

**PRESSURE LOCKING EVALUATION FOR REQUIRED PULLOUT FORCE**

= INPUTS

MOV

2-FCV-68-332

Valve type =

Flex Wedge

**VALVE DESIGN DATA**

VALVE DWG

88405-2

MARK No.

8000A

$\mu = 0.4$   
 $a = 1.2810$  inches  
 $b = 0.406$  inches

theta = 5 deg  
 $r_o = 0.406$  inches  
 $v = 0.3$

**PRESSURE and TEMPERATURE DATA**

Pbon =  
 Phigh =  
 Plow =  
 DP =  
 Normal Temp =  
 Max Temp =  
 Delta Temp =  
 Pbonnet = Pbon + (Delta Temp\*33psi/F)

2250 psi  
 0 psi  
 0 psi  
 0 psi  
 0 F  
 0 F  
 0 F  
 2250 psi

EPRI MOV PPP INTERNAL DESIGN INFO, Ref. \_\_\_\_\_

D1 E1 M1  
 2.937 2.187 0.812

 $a = ((D1 + E1) / 2) / 2 = 1.281$  $b = M1 / 2 = 0.406 = r_o$  $v = \text{Poisson's Ratio} = 0.3$ 

$\mu =$  friction coefficient  
 based on Calc method. & EPRI results

theta = 1/2 total valve  
 disk angle

**ROARK FORMULAS**

$C2 = (1/4)\{1 - (b/a)^2[1 + 2\ln(a/b)]\}$   
 $C3 = (b/4a)\{[(b/a)^2 + 1]\ln(a/b) + (b/a)^2 - 1\}$   
 $C8 = (1/2)[1 + v + (1 - v)(b/a)^2]$   
 $C9 = (b/a)\{[(1 + v)/2]\ln(a/b) + [(1 - v)/4][1 - (b/a)^2]\}$   
 $L11 = (1/64)\{1 + 4(ro/a)^2 - 5(ro/a)^4 - 4(ro/a)^2[2 + (ro/a)^2]\ln(a/ro)\}$   
 $L17 = (1/4)\{1 - [(1 - v)/4][1 - (ro/a)^4] - (ro/a)^2[1 + (1 + v)\ln(a/ro)]\}$

0.167176  
 0.028914  
 0.685158  
 0.286608  
 0.005962  
 0.144066

Load Constant = (C2L17 - C8L11)/(C2C9 - C3C8)

0.711633

**SEAT REACTION LOAD (BONNET psi)**

Reaction at Hub Perimeter = QH(Bonnet) = Pbonnet(a)(Load Constant)

2051.1 lb/in

Reaction at Seat: QS(Bonnet) = QH(Bonnet)(b/a) - (Pbonnet/2a)(a<sup>2</sup> - b<sup>2</sup>)

-646.3 lb/in

**SEAT REACTION LOAD (Disk Area DP)**

Reaction at Hub perimeter = QH(DiskDP) = (DP)(a)(Load Constant)

0 lb/in

Reaction at Seat = QS(DiskDP) = QH(DiskDP)(b/a) - ((DP)/2a)(a<sup>2</sup> - b<sup>2</sup>)

0 lb/in

**SEAT REACTION LOAD (Hub Area DP)**Force on Hub due to DP = Whub = QH(DPdisk) + (DP)PI(b<sup>2</sup>)/2PI(b)

0 lb/in

Reaction at Seat = QS(HubDP) = (-Whub)(b/a)

0 lb/in

Sum of Seat Reaction Loads = 2\*QS(Bonnet) - QS(DiskDP) + QS(HubDP)

-1292.57 lb/in

VF = mu/(cosA + musinA)

0.387951

Thrust Load = VF\*(Sum Seat Reaction)\*(Seat Circumference)

-4035.97 lbs

Unwedging Load (Static test)

-5228 lbs

TOTAL THRUST = Thrust Load + Unwedging Load =

-9264 lbs

NOTE: THE NEGATIVE SIGN INDICATES THAT THE STEM IS IN TENSION

9608130258 960806  
 PDR ADOCK 05000327  
 P PDR

Rev.

Prepared: R. J. [Signature]

Checked: [Signature]

**PRESSURE LOCKING EVALUATION FOR REQUIRED PULLOUT FORCE**

= INPUTS

MOV 2-FCV-68-332  
 VALVE DWG 88405-2  
 MARK No. 8000A

Valve type = Flex Wedge

**VALVE DESIGN DATA**

$\mu = 0.4$   
 $a = 1.2810$  inches  
 $b = 0.406$  inches

theta = 5 deg  
 $ro = 0.406$  inches  
 $v = 0.3$

EPRI MOV PPP INTERNAL DESIGN INFO, Ref. _____			
D1	E1	M1	
2.837	2.187	0.812	
$a = ((D1 + E1) / 2) / 2 = 1.281$			
$b = M1 / 2 = 0.406 = ro$			
$v = \text{Poisson's Ratio} = 0.3$			
$\mu = \text{friction coefficient based on Calc method. \& EPRI results}$			
theta = 1/2 total valve disk angle			

**PRESSURE and TEMPERATURE DATA**

Pbon =  
 Phigh =  
 Plow =  
 DP =  
 Normal Temp =  
 Max Temp =  
 Delta Temp =  
 Pbonnet = Pbon + (Delta Temp \* 33psi/F)

2235	psi
300	psi
0	psi
300	psid
0	F
0	F
0	F
2235	psi

**ROARK FORMULAS**

$C2 = (1/4) \{ 1 - (b/a)^2 [ 1 + 2 \ln(a/b) ] \}$   
 $C3 = (b/4a) \{ [(b/a)^2 + 1] \ln(a/b) + (b/a)^2 - 1 \}$   
 $C8 = (1/2) [ 1 + v + (1-v)(b/a)^2 ]$   
 $C9 = (b/a) \{ [(1+v)/2] \ln(a/b) + [(1-v)/4] [ 1 - (b/a)^2 ] \}$   
 $L11 = (1/64) \{ 1 + 4(ro/a)^2 - 5(ro/a)^4 - 4(ro/a)^2 [ 2 + (ro/a)^2 ] \ln(a/ro) \}$   
 $L17 = (1/4) \{ 1 - [(1-v)/4] [ 1 - (ro/a)^4 ] - (ro/a)^2 [ 1 + (1+v) \ln(a/ro) ] \}$

0.167176
0.028914
0.685158
0.286608
0.005962
0.144066

Load Constant = (C2L17 - C8L11) / (C2C9 - C3C8)

0.711633

**SEAT REACTION LOAD (BONNET psi)**

Reaction at Hub Perimeter = QH(Bonnet) = Pbonnet(a)(Load Constant)

Reaction at Seat: QS(Bonnet) = QH(Bonnet)(b/a) - (Pbonnet/2a)(a<sup>2</sup> - b<sup>2</sup>)

2037.4	lb/in
-642.0	lb/in

**SEAT REACTION LOAD (Disk Area DP)**

Reaction at Hub perimeter = QH(DiskDP) = (DP)(a)(Load Constant)

Reaction at Seat = QS(DiskDP) = QH(DiskDP)(b/a) - ((DP)/2a)(a<sup>2</sup> - b<sup>2</sup>)

273.4806	lb/in
-86.1714	lb/in

**SEAT REACTION LOAD (Hub Area DP)**Force on Hub due to DP = Whub = QH(DPdisk) + (DP)PI(b<sup>2</sup>) / 2PI(b)

Reaction at Seat = QS(HubDP) = (-Whub)(b/a)

334.3306	lb/in
-105.979	lb/in

Sum of Seat Reaction Loads = 2 \* QS(Bonnet) - QS(DiskDP) + QS(HubDP)

VF =  $\mu / (\cos A + \mu \sin A)$ 

Thrust Load = VF \* (Sum Seat Reaction) \* (Seat Circumference)

Unwedging Load (Static test)

-1303.76	lb/in
0.387951	
-4070.91	lbs
-5228	lbs

TOTAL THRUST = Thrust Load + Unwedging Load =

NOTE: THE NEGATIVE SIGN INDICATES THAT THE STEM IS IN TENSION

-9299 lbs

PRESSURE LOCKING REQUIREMENT =

9264 lbs

ACTUATOR/VALVE CAPABILITY EVALUATIONCALCULATION: 2-FCV-68-332

Actuator Model

SMB-00

Motor Start Torque (MT)

25 ftlbs

Overall Gear Ratio (OGR)

49

Pullout Efficiency (PE)

40 %

Application Factor (AF)

0.9 or 1.0

1

Valve Factor (VF)

1.0 or (VF/460)\*\*2

0.7702

403.7VAC

Stem Factor (SF)

0.0156

Max Temperature (Temp)

327 F

Loss Percentage (elevated temp)

23.2 %

Note 1

Torque Loss Factor =  $1 - \text{Loss\%} \cdot (\text{Temp} - 104) / (356 - 77)$ 

0.8146

Actuator Torque Capability =  $(\text{MT} \cdot \text{OGR} \cdot \text{PE} \cdot \text{AF} \cdot \text{TLF} \cdot \text{VF})$ 

307.42 ftlbs

SF =

Actuator Thrust Capability = Torque/Stem Factor

19706 lbs

0.0156

Actuator Thrust /Torque Rating

19600 lbs

250.00 ftlbs

Valve Weak Link Thrust/Torque Rating

14850 lbs

SF =

228.54 ftlbs

0.0156

Seismic Thrust/Torque Rating

21500 lbs

SF =

335.40 ftlbs

0.0156

Note 1: Reference: Limitorque Technical Update 93-03

RESULTS:

PRESSURE LOCKING REQUIREMENT =

9264 lbs

ACTUATOR / VALVE LIMITING CAPABILITY =

14650 lbs

COMMENTS:

Rev.

Prepared:

Checked: