0	21.1:1	26.4-96.2	30
	33:1	102.6-150.8	25
	54.1:1	158.3-247	25
SMB-1	10.75:1	11.6-25.6	60
SB-1	25.3:1	27.2-88.4	30
	49.0:1	92.4-171.6	25
	66.7:1	191.7-234	25
SMB-2	9:1	10.6-25.5	60
SB-2	22.3:1	26.2-82.5	30
	40.5:1	84.8-150	25
	57.4:1	153-212.5	25
SMB-3	7.15:1	11.1-24.1	60
SB-3	11.07:1	25.7-37.3	60
	28.37:1	43.9-95.5	30
	39.4:1	98.6-132.8	25
	55.36:1	138.4-186.4	25
SMB-4	8.7:1	13.4-32.3	60
SMB-4T	13.06:1	33.6-48.4	60
SB-4	33.69:1	51.8-124.9	30
	39.87:1	131.8-147.9	25
	59.13:1	152.1-219.3	25
SMB-5	86:1)	61.4-93.4	25
SMB-5T	163.5:1)		
	142.0:1)	101.4-230.2	25
	269.8:1)		

UNIT SIZE	HANDWHEEL RATIO	UNIT RATIO	EFF.%
HMB-00	19:1	9.7-22.0	60
	45:1	23.0-109.0	30
HMB-0	15.7:1	11.2-26.1	60
	37:1	26.4-96.2	30
	58:1	102.6-150.8	25
	95:1	158.3-247	25
HMB-1	14.5:1	11.6-25.6	60
	34:1	27.2-88.4	30
	66:1	92.4-171.6	25
	90:1	191.7-234	25
HMB-2	13.3:1	10.6-27.2	60
	33:1	26.2-82.5	30
	60:1	84.8-150.0	25
	85:1	153-212.5	25
HMB-3	10.3:1	11.1-24.1	60
	16:1	25.7-37.3	60
	41:1	35.9-95.5	30
	57:1	98.6-132.8	25
	80:1	138.4-186-4	25
HMB-4	12.7:1	10.1-32.3	60
HMB-4T	50:1	40.0-124.9	30
	58:1	131.8-147.9	25

*This ratio supplied when torque required exceeds 65 ft/lbs.

△ For SMB-5 and SMB-5T unit, this ratio provided as standard. Alternate ratio shown provided only on request.

Calc # M-VLV-418 Up 10 (6)

(7)

CALC # M-VLV-418
Page ___ of ___ Rev 11

~~VALVE ID~~ V80063
Valve ~~WA NO~~ ID HV255-F003
SYSTEM 52

This is incorrect The order # Should be 381264 H per serial number 205546.

5.12 Actuator Trouble Shooting

JAB 11/7/90

SECTION I (NAMEPLATE/REFERENCE)

Q (Y/N)	YES	Actuator Order No.	381264-1
P&ID	M-255	Actuator Serial No.	205546
Schematic	E152 SH.31	Actuator Size	SMB-1
Loc. Area			
LLRT (Y/N)	YES	Motor Start torque	40 FT lbs
		Motor Run torque	8 FT lbs
Number of handwheel turns to (1) stroke	750	Motor Mfgr	Reliance
Max Thrust		Motor Hp	SPCL
Pitch		Motor Voltage	250
Lead		Motor Run Current	11.10
		Motor Start Current	N-A
		Motor RPM	1900

SECTION II (TORQUE SWITCH DATA)

	LIMITORQUE	AS FOUND	AS LEFT	CONFIRM
"OPEN" SETTING		2 1/2 3	2 1/2	
"CLOSE" SETTING		2 1/2 3	2 1/2	
		KS 3/21/88		
Normal Setting	2 1/2			
Maximum Setting	3 3/4			
As Found Setting Corresponding ft-lbs				
Normal Setting Corresponding ft-lbs				
Max Setting Corresponding ft-lbs				
Torque Switch Calibration Chart	11 # Washers .157 Thickness 110 380 650 920 1050 (AS LEFT) 1 2 3 4 5	60-600-0007-1		

SECTION III (SPRING PAC)

	LIMITORQUE	AS FOUND	AS LEFT	CONFIRM
Part No.	60-608-007-1			
No. of Washers	11	11	11	DJ
Thickness of Washers	.157	.157	.157	
Spring PAC Gap		.657	.657	
Spring PAC Preload		~~1/4~~ TURN PER MANUFS		

WA NO 180063
VALVE ID HV2552F003

SECTION IV (RATIOS/EFFICIENCIES)	LIMITORQUE	AS FOUND	AS LEFT	CONFIRM
Actuator Overall Ratio	103.7	77.88	77.88	DTS
Pinion Gear to Wormshaft Gear Ratio		118:1	118:1	DTS
Worm to Worm Gear Ratio	66:1	66:1	66:1	DTS
Worm to Worm Gear Efficiency				
Handwheel to Stem Ratio	49:1	49:1	49:1	DTS
Handwheel to Stem Efficiency				
# Motor Pinion Gear Teeth	~~33~~ 28 DTS 3/24/88	33	33	DTS
# Wormshaft Gear Teeth	~~39~~ 44 DTS 3/24/88	39	39	DTS

5.12.12 Actuator operates satisfactorily. DTS

Comments:

5.12.13 This completed data sheet has been forwarded to Maintenance Engineer. DTS

David Lincoln / 3/21/88
Confirm / Date

S. Montgomery / 4/6/88
Review / Date

Calc # M-VLV-418
Page ~~of~~ left"

WA# V60388
SYS 252
DATE 9-24-86

Design Inputs for M-VLV-029 showing order #, motor type.

MOVATS TEST DATA SHEET

SECTION I

Record Operator Information

Type:	SMB
Size:	1
Serial No.:	205546
Order No:	381264H
Stem Orientation:	Horiz
Spring Pack No.:	1675-11

Record Valve Information

I.D. #:	HV-E41-F003
Type:	GaTe
Size:	10"
Valve Body Orientation:	Horiz
# of Handwheel turns:	N/A
# of turns to open limit:	N/A
Orifice size:	N/A
Stem diameter:	about 2"

Record Motor Information

Volts:	(Rated) / Actual 250 VDC
Rated Amps:	11.10
Speed:	1900 RPM
Horsepower:	SPCL
AC or DC:	AC / (DC)
Orientation:	Top (Side) Bot

Control Circuit Volts:	250
AC or DC Control Circuit:	AC/(DC)
Open Control:	(LIM) / TOR
Close Control:	LIM / (TOR)
Breaker #:	2D264-031

Record System Information

System:	HPCI 252
Flow:	0
Temp:	Amb
Press:	Atms

Record Torque Switch Information

Open Torque Switch Setting:	3.0
Close Torque Switch Setting:	3.0
Limiter Plate Size:	3¾
TS Balancing Capability:	Yes

Record Test Equipment Numbers and Calibration Due Dates

Mainframe:	7/30/87
Load Cell:	7/31/87
TMD:	7/31/87
Amp Probe:	7/31/87
Cable Length:	30 feet

Initial Position of Valve:	0 / (C)
Final Position of Valve:	0 / (O)
Safety Related:	(Yes) No

85D02141
29337
6961-004
00776

TORQUE SWITCH BALANCING

SECTION II:

As Found DSP at TST O	1.445	TSS	torque switch	Final DSP at TST O	.965
As Found DSP at TST C	.620	1¼/1¼	spring pack	Final DSP at TST C	1.055

SPRING PACK CALIBRATION

SECTION III:

Spring Pack Constant: 12046 #/V Preload: 2 RL

Cal # M-VLV-418
Rf 13

Anchor/Darling

Valve Company

701 FIRST STREET
P.O. BOX 3428
WILLIAMSPORT, PA 17701-0428
(717) 327-4800
TELEX: 759953

February 20, 1990

PENNSYLVANIA POWER & LIGHT COMPANY
Two North Ninth Street
Allentown, PA 18101

Attn: Mr. Ken Anderson, Engineering

SUBJECT: VALVE DATA

Dear Ken,

The valve data you requested at our recent meeting is enclosed.

Please advise if you need further information.

Yours sincerely,

ANCHOR/DARLING VALVE COMPANY

R. W. Dommers
Director - Marketing & Sales

/cll

cc: J. J. Chappell
R. J. Stout

encl.

Cal # M-VLV-418 (12)

STEM DATA FOR P.P.&L. (SUSQUEHANNA)

1 CERT. DWG NO.	2 A/DW S.O ITEM NO	3 VALVE SIZE/TYPE	4 STEM DIA AT S. BOX	5 STEM DIA AT THDS	6 PITCH & LEAD	7
21700	1564-2	2-1500-DD	.750	.750	1/3 - 1/3	
21699	1564-1	2-1500-DD	.750	.750	1/3 - 1/3	
13661	5853-1	4-900-FW	1.250	1.250	1/3 - 2/3	149F007
13662	5853-2	4-900-FW	1.250	1.250	1/3 - 2/3	147F008
13689	5854-14	20-150-FW	1.875	1.875	1/3 - 1/3	
13692	5854-21	6-150-FW	1.125	1.125	1/3 - 1/3	
13699	5854-9	3-300-FW	.875	.875	1/3 - 1/3	
13709	5853-8	14-900-FW	2.375	2.375	1/3 - 1	151F006
13711	5853-11	10-900-FW	2.000	2.000	1/3 - 1	
13712	5853-15	6-900-FW	1.625	1.625	1/3 - 2/3	
13713	5853-85	4-900-GB	1.500	1.500	1/4 - 1/4	149F022
13715	5854-18	10-150-FW	1.500	1.500	1/3 - 1/3	
13739	5855-2	20-900-FW	3.125	3.125	1/3 - 1	151F002
13740	5855-3	20-900-FW	3.125	3.125	1/3 - 2/3	151F
13747	5855-10	6-900-GB	2.125	2.125	1/3 - 2/3	
13795	5853-28	10-900-GB	3.125	3.125	1/4 - 1/4	
13797	5853-5	3-900-FW	1.125	1.125	1/3 - 2/3	
13798	5853-6	3-900-FW	1.125	1.125	1/3 - 2/3	
13801	5853-21	10-600-FW	1.875	1.875	1/3 - 2/3	
13802	5853-22	10-600-FW	1.875	1.875	1/3 - 2/3	
13808	5854-27	18-300-GB	3.250	3.250	1/4 - 1/4	
13812	5854-30	6-300-GB	1.500	1.500	1/4 - 1/4	
13814	5853-93	4-600-FW	1.250	1.250	1/3 - 2/3	
13831	5854-28	12-300-GB	2.500	2.500	1/4 - 1/2	
13858	5854-16	16-150-FW	1.750	1.750	1/3 - 1/3	
13956	5796-3	6-900-FW	1.625	1.625	1/3 - 1/3	
13981	5854-89	3-150-FW	.750	.750	1/3 - 2/3	
14071	5853-109	4-900-FW	1.250	1.250	1/3 - 1/3	
15251	5853-87	4-900-GB	1.500	1.500	1/4 - 1/4	
13687	5854-12	24-150-FW	2.000	2.000	1/3 - 1/3	
13710	5853-10	12-900-FW	2.250	2.250	1/3 - 1	
13741	5855-4	12-900-FW	2.250	2.250	1/3 - 1	151F
15175	9052-1	4-150-FW	1.000	1.000	1/4 - 1/2	
13738	5855-1	24-900-FW	3.750	3.250	1/3 - 1	151F
13691	5854-19	6-150-FW	1.125	1.125	1/3 - 1/3	
* 13688		20-150-FW	1.875	1.875	1/3 - 1/3	151F006
* 13748			1.5	1.5	1/3 - 1/3	
X 13668			1.5	1.5	1/3 - 1/3	

Ref. 15

PENNSYLVANIA POWER & LIGHT
Susquehana Steam Electric Station
MOV - Design Basis Review

VALVE TAG NUMBER:HV-255F003 UNIT 2 PRIORITY: 2

VALVE DWG NO.FF110100-6101 MFG. ANCHOR/DARLING

DESIGN DATA		REF NO	MATERIAL/DIMENSIONAL DATA		REF NO
Valve Type	GT	3	Stroke Length (in)	10.625	22
Valve Size	10.00	3	Stroke Time (sec)	50	4
Pressure Class	600	3	Orifice Diameter (in)	9.187	22
Valve Code	SR	6	Stem Diameter (in)	1.875	2
Area/Room	33/II202	5,16	Stem Pitch (in)	0.33	2
Elevation	708.5'	5	Stem Lead (in)	0.66	2
Line No.	DBA-202	1	Stem Material	A276-410T	3
Normal Valve Pos	O	1	Stem Mod of Elasticity	29.200	21
Actuator Size	SMB-1-40	3	Stem Mod of Rigidity	11.300	21
Valve Orientation	H	5	Valve Thrust Capability		
Stem Orientation	R	5	Dsk Guide Fac Mat	SA216-WCB	3
Power Supply	2D264031	6	Dsk Seat Surf Mat	STELLITE	3
Rework Window	OC-1, 2 & 3 - 14 DAYS (3.5.1)				

DEFINITION OF SAFETY RELATED FUNCTION

HV-255F003, A NORMALLY OPEN VALVE, IS THE HPCI STEAM SUPPLY LINE INBOARD CONTAINMENT ISOLATION VALVE. THIS VALVES SAFETY FUNCTION IS TO CLOSE TO ISOLATE HPCI ON A STEAM LINE BREAK, TO PREVENT TURBINE EXHAUST OVERPRESSURE, AND ON LOW STEAM LINE PRESSURE AND PROVIDES CONTAINMENT ISOLATION. RECOVERY FROM MISPOSITIONING IS NOT REQUIRED SINCE THE VALVE IS NOT CLASSIFIED AS POSITION CHANGEABLE.

VALVE OPERATIONAL DATA

	Lrge Brk LOCA	Smal Brk LOCA	Station Blackout	HELB	LOOP	Fire	Inadvert Oper
Max Diff Press	1030	1030	NA	1146	NA	NA	NA
Dir Diff Press	D	D	NA	D	NA	NA	NA
Flow Rate	216K	216K	NA	648K	NA	NA	NA
Line Press(psig	1040	1040	NA	1146	NA	NA	NA
Fluid	S	S	NA	S	NA	NA	NA
Process Temp(F)	551	551	NA	563	NA	NA	NA
Duty Cycle	1	1	NA	1	NA	NA	NA
Time Line (sec)	5	5	NA	3	NA	NA	NA
Envr Profile(F)	139	139	NA	130	NA	NA	NA
Initiate Signal	P4	P4	NA	DP1	NA	NA	NA
Valve Cycle	C	C	NA	C	NA	NA	NA
Normal Cond		O,C					

M-VLV-418
Ref. 16

ATTACHMENT B

VALVE TAG NUMBER: HV-255F003 GE ID NO: HV-E41-2F003

INPUT DATA

Motor Control Center	2D264031
Motor Rated Voltage (Vdc)	240
Motor Locked Rotor Amps (amps)	85.40
Motor Accident Temperature (°C)	59.4
Conductor Scheme	FP2Q4012A
Conductor Type	D21
Conductor Size	2
Conductor Resistance/1000 ft at 50 °C (ohms)	0.185
Number of Conductors per Leg/Phase	1
Circuit Length (one-way distance from starter to mtr) (ft)	233
Starting Resistor (ohms)	0.52
Overload Heater Catalog Number	L135B
Overload Heater Resistance/Heater (ohms)	0.011
Motor Control Center Minimum Voltage (Vdc)	210.0

CALCULATED DATA INPUT

Motor Resistance at 59.4 °C (ohms)	3.135
Motor Reactance (PU)	0.000
Cable Resistance at 59.4 °C/50 °C (ohms)	0.175
Overload Heater Resistance (ohms)	0.022
Total Circuit Resistance (ohms)	3.852
Total Circuit Reactance (PU)	0.000

AVAILABLE VOLTS/AMPS

Motor Inrush Current Draw (amps)	54.5
Motor Terminal Voltage (Vdc)	170.9
TORQUE (FT-LBS)	44.0

SOURCE DOCUMENTS

Electrical Schematic:	E-152	SHT 31	REV 11
Set Point Drawing:	E-618	SHT 5	REV 0
Set Point Calculation:	E-AFS-004		04/18/83
Valve Design Basis:	SEA-ME-238		REV 0
Cable Codes and Descriptions:	E-1001 REV 2		
Conductor Resistance:	Attachment F		
Overload Heater Resistance:	Attachments C,D or E		

'CARTS'

REMARK: Motor is assumed to be same as Unit 1 (WA V10195)
LRA & torque obtained from motor performance curve (Attachment H).