Gilbert Commonwealth Companies

POWER AND INDUSTRIAL SYSTEMS DIVISION – READING
DESIGN VERIFICATION RECORD

A PROJECT: R E Ginna Station

SUBJECT: PRV Block Valve Thrust Calculation

SECTION NAME AND NUMBER: Mech Nuc. 0428

W.O.: 04-4824-074

D. H. Hunt
ORIGINATOR

F. C. Rosch, Jr
PROJECT ENGINEER

THIS DOCUMENT CONTAINS PRELIMINARY DATA/ASSUMPTIONS:

NO ✓ YES _____ PAGE(S) _____

A COMPUTER PROGRAM WAS:

✓ NOT USED _____ USED (CERTIFIED PER CAM) _____ USED (NOT CERTIFIED–TO BE VERIFIED WITH CALCULATION)

PROGRAM SYSTEM NAME	REV.		REV.
(1) N/A		(4)	
(2)		(5)	
(3)		(6)	

VERIFICATION PACKAGE (IDENTIFY EACH ITEM)

DOCUMENTS TO BE VERIFIED	REV.		REV.
(1) DC 044824074-8	0	(4)	
(2)		(5)	
(3)		(6)	

SUPPORTING DOCUMENTS	REV.		REV.
(1) SEE REFERENCES		(7)	
(2)		(8)	
(3)		(9)	
(4)		(10)	
(5)		(11)	
(6)		(12)	

DHHunt
ORIGINATOR'S SIGNATURE

4-14-89
DATE

B NO VERIFICATION REQUIRED PER DCP 2.05:

REASON: N/A

VERIFICATION REQUIRED (CHECK METHOD(S)):

DESIGN REVIEW ✓ ALTERNATE CALCULATION _____ QUALIFICATION TESTING _____

IDENTIFICATION OF VERIFIER/~~VERIFICATION TEAM~~: J. J. Nyeste

PROJECT ENGINEER'S SIGNATURE

4-16-89
DATE

6/11.

C. CONCURRENCE WITH SELECTION OF VERIFIER(S):

Jayey G. Bonstrow — SECTION MANAGER'S SIGNATURE

4/14/89 — DATE

D. EXTENT OF VERIFICATION:

Verified math + correct format and procedures: EOM, WCP

RESULTS OF VERIFICATION:

Calculation is satisfactory

ATTESTATION:

THIS DESIGN VERIFICATION WAS PERFORMED IN ACCORDANCE WITH DCP 2.05.

[signature] — VERIFIER'S SIGNATURE

4-14-89 — DATE

E. COMPLETION OF VERIFICATION:

Francis C. Bonk Jr — PROJECT ENGINEER'S SIGNATURE

4-14-89 — DATE

PURPOSE: Calculate valve thrust for opening and closing the PRV block valve against three different ΔP's:

2250 psid – operating condition
2485 psid – design condition
3782 psid – valve rating

REFERENCES:

1. DI-044824074-3
2. Limitorque Selection Procedures

ASSUMPTIONS: None

CLASSIFICATION: Nuclear Safety Related

COMPUTER USE: None

RESULTS:

ΔP	OPENING THRUST	CLOSING THRUST
2250	4778.25	6766.25
2485	5172.9	7368.5
3782	7350.8	10692.4

PRV Block Valve Thrust Calculation

3" Anchor Darling Parallel Seat Gate Valve with Limitorque Actuator

P = 2250 psid

Thrust Calculation

		OPENING	CLOSING
1. Seat Diameter	$D_1 = 3.0"$		
2. Seat Area	$A_1 = \pi \frac{D_1^2}{4} = 7.07\ in^2$		
3. Line Pressure	P_L	2250	2250
4. Differential Pressure	ΔP	2250	2250
5. Friction Coefficient	$C_f = 0.3$		
6. Disc Load	$A_1 \times \Delta P \times C_f$	4772.25	4772.25
7. Stem Diameter	$D_2 = 0.75"$		
8. Stem End Thrust	$P_L \times \pi \frac{D_2^2}{4}$	(994.)	994.
9. Stuffing Box Load		1000	1000
10. Total Stem Thrust		4778.25	6766.25

PRV Block Valve Thrust Calculation

3" Anchor Darling Parallel Seat Gate Valve with Limitorque Actuator

$P = 2485$ psid

Thrust Calculation

			OPENING	CLOSING
1.	Seat Diameter	$D_1 = 3.0"$		
2.	Seat Area	$A_1 = \pi \frac{D_1^2}{4} = 7.07\ in^2$		
3.	Line Pressure	P_L	2485	2485
4.	Differential Pressure	ΔP	2485	2485
5.	Friction Coefficient	$C_f = 0.3$		
6.	Disc Load	$A_1 \times \Delta P \times C_f$	5270.7	5270.7
7.	Stem Diameter	$D_2 = 0.75"$		
8.	Stem End Thrust	$P_L \times \pi \frac{D_2^2}{4}$	(1097.8)	1097.8
9.	Stuffing Box Load		1000	1000
10.	Total Stem Thrust		5172.9	7368.5

PRV Block Valve Thrust Calculation

3" Anchor Darling Parallel Seat Gate Valve with Limitorque Actuator

P = 3782 psid

Thrust Calculation

			OPENING	CLOSING
1.	Seat Diameter	$D_1 = 3.0"$		
2.	Seat Area	$A_1 = \pi \frac{D_1^2}{4} = 7.07\ in^2$		
3.	Line Pressure	P_L	3782	3782
4.	Differential Pressure	ΔP	3782	3782
5.	Friction Coefficient	$C_f = 0.3$		
6.	Disc Load	$A_1 \times \Delta P \times C_f$	8021.6	8021.6
7.	Stem Diameter	$D_2 = 0.75"$		
8.	Stem End Thrust	$P_L = \pi \frac{D_2^2}{4}$	(1670.8)	1670.8
9.	Stuffing Box Load		1000	1000
10.	Total Stem Thrust		7350.8	10692.4