A/DV S.O. E3276

Revision A

12-17

ENGINEERING DATA
A/DV SWING CHECK VALVES
for
Niagara Mohawk Power Corporation

P.O. No. NMP2-P303W

Stone & Webster Engineering Corporation
Cherry Hill, New Jersey

Job No. 12177

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Date: 3/15/84

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S.O. E3276 A-1-8

RECORD OF REVISION

REV.	PAGE	DESCRIPTION	BY/DATE
A	All	Added page numbers	3/27/84
A	6	Add "root" to velocity equation Add disc angle, open and closed	
A	1	Add I. Disc Angle	

TABLE 1

VALVE IDENTIFICATION

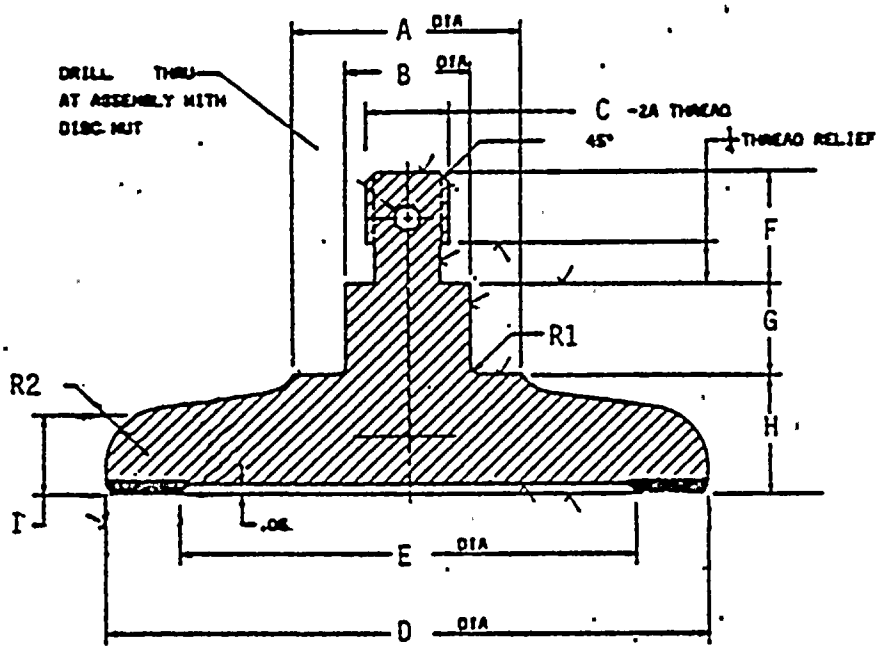
17-19

Item 1A:	24-Inch-900 lb. Swing Check Valve with Air Actuator and Limit Switches; Drawing Nos. 4020-3 and 4021-3 A/DV SJO Nos. 6308-1 and 6308-2 Mark Nos. 2FWS/AOV23A,B
Item 1B:	24-Inch-900 lb. Swing Check Valve Drawing No. 4022-3 A/DV SJO No. 6308-3 Mark No. 2FWS/V12A,B
Item 2:	12-Inch-900 lb. Swing Check Valve with Air Actuator and Limit Switches; Drawing No. 4023-3; A/DV SJO No. 6308-4 Mark No. 2CSH/AOV108
Item 3:	16-Inch-900 lb. Swing Check Valve Drawing No. 4029-3 A/DV SJO No. 6308-10 Mark No. 2CSH/V9

R-20

FIGURE 1

DISC DIMENSIONS



Valve Size	12-Inch	16-Inch	24-Inch
A	3.25	4.00	5.25
B	1.50	1.88	2.63
C	.875	1.00	1.25
D	11.25	13.94	20.00
E	9.56	12.13	18.06
F	1.13	1.50	1.50
G	1.44	1.56	2.31
H	2.25	2.75	3.75
I	1.25	1.75	2.69
R1	.063	.063	.063
R2	.75	.75	1.00

Note: All dimensions are inches.

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INTRODUCTION

Engineering data pertinent to A/DV swing check valves, particularly the disc, hinge and flow characteristics are given in this report. This data is applicable to the valves identified in Table 1. The information contained in this report includes:

A. Valve Identification - Table 1

B. Disc Dimensions - Figure 1

C. Hinge Dimensions - Figure 2 and Table 2

D. Orifice Diameter at Inlet, Outlet and Seat - Table 3

E. Mass of Disc and Hinge - Table 3

F. Disc/Hinge Center of Gravity about Pivot - Table 3

G. Moment of Inertia of Disc/Hinge about Pivot - Table 3

H. Minimum Flow Requirements - Table 3

1. Hold Disc Full Open
2. Hold Disc Full Open and Stable
3. Maintain Disc Off Seat (Crack Open)

I. Disc Angle, Open and Closed - Table 3 (A)

FIGURE 2

HINGE DIMENSIONS
(See Table 2 for Values)

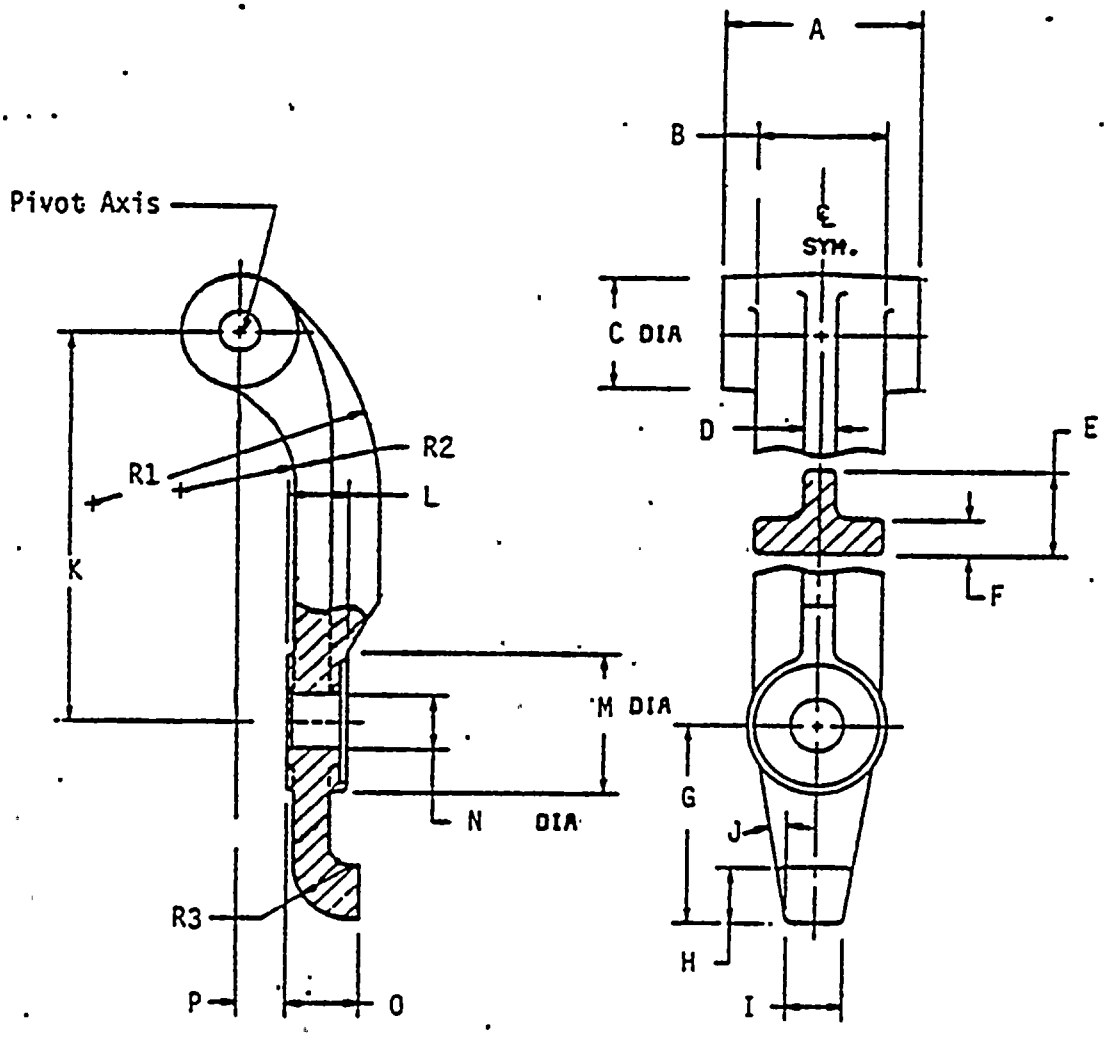

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TABLE 2

HINGE DIMENSIONS
(See Figure 2 for sketch)

Valve Size	12-Inch	16-Inch	24-Inch
A	5.94	5.94	11.94
B	2.75	3.25	4.13
C	2.50	3.00	3.00
D	.875	1.00	1.25
E	1.75	2.13	2.75
F	.75	.94	1.13
G	4.50	5.50	6.00
H	2.00	2.00	-
I	1.50	1.75	1.25
J	10	10	30
K	9.00	10.50	14.97
L	1.50	1.63	2.38
M	3.00	3.87	5.00
N	1.53	1.93	2.68
O	1.75	2.13	2.00
P	2.25	2.75	3.75
R1	4.50	5.00	10.0
R2	2.50	3.00	6.0
R3	.625	1.0	-

Note: All dimensions are inches, except J is degrees

12-24

TABLE 3

VALVE CHARACTERISTICS

Valve Size	12-Inch	16-Inch	24-Inch
Orifice Diameters (inch)			
Inlet	11.13	14.00	21.00
Outlet	11.13	14.00	21.00
At Seat	10.13	12.69	18.75
Component Mass (slug)			
Disc	1.75	3.48	9.64
Hinge	0.75	1.24	2.18
Total	2.50	4.72	11.8
Disc/Hinge Center of Gravity About Pivot Axis (inch)	7.63	9.50	13.9
Disc/Hinge Mass Moment of Inertia About Pivot Axis ($ft\text{-}lb\text{-}sec^2$)	1.20	3.80	17.7

Minimum Flow Requirements: The fluid velocity required to maintain the valve disc at a given position is dependent upon the fluid conditions and valve seat diameter and can be determined by the following expression:

$$v = C\,\beta^2\sqrt{\bar{V}} \qquad \text{(A)}$$

where: v = fluid velocity in pipe (ft/sec)

C = Constant defined below

β = Ratio of seat diameter (orifice) to pipe inside diameter

$\bar{V}$ = Specific volume of fluid (ft^3/lb)

Values of "C" for disc position* (independent of nominal valve size):

Lift Disc to Full Open	C = 80
Hold Disc Full Open and Stable	C = 150
Maintain Disc Off Seat (crack open)	C = 25

Angle between disc face and vertical (all valve sizes): (A)

Disc Fully Closed = 5^0

Disc Fully Open = 68^0

*Valves with operator assist are in the "Free Swing" mode.

Stone and Webster Engineering Corporation
CALCULATION SHEET

Calculation Identification Number				
J.O./W.O. NO. 12177	DIVISION & GROUP NM(C)	CALCULATION NO. 1948	OPTIONAL CODE SQE	PAGE A-25

REFERENCE 12

STONE & WEBSTER ENGINEERING CORPORATION

ENGINEERING MECHANICS DIVISION

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TELEPHONE MEMORANDUM

Call Date 4-23-85 Time 11 30/9 (Incoming) Outgoing

Project Nine Mile Pt 2 J.O.No. 12177

Between R. Green 717-327-4875 of Anchor/Darling

of

and J. Gwinn of Stone & Webster

SUMMARY

SUBJECT: DIMENSIONS OF FW CK VALVES

2FWS*ROV023 & 2FWS*V012

(1) The diameter of the hinge pin is 2" OD.

(2) The clearance at the disk/stud connection is approximately .010". However, it is held snug by a nut & washer.

(3) The clearance between the hinge pin and the bearing is less than 1/16 of an inch.

NOTED APR 23 1985 J.M.GWINN

Copy to:

Calculation Identification Number				
J.O./W.O. NO. 12177	DIVISION & GROUP NM(C)	CALCULATION NO. 1948	OPTIONAL CODE SQE	PAGE B-1 of 3

APPENDIX B

Computer Log and Microfiche

ENGINEERING MECHANICS DIVISION
COMPUTER LOG
****

CALCULATION NUMBER: 12177-NM(C)1948-SQE S&H COMP. AUTH# 4936 CHARGE NUMBER: *** OTHER:

PROGRAM NAME	LIBRARY REF. NUMBER	VERSION / LEVEL	RUN NO.	JOB SUBMITTAL NUMBER	FICHE LOC		PREPARED BY:		COMPUTER USED **	COMMENTS
					SECT	PAGE	NAME	DATE		OTHER PERTINENT INFORMATION
ANSYS	ST-348	04/IC	1	5753	Y		J. Gwinn	6/24/5	370	DISK IMPACT
"	"	"	2	199	"		J. Gwinn	6/24/5	370	SEAT
"	"	"	3	9126	"		J. Gwinn	6/24/5	370	TAIL LINK - PRE-IMPACT
"	"	"	4	514	"		J. Gwinn	6/24/5	370	TAIL LINK-IMPACT

* = COMPUTER GENERATED JOB SUBMITTAL NUMBER
** = COMPUTER USED (SHEC OR OTHER)
*** = IF OTHER THAN SHEC COMPUTER IS USED