UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 4, 2000

MEMORANDUM TO: Stuart A. Richards, Director
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Jack Cushing, Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH JOINT OWNERS GROUP TO DISCUSS MOTOR-OPERATED VALVE (MOV) PERIODIC VERIFICATION PROGRAM

On April 19, 2000, the NRC staff met with representatives of the Joint Owners Group (JOG) to discuss the current status of the JOG Program on Motor-Operated Valve (MOV) Periodic Verification. The JOG program was established in response to Generic Letter (GL) 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves." The NRC staff prepared a safety evaluation (dated October 30, 1997) accepting the JOG program with certain conditions and limitations as an industry-wide response to GL 96-05 to identify age-related valve degradation. Attachment 1 is a list of the meeting participants. Attachment 2 is a copy of the meeting agenda.

At the outset of the April 19 meeting, the NRC staff discussed the current status of the review of MOV programs established at nuclear plants in response to GL 96-05. During the meeting, the JOG participants indicated that several licensees (in addition to those noted by the staff) were considering the benefits of participating in the JOG program. Attachment 3 is an updated status list that reflects the latest information obtained by the staff on GL 96-05 programs. Attachment 4 is a plant-specific list of GL 96-05 programs and their review status. The NRC staff noted that the Babcock & Wilcox Owners Group (B&WOG) had submitted a request on October 19, 1999, for staff review of its participation in the JOG program. The staff is completing the review of the B&WOG submittal. The staff is working to complete the review of GL 96-05 programs established by licensees committed to the JOG program in 2000. The staff reviews on an individual basis those GL 96-05 programs developed by licensees that have not committed to implement the JOG program.

During a public meeting in October 1999, the NRC staff emphasized that licensees should review carefully the NRC safety evaluation prepared on their response to GL 96-05 to ensure that they understand the staff's assumptions in completing the GL 96-05 review. The staff noted at the April meeting that it had not received any comments regarding the GL 96-05 safety evaluations issued since the October meeting. The JOG also stated that they had not identified any misunderstandings regarding the NRC safety evaluations on the GL 96-05 programs from their participating licensees.

The JOG representatives presented a status of the JOG program and the test results to date (Attachment 5). The JOG stated that licensees of 95 reactor units are participating in the MOV dynamic test program. The JOG reported timely submittal of the results of repetitive dynamic tests of MOVs conducted at one-year (or more) intervals by licensees participating in the JOG program. The JOG stated that it has determined that its 5-year dynamic test program will be completed in October 2002 rather than in March 2002 as specified in the JOG topical report. Based on discussions between the JOG and NRC staff, the individual owners' groups will submit a letter notifying the NRC of the revised date for completion of the JOG dynamic test program. The NRC staff will review those submittals and provide a reply to each owners' group. As noted during the October 1999 meeting, the JOG has identified variations in valve factor for some gate valves during repetitive dynamic tests in the same test sequence, and over the one-year time interval between dynamic tests. In a recent feedback notice to its participants, the JOG reported that disassembly and reassembly of gate valves prior to a dynamic test can result in a temporarily low valve factor that subsequently increases over time. The NRC staff reviewed the feedback notice during the public meeting and returned the notice to the JOG at the end of the meeting. The JOG stated that a recent repeat dynamic test had revealed an increase in valve factor for a Walworth solid wedge gate valve in an untreated water system. The JOG is evaluating the need for a feedback notice to alert its participants to that test result. The JOG is also continuing its evaluation of valve factor changes revealed during dynamic tests of Aloyco split-wedge gate valves. The JOG is beginning to evaluate potential valve factor changes in gate valves resulting from valve operation prior to a dynamic test. The JOG is also beginning to evaluate observed changes in the performance of globe valves with some effects to be assessed as a part of the next dynamic test sequence in the JOG program. The JOG has not identified any significant changes in the performance of butterfly valves at this time.

The Boiling Water Reactors Owners Group (BWROG) Valve Technical Review Group chairman reported on the BWROG effort to develop a computer model to provide updated guidance for determining the performance of dc-powered MOVs (Attachment 6). The BWROG effort was initiated in response to concerns identified by dc-powered motor actuator testing at the Idaho National Engineering and Environmental Laboratory (INEEL) sponsored by the NRC Office of Nuclear Regulatory Research, and reported in NUREG/CR-6620 (May 1999), "Testing of dc-Powered Actuators for Motor-Operated Valves." The BWROG completed Revision 0 of its report on dc-powered MOVs in March 2000, and provided the report to Limitorque Corporation for its review. The BWROG industry representative agreed to arrange a meeting with the NRC staff in August 2000 (if possible) for a detailed discussion of the BWROG dc-powered MOV model. Following that meeting, the NRC staff will evaluate the need to update NRC Information Notice 96-48 (August 21, 1996), "Motor-Operated Valve Performance Issues," and its Supplement 1 (July 24, 1998).

The NRC staff and JOG representatives set a tentative date of October 11, 2000, for their next public meeting to discuss the status of the JOG program.

Project No. 692

Attachments:
1. Meeting Participants
2. Meeting Agenda
3. Status of Generic Letter 96-05 Review
4. Plant-Specific List of GL 96-05 Programs
5. Joint Owners' Group MOV Periodic Verification Program Status Update
6. BWROG DC Motor Presentation

cc w/atts: See next page

DISTRIBUTION:

Hard Copy
PUBLIC
PDIV-2 Reading

E-Mail::
JZwolinski/SBlack (RidsNrrDlpm)
SRichards (RidsNrrDlpmLpdiv)
JCushing (RidsNrrPMJCushing
EPeyton (RidsNrrLAEPeyton)
DWessman
MKotzalas
GImbro
TScarbrough
STingen
DTerrao
DDempsey

Accession No: ML003

OFFICE	PDIV-2/PM	PDIV-2/LA	EMCB/BC	PDIV-2/SC
NAME	JCushing	EPeyton	EImbro	SDembek
DATE	5/1/00	4/27/00	4/27/2000	5/4/2000

G:\PDIV-2\JOG\MTS4-19.wpd

OFFICIAL RECORD COPY

Joint Owners Group

cc:

Mr. Charles B. Brinkman, Director
Washington Operations
ABB-Combustion Engineering, Inc.
12300 Twinbrook Parkway, Suite 330
Rockville, MD 20852

Mr. Gordon C. Bischoff, Project Director
CE Owners Group
ABB Combustion Engineering Nuclear Power
M.S. 9615-1932
2000 Day Hill Road
Post Office Box 500
Windsor, CT 06095

Mr. Ralph Phelps, Chairman
CE Owners Group
Omaha Public Power District
P.O. Box 399
Ft. Calhoun, NE 68023-0399

Randy Hutchinson, Chairman
B&WOG Executive Committee
Vice President Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, Arkansas 72801-0967

Mr. W. W. Foster, Chairman
B&WOG Steering Committee
Director of Safety Assurance
Duke Power Company
Oconee Nuclear Station
P.O. Box 1439
Seneca, SC 29679

Mr. J. J. Kelly, Manager
B&W Owners Group Services
Framatome Technologies, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

Mr. Andrew Drake, Project Manager
Westinghouse Owners Group
Westinghouse Electric Corporation
Mail Stop ECE 5-16
P.O. Box 355
Pittsburgh, PA 15230-0355

Mr. Jack Bastin, Director
Regulatory Affairs
Westinghouse Electric Corporation
11921 Rockville Pike
Suite 107
Rockville, MD 20852

Mr. Hank Sepp, Manager
Regulatory and Licensing Engineering
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230-0355

Mr. W. Glenn Warren
BWR Owners' Group Chairman
Southern Nuclear Company
42 Inverness Parkway
P.O. Box 1295
Birmingham, AL 35201

Mr. Thomas G. Hurst
GE Nuclear Energy
M/C 182
175 Curtner Avenue
San Jose, CA 95125

JOG/NRC MEETING

APRIL 19, 2000

MEETING PARTICIPANTS

Name	Organization
David Terao	NRC/NRR/EMEB
Tom Scarbrough	NRC/NRR/EMEB
Steve Tingen	NRC/NRR/EMEB
Margaret Kotzalas	NRC/NRR/EMEB
Jack Cushing	NRC/NRR/DLPM
Steve Loehlein	WOG
Wendell Fiock	BWROG
Ike Ezekoye	WOG
Brian Bunte	ComEd/BWROG
Frank Ferraraccio	CEOG
Chad Smith	B&WOG
Bob Schomaker	B&WOG
John Ihnacik	CEOG/Calvert Cliffs
Tim Chan	TVA
Paul Damerell	MPR
Todd Spears	MPR

Attachment 1

AGENDA

NRC/JOG PUBLIC MEETING

MOV PROGRAM ON PERIODIC VERIFICATION

April 19, 2000

OWFN O-13B2

8:30 a.m.	Introductions (NRC and JOG)
8:35 a.m.	GL 96-05 Review Issues and Status (NRC)
9:00 a.m.	JOG Test Program Results since previous meeting (JOG)
10:15 a.m.	BREAK
10:30 a.m.	Status of Utility Feedback Notices (JOG)
10:45 a.m.	Status of Utility Testing and Data Submittals (JOG)
11:15 a.m.	Items of Interest (BWROG dc motor test program) (NRC)
11:45 a.m.	Action Items and Schedule for Next Meeting (NRC and JOG)
Noon	Closing (NRC)

Attachment 2

STATUS OF GENERIC LETTER 96-05 REVIEW
(April 19, 2000)

GL 96-05 REVIEW COMPLETE AND SAFETY EVALUATION ISSUED FOR 58 UNITS:

Braidwood 1/2
Beaver Valley 1/2
Browns Ferry 2/3
Byron 1/2
Calvert Cliffs 1/2
Catawba 1/2
Clinton
Comanche Peak 1/2
Cooper
Diablo Canyon 1/2
Duane Arnold
FitzPatrick
Ginna
Harris
Hatch 1/2
Hope Creek
Kewaunee
LaSalle 1/2
McGuire 1/2
Millstone 2
Monticello
Oconee 1/2/3
Palisades
Palo Verde 1/2/3
Perry
Pilgrim
Prairie Island 1/2
Quad Cities 1/2
Robinson
Salem 1/2
Seabrook
Sequoyah 1/2
South Texas 1/2
Summer
TMI-1
Watts Bar
WNP-2
Wolf Creek

GL 96-05 REVIEW COMPLETE AND SAFETY EVALUATIONS IN PREPARATION FOR 10 UNITS:

ANO 1/2
Dresden 2/3
Indian Point 2
Indian Point 3
Millstone 3
Vogtle 1/2
Waterford

7 NON-JOG UNITS BEING ADDRESSED SEPARATELY:

Callaway (inspection and followup information under review)
Crystal River (preliminary plans to participate in JOG program)
Davis Besse
Fort Calhoun
Palisades (inspection and SE issued)
San Onofre 2/3 (inspection with SE in preparation)

STAFF PLANS TO COMPLETE GL 96-05 REVIEWS FOR JOG PLANTS IN 2000.

Attachment 3

PLANT-SPECIFIC LIST OF GL 96-05 PROGRAMS
(April 19, 2000)

	Submittal	JOG	RAI Issued/Response	Inspection	SE Issued
Arkansas Nuclear One 1,2	1-11-99	yes	4/2/99-5/28/99		
Beaver Valley 1,2	4-13-98	yes	1/14/99-3/19/99	no	2/22/00
Braidwood 1,2	8-24-98	yes	2/4/99-4/12/99	no	7/30/99
Browns Ferry 2,3	4-28-98	yes	1/12/99-3/30/99	no	11/19/99
Brunswick 1,2	10-27-98	yes			
Byron 1,2	8-24-98	yes	2/4/99-4/12/99		
Callaway 1	3-13-97	no	6/18/99-7/28/99	3/29/99	
Calvert Cliffs 1,2	6-30-98	yes	1/29/99-4/2/99	no	12/15/99
Catawba 1,2	3-31-98	yes	1/27/99-3/19/99	no	5/14/99
Clinton	7-14-98	yes	1/26/99-3/30/99	no	2/8/00
Comanche Peak 1,2	6-24-98	yes	none	no	9/30/98
Cook 1,2	4-18-97	yes			
Cooper	5-4-98	yes	10/28/98-2/22/99	no	5/12/99
Crystal River 3	11-16-96	no*			
Davis-Besse	3-14-97	no			
Diablo Canyon 1,2	9-8-98	yes	12/29/98-3/25/99	no	9/20/99
Dresden 2,3	8-24-98	yes	2/4/99-4/12/99		
Duane Arnold	5-13-98	yes	9/23/98-11/20/98	no	3/3/99
Farley 1,2	6-10-98	yes	4/30/99-5/28/99		
Fermi 2	6-17-98	yes	2/22/99-4/23/99		
Fitzpatrick	6-2-98	yes	9/22/98-10/16/98	no	12/4/98
Fort Calhoun 1	11-15-96	no			
Ginna	4-3-98	yes	2/3/99-6/11/99	no	12/27/99
Grand Gulf 1	1-11-99	yes	2/1/99-5/13/99		
Harris 1	6-12-98	yes	3/9/99-5/28/99	no	10/4/99

	Submittal	JOG	RAI Issued/Response	Inspection	SE Issued
Hatch 1,2	2-27-98	yes	1/28/99-4/9/99	no	8/2/99
Hope Creek	6-4-98	yes	3/1/99-5/27/99	no	12/7/99
Indian Point 2	4-30-98	yes	3/12/99-5/14/99		
Indian Point 3	11-10-97	yes	3/5/99-4/22/99		
Kewaunee	7-14-98	yes	2/22/99-4/23/99	no	12/16/99
LaSalle 1,2	8-24-98	yes	2/4/99-4/12/99	no	11/15/99
Limerick 1,2	5-14-98	yes	3/22/99-7/2/99		
McGuire 1,2	3-31-98	yes	1/28/99-3/19/99	no	5/11/99
Millstone 2	3-17-97	yes	3/23/99-5/24/99	no	8/30/99
Millstone 3	3-17-97	yes	3/1/99-5/28/99		
Monticello	3-23-98	yes	9/10/98-11/4/98	no	3/18/99
Nine Mile Point 1,2	11-19-98	yes	3/11/99-5/11/99		
North Anna 1,2	5-26-99	yes			
Oconee 1,2,3	3-31-98	yes	2/16/99-5/24/99	no	8/2/99
Oyster Creek	4-23-98	yes			
Palisades	3-12-97	no		5/3/99	8/9/99
Palo Verde 1,2,3	7-19-98	yes	3/17/99-6/15/99	no	12/21/99
Peach Bottom 2,3	5-14-98	yes	4/20/99-7/2/99		
Perry 1	9-10-98	yes	3/25/99-6/29/99	no	2/25/00
Pilgrim 1	6-26-98	yes	9/14/98-11/25/98	no	12/2/99
Point Beach 1,2	2-15-00	yes		6/16/99	
Prairie Island 1,2	5-3-99	yes	3/4/99-5/3/99	no	12/29/99
Quad Cities 1,2	8-24-98	yes	2/4/99-4/12/99	no	8/2/99
River Bend 1	1-11-99	yes	12/15/99-		
Robinson 2	4-3-98	yes	12/29/98-3/4/99	no	2/7/00
Salem 1,2	6-4-98	yes	3/23/99-5/27/99	no	12/29/99
San Onofre 2,3	3-13-97	no	4/20/99-6/17/99	12/6/99	
Seabrook 1	4-6-98	yes	none	9/21/98	12/2/98

	Submittal	JOG	RAI Issued/Response	Inspection	SE Issued
Sequoyah 1,2	4-28-98	yes	1/27/99-4/23/99	no	1/3/00
South Texas 1,2	11-18-98	yes	4/15/99-7/13/99	no	2/14/00
St. Lucie 1,2	3-11-97	yes	3/17/99-6/30/99	1/11/99	
Summer 1	11-2-98	yes	8/6/98-10/8/98	10/19/98	2/12/99
Surry 1,2	5-26-99	yes			
Susquehanna 1,2	9-17-98	yes	4/12/99-7/15/99		
TMI 1	5-13-98	yes	11/5/98-1/21/99	no	5/27/99
Turkey Point 3,4	3-11-97	yes	4/15/99-6/18/99	1/11/99	
Vermont Yankee	5-27-99	yes	3/1/99-5/27/99	11/16/98	
Vogtle 1,2	6-3-98	yes	update 4/28/99		
Waterford 3	1-11-99	yes	2/11/99-4/12/99		
Watts Bar 1	4-28-98	yes	1/27/99-4/26/99	no	7/21/99
WNP 2	5-20-98	yes	3/26/99-6/4/99	no	10/18/99
Wolf Creek	4-29-98	yes	3/26/99-7/14/99	no	4/4/00

JOG = Joint Owners Group
RAI = Request for Additional Information
SE = Safety Evaluation

* = Licensee is considering participation in the JOG program.

Joint Owners' Group (JOG) MOV Periodic Verification (PV) Program

Status Update

JOG-NRC Meeting
April 19, 2000

MPR

JOG PV Program Participation

- Four Owners' Groups (B&WOG, BWROG, CEOG, & WOG)
  - 60 plants
  - 95 units
- Additional program participants
  - 1single-unit plant addition is likely. Owners' Group is working with plant to try and get plant up to speed.
  - 1 two-unit plant has expressed an interest in joining but has yet to formally agree to participate.
- Current Test Matrix (192 total valves) is attached

Dynamic Test Program Results

Status of in-plant test data submittals (as of 4/17/00)

Valve Type	No. of Baseline Test Data Packages		No. of Second Test Data Packages		No. of Third Test Data Packages	
	Received	Approved	Received	Approved	Received	Approved
Gate	119	96	44	19	4	2
Butterfly	19	12	9	7	-	-
Balanced Globe	7	7	5	1	-	-
Unbalanced Globe	11	9	5	4	1	1
Total	156	124	63	31	5	3

Total test packages received (as of 4/17/00) = 224

Total test packages approved (as of 4/17/00) = 158

Note: The above totals do not include 13 test data packages which were evaluated and not accepted

Testing Progress

- Owners' Group Project Managers track testing status at each plant to ensure testing is completed and test packages are submitted.
- We observed that plants started their testing after NRC issued SE in October 1997.
- Based on test schedules, JOG Core Group determined that 5 year test program runs from October 1997 to October 2002 (as opposed to March 1997 to March 2002).
- A few plants have informed JOG that their third test will occur after October 2002.

NobleChem Injection

- During October 99 meeting, 1 valve (G22.22) was identified as having injection prior to second test
- Survey of BWR plants conducted to identify JOG valves potentially influenced by NobleChem
  - 4 JOG valves (all gate valves) will be exposed to NobleChem injection
- The JOG Program will evaluate the data from the valves potentially affected by NobleChem to determine if there appears to be an influence.

Dynamic Test Program Results

Test data packages used to present results at this meeting:

Valve Type	No. of Baseline Test Data Packages	No. of Second Test Data Packages	No. of Third Test Data Packages
Gate	92	31	4
Butterfly	13	7	-
Balanced Globe	7	3	-
Unbalanced Globe	8	5	1
Total	120	46	5

Total test packages received (as of 4/17/00) = 224

Total packages included in presentation of results = 171

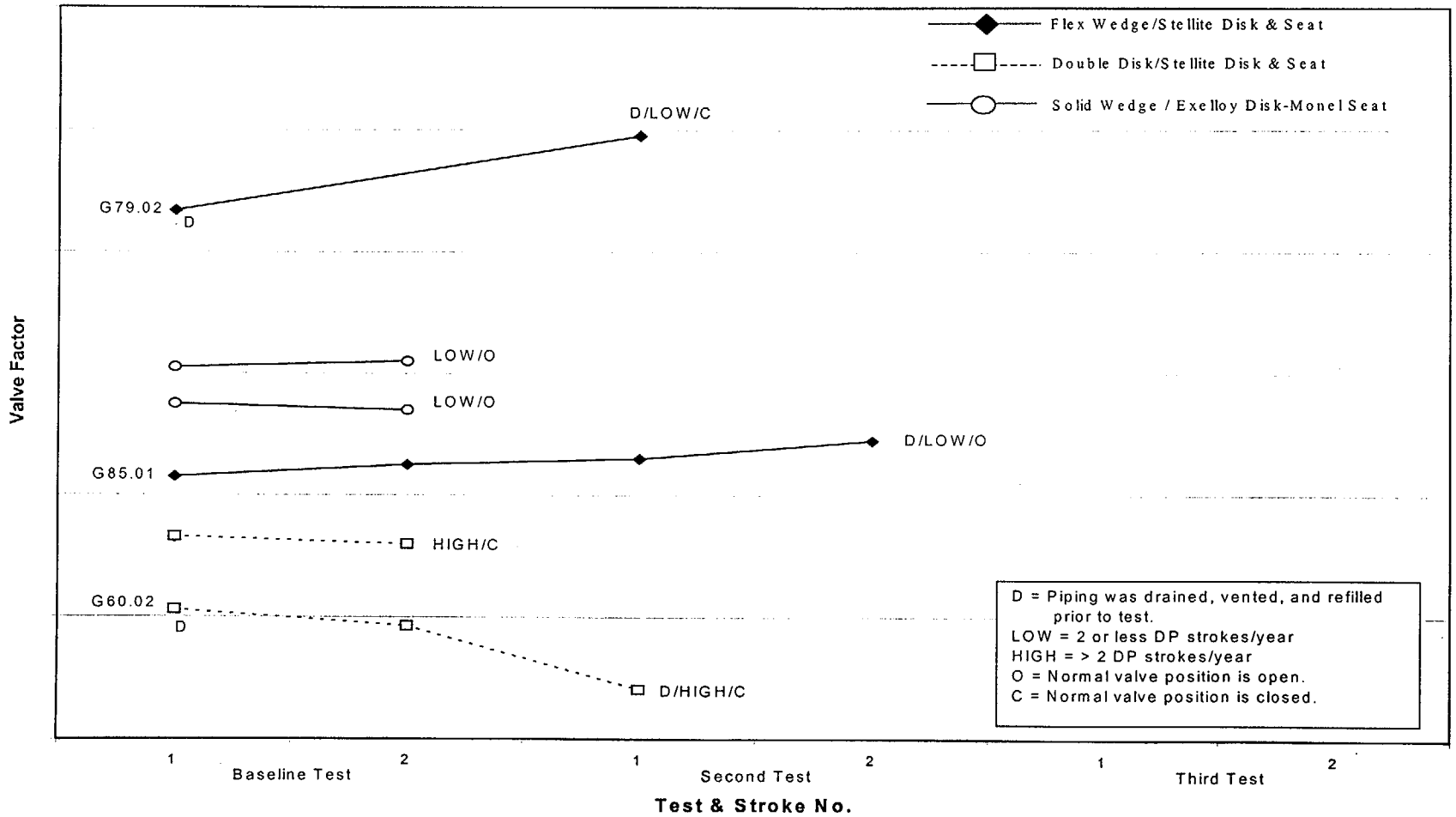
Gate Valve Test Results

- Grouping of gate valves for presentation
  - Divided by fluid medium
  - Divided by disk-to-seat material pair
  - Divided by design type
  - Divided by guide material pair
  - High DP stroking identified
  - Drained, vented, and refilled piping identified
  - Stem orientation identified
  - Normal position identified
  - Elapsed time between static and DP strokes evaluated

Gate Valve Test Results (cont'd)

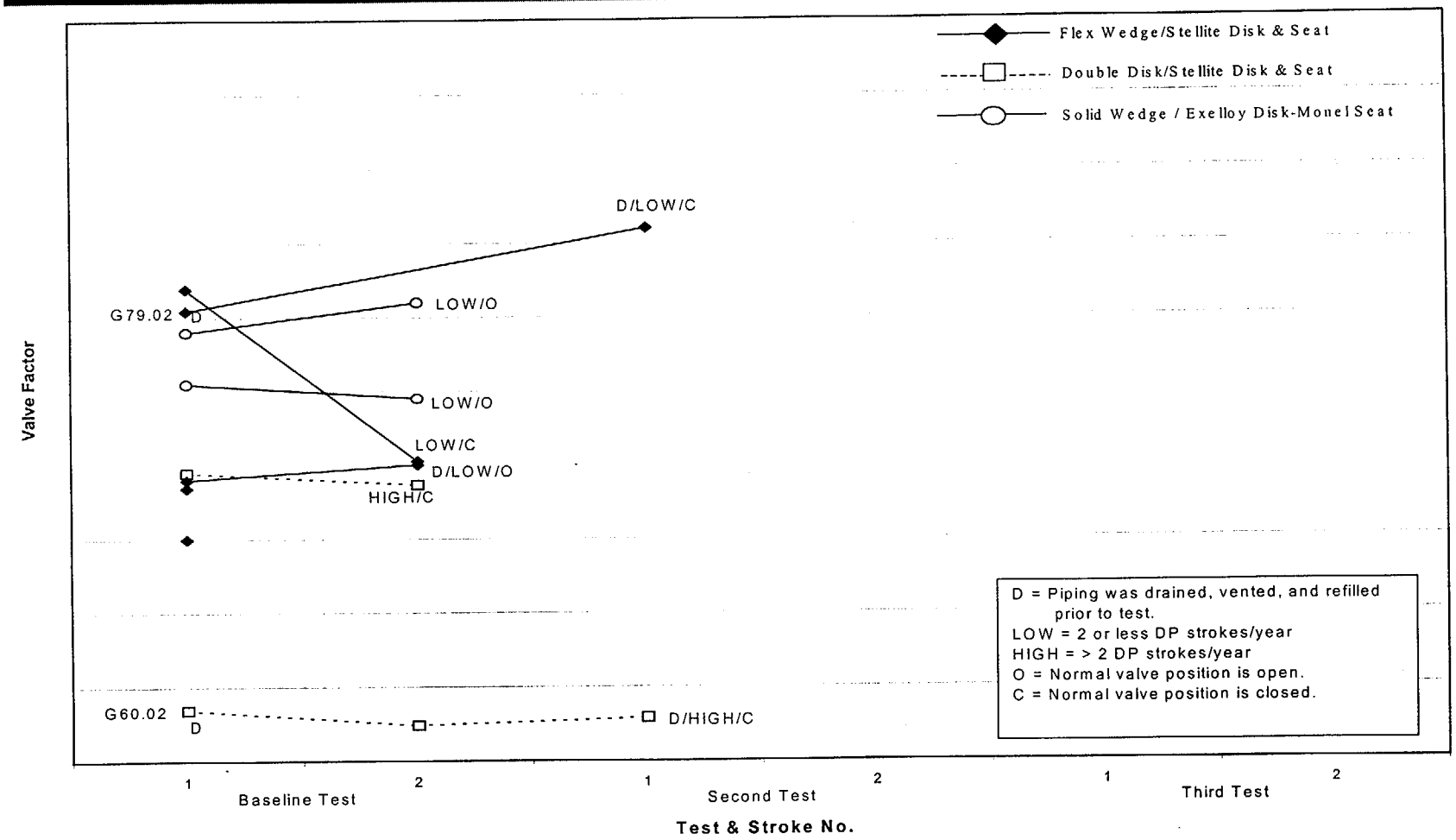
- Hot water/steam valves
  - VFs tend to remain fairly constant between strokes during a DP test
  - 1 new repeat test (G85.01) shows nearly constant closing VFs between baseline and second tests. No second test open data available
  - 1 new repeat test (G79.02) shows VF increase between baseline and second tests. Package is not yet approved.

Progression of Closing Valve Factors at Initial Wedging - Hot Water/Steam



MPR

Progression of Opening Valve Factors at Maximum- Hot Water/Steam

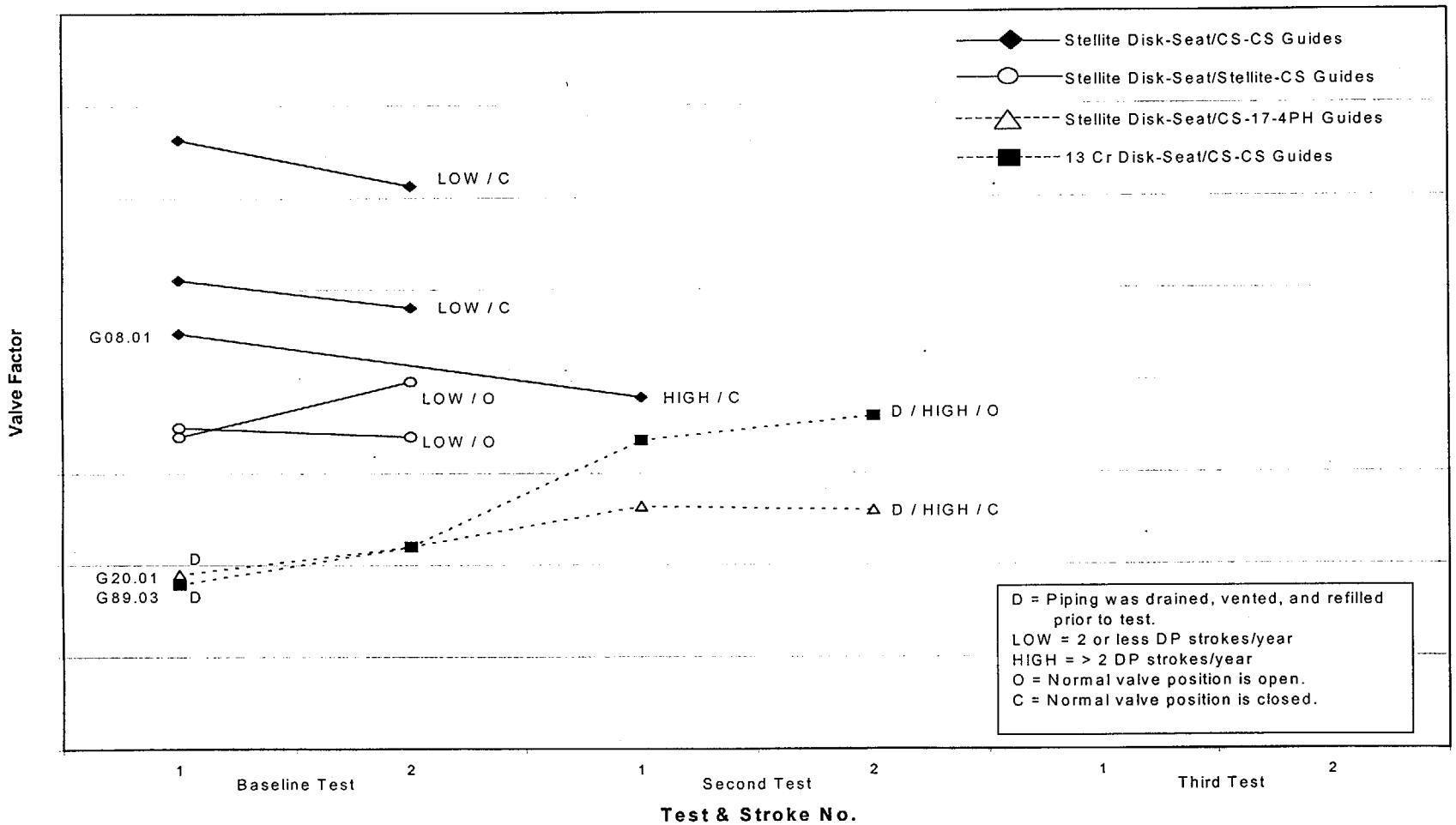


MPR

Gate Valve Test Results (cont'd)

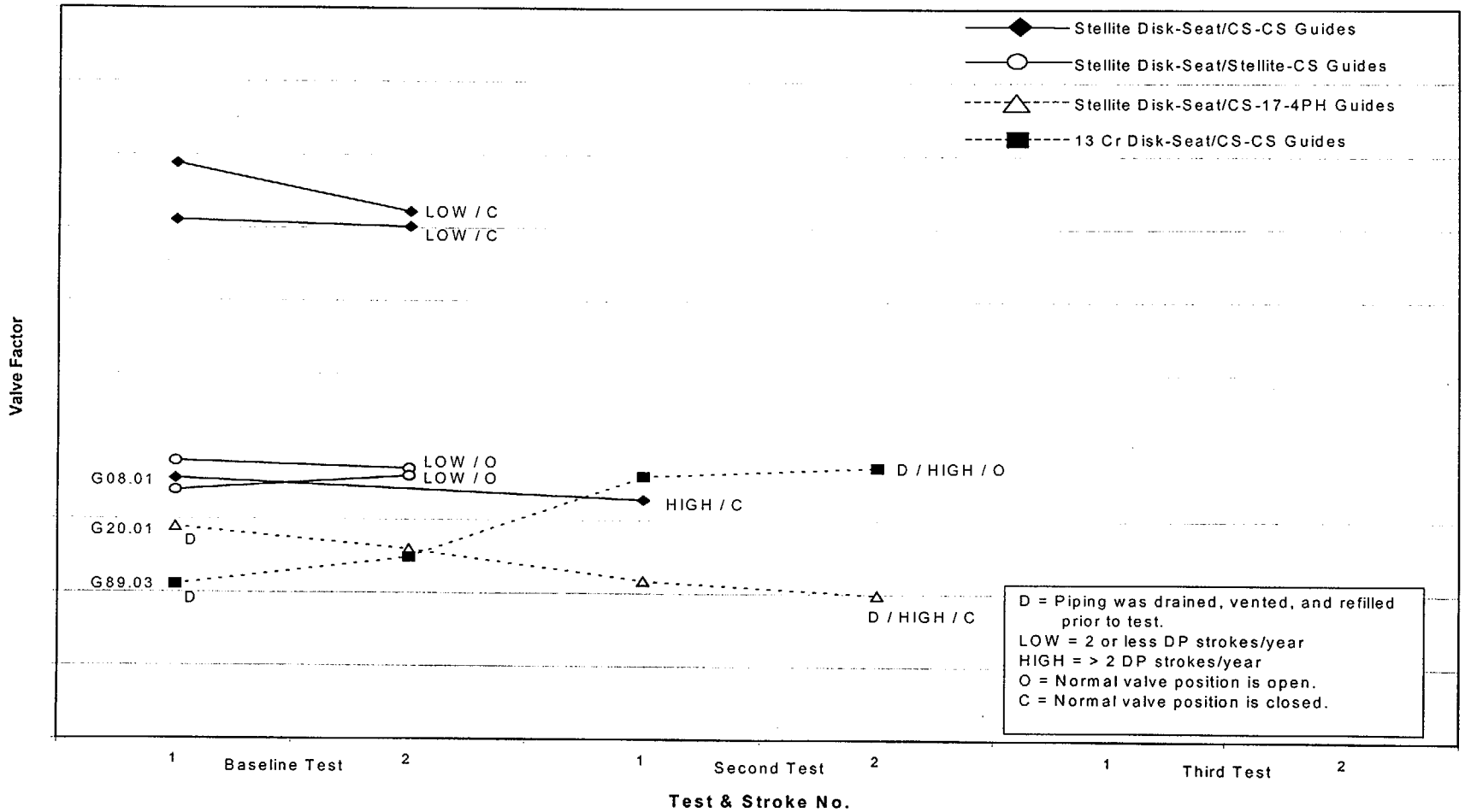
- Untreated (raw) water valves
  - Mixture of VF increases and decreases between strokes during a DP test
  - 2 repeat tests (G08.01, G20.01 discussed last meeting) indicate VF tends to decrease between baseline and second tests
  - 1 new repeat test (G89.03) indicates significant VF increases between baseline and second tests; most VFs relatively low

Progression of Closing Valve Factors at Initial Wedging - Untreated Water



MPR

Progression of Opening Valve Factors at Maximum-Untreated Water

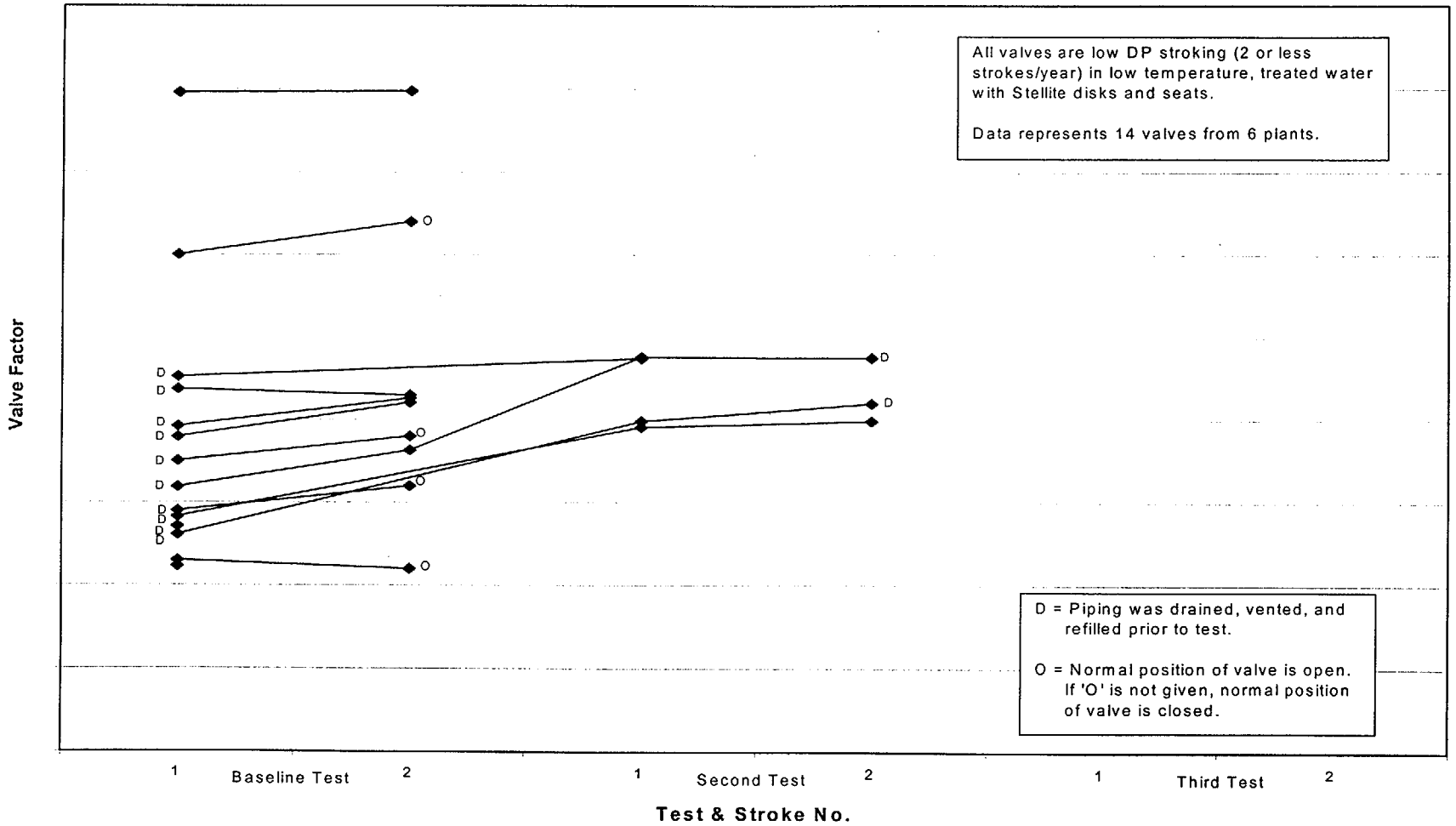


MPR

Gate Valve Test Results (cont'd)

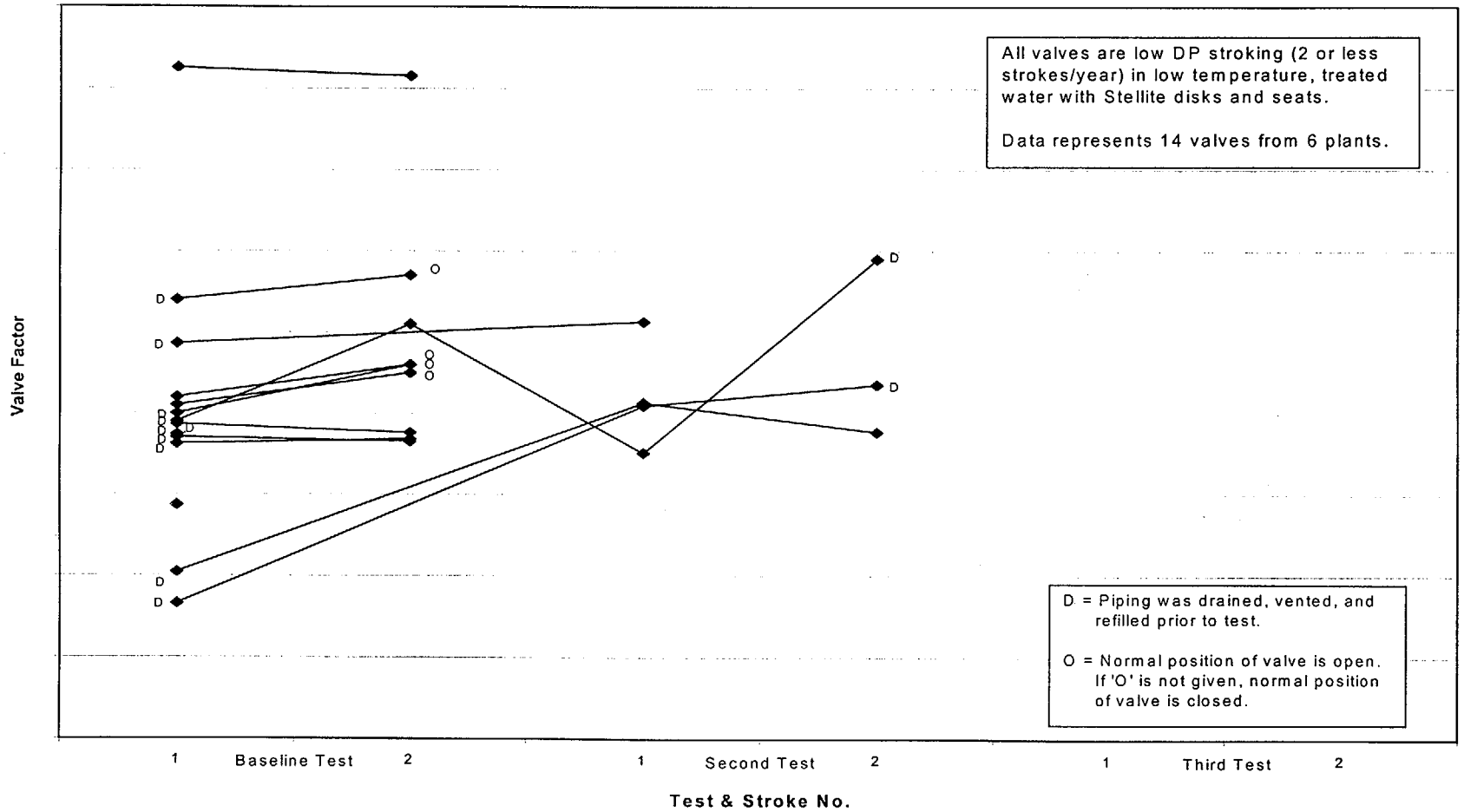
- SS guides in treated water
  - VF tends to increase between strokes during a DP test
  - 2 repeat tests (discussed last meeting) show significant VF increases between baseline and second tests; addressed in FN-03
  - 1 new repeat test (G44.10) shows same VF increase as the previous repeat tests; valve is identical to other two and had the same pre-baseline test disassembly
  - 1 new repeat test (G44.09) shows a stable VF at all points; valve is identical to others and had the same pre-baseline test disassembly
  - All repeat tests appear to plateau similarly

Progression of Closing Valve Factor at Initial Wedging - Stainless Steel Guides in Treated Water



MPR

Progression of Opening Valve Factor at Maximum - Stainless Steel Guides in Treated Water



MPR

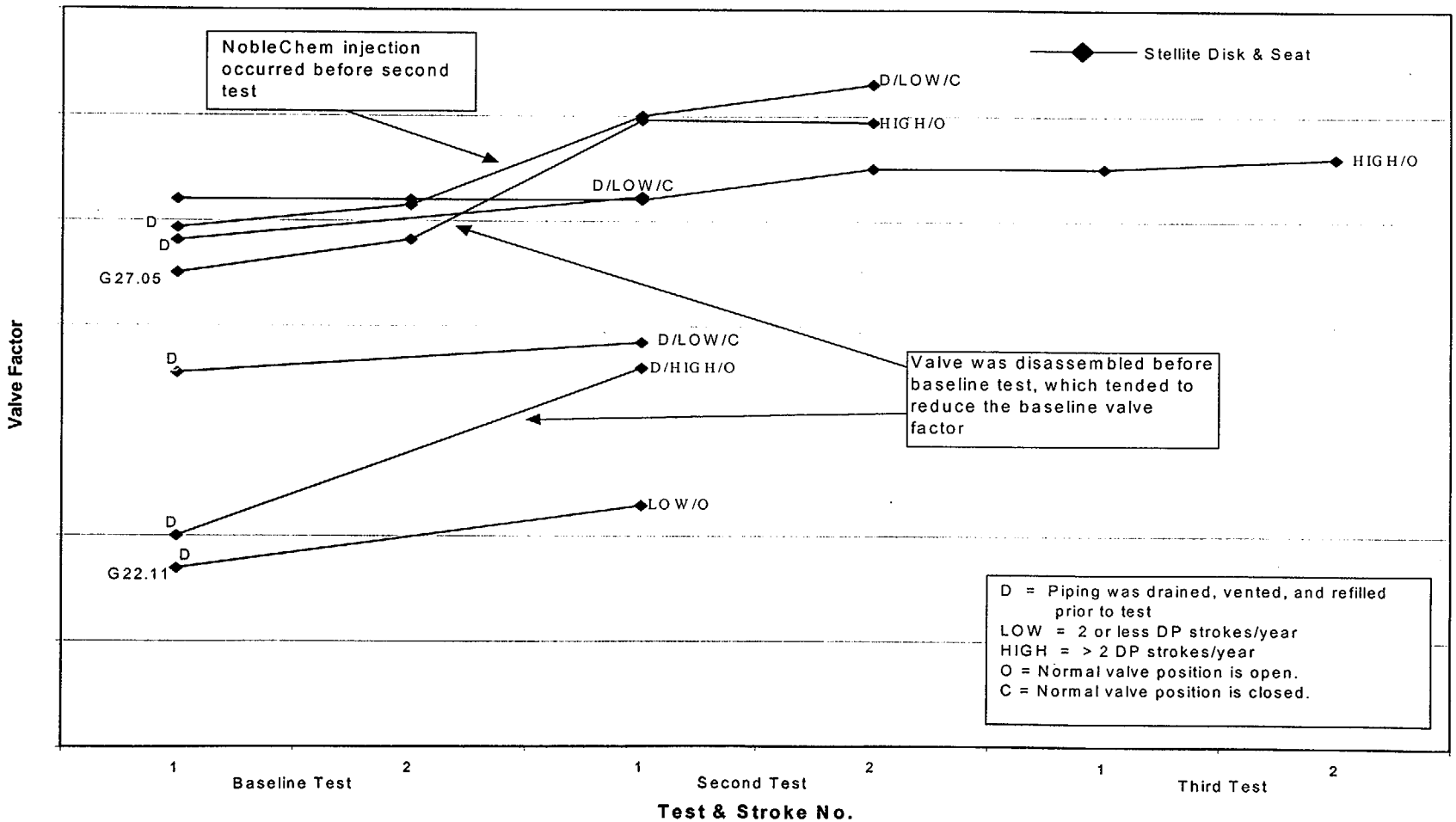
Gate Valve Test Results (cont'd)

- CS guides in treated water
  - Mixture of VF increases and decreases between strokes during a DP test
  - VF tends to increase between baseline and second test (1st stroke to 1st stroke)
  - Previous repeat test data includes G27.08 (discussed in FN-03), G22.22 (NobleChem injection), and G22.08
  - 3 new repeat tests (2 second tests, 1 third test)

Gate Valve Test Results (cont'd)

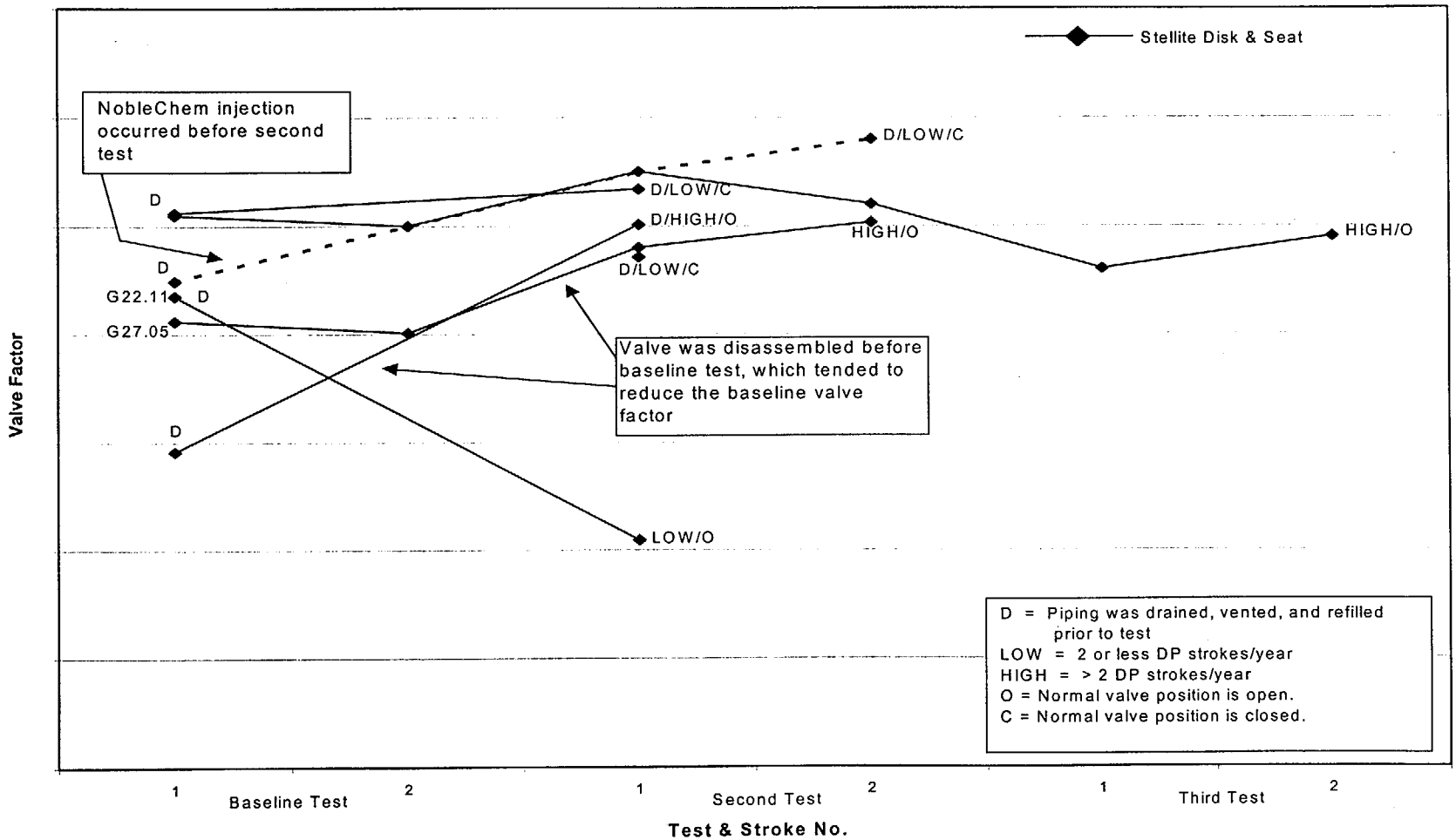
- CS guides in treated water (cont'd)
  - 1 valve with all 3 tests completed (G27.07) shows relatively constant VF, small changes
  - 1 new repeat test (G27.05) indicates VF increases at all points; system piping drained and valve disassembled prior to baseline test
  - 1 new repeat test (G22.11) indicates a VF increase during the closing stroke and decrease during the opening stroke; questions related to tests still to be addressed with plant

Progression of Closing Valve Factors at Initial Wedging - CS Guides/Treated Water (Repeat Tests)



MPR

Progression of Opening Valve Factors at Maximum-CS Guides in Treated Water (Repeat Tests)

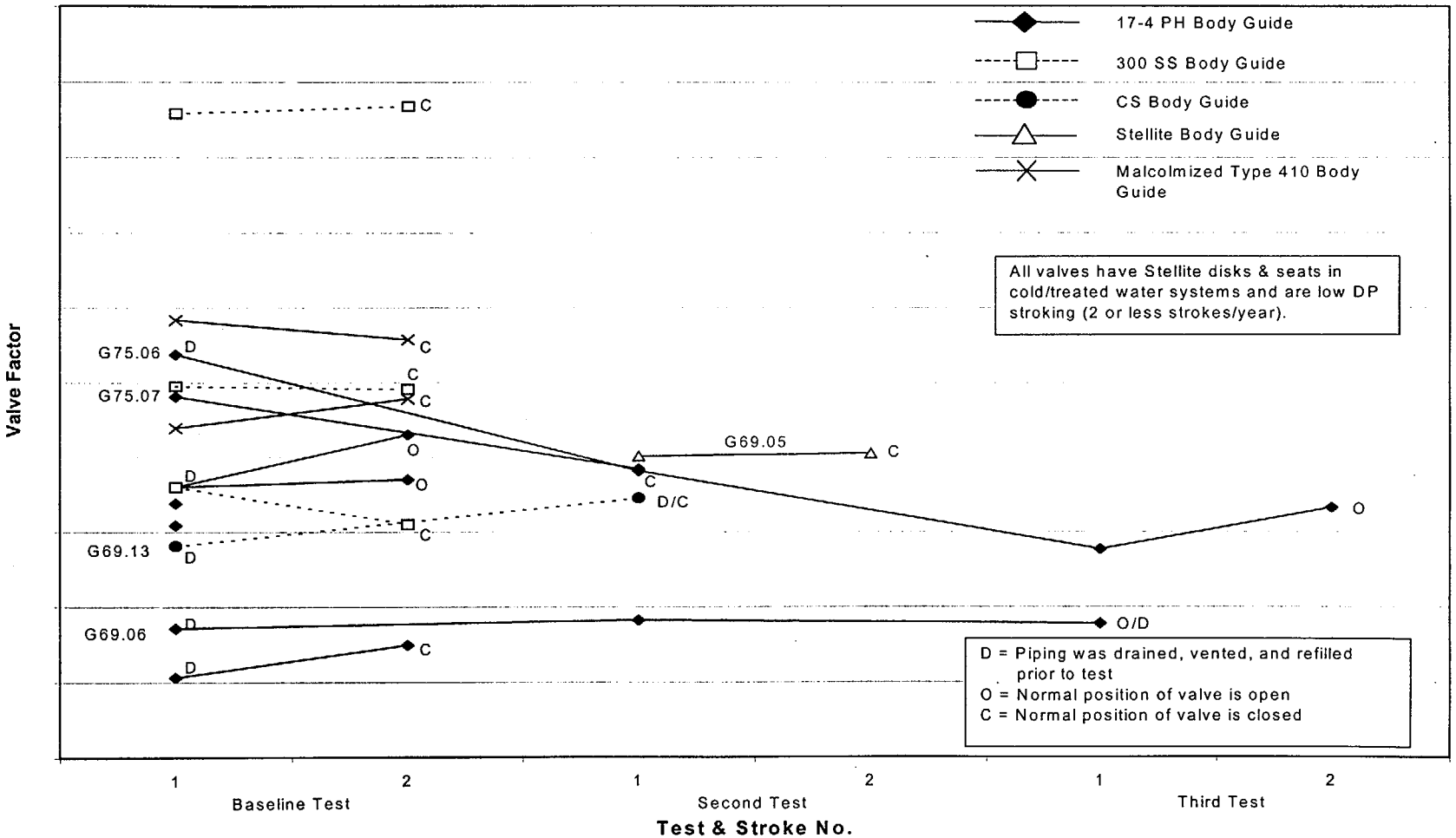


MPR

Gate Valve Test Results (cont'd)

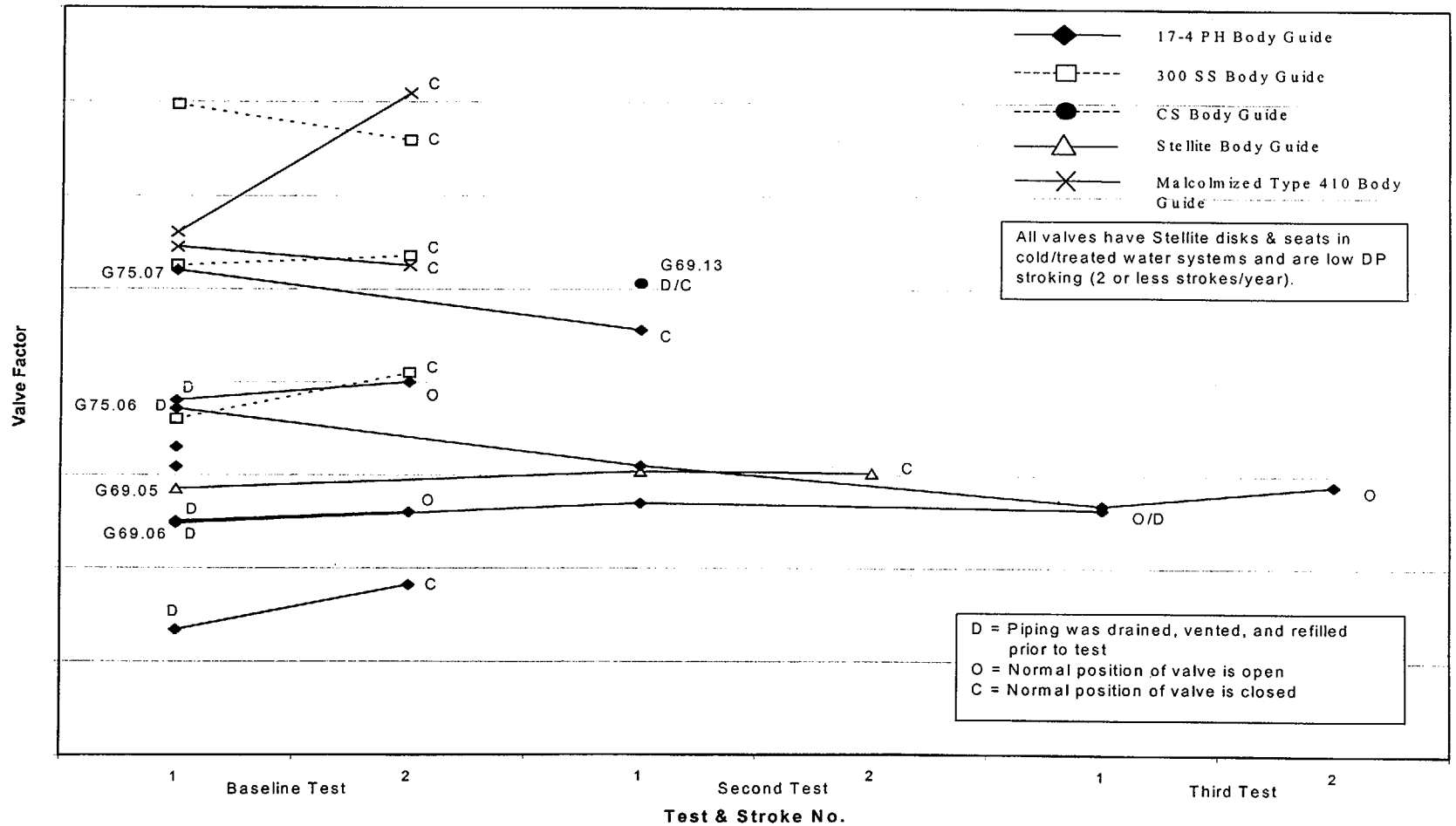
- Stellite disk guide in treated water
  - VF tends to increase between strokes during a DP test
  - 4 new repeat tests (3 second tests, 1 third test)
  - VFs tend to decrease or show small increases between baseline and second tests
  - 2 valves have all three tests completed (Westinghouse flex wedge, Stellite seats, 17-4PH body guide, low DP strokes) and show stable valve factors

Progression of Closing Valve Factors at Initial Wedging - Stellite Disk Guide in Treated Water



MPR

Progression of Opening Valve Factors at Maximum-Stellite Disk Guide in Treated Water

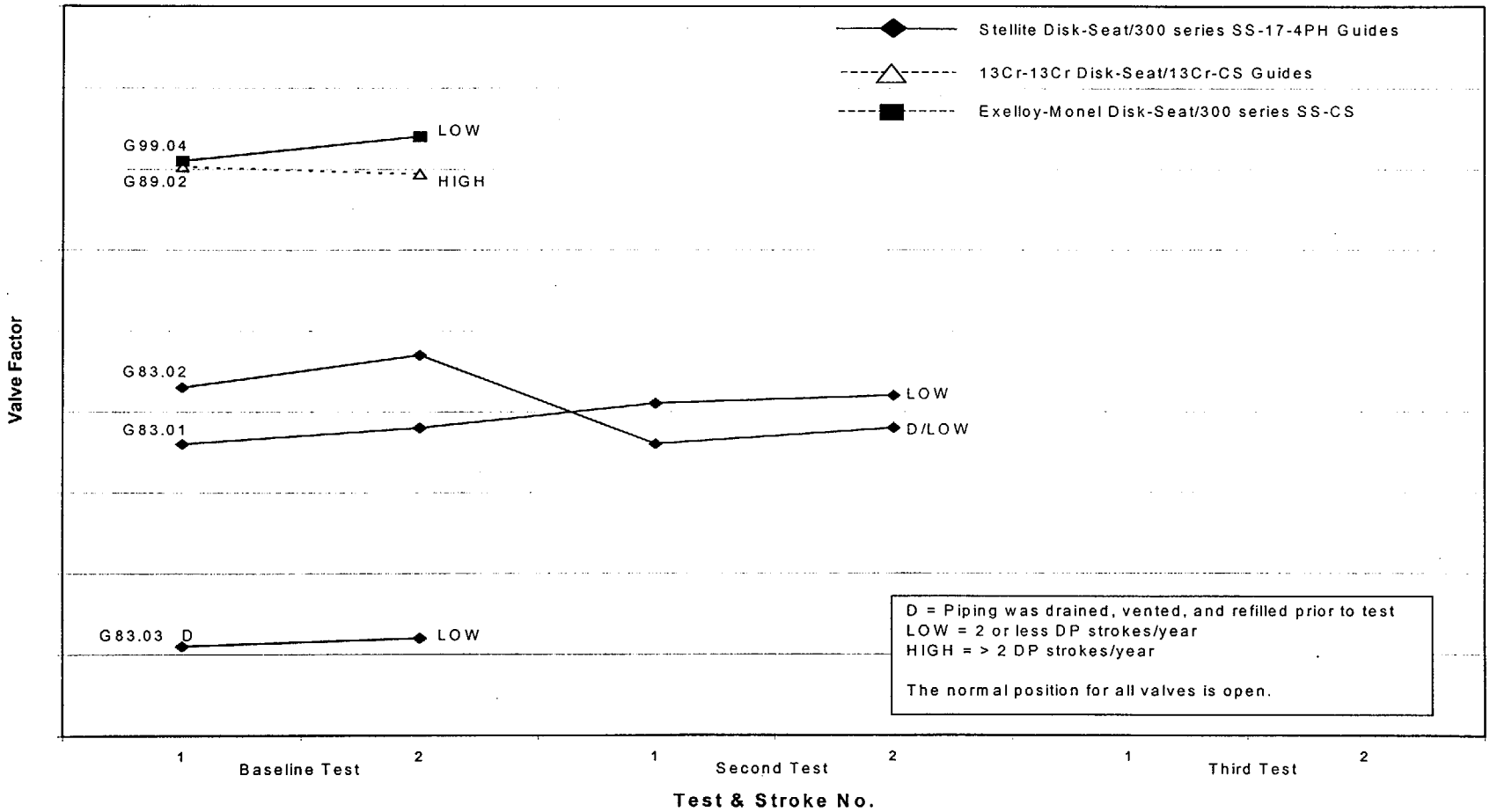


MPR

Gate Valve Test Results (cont'd)

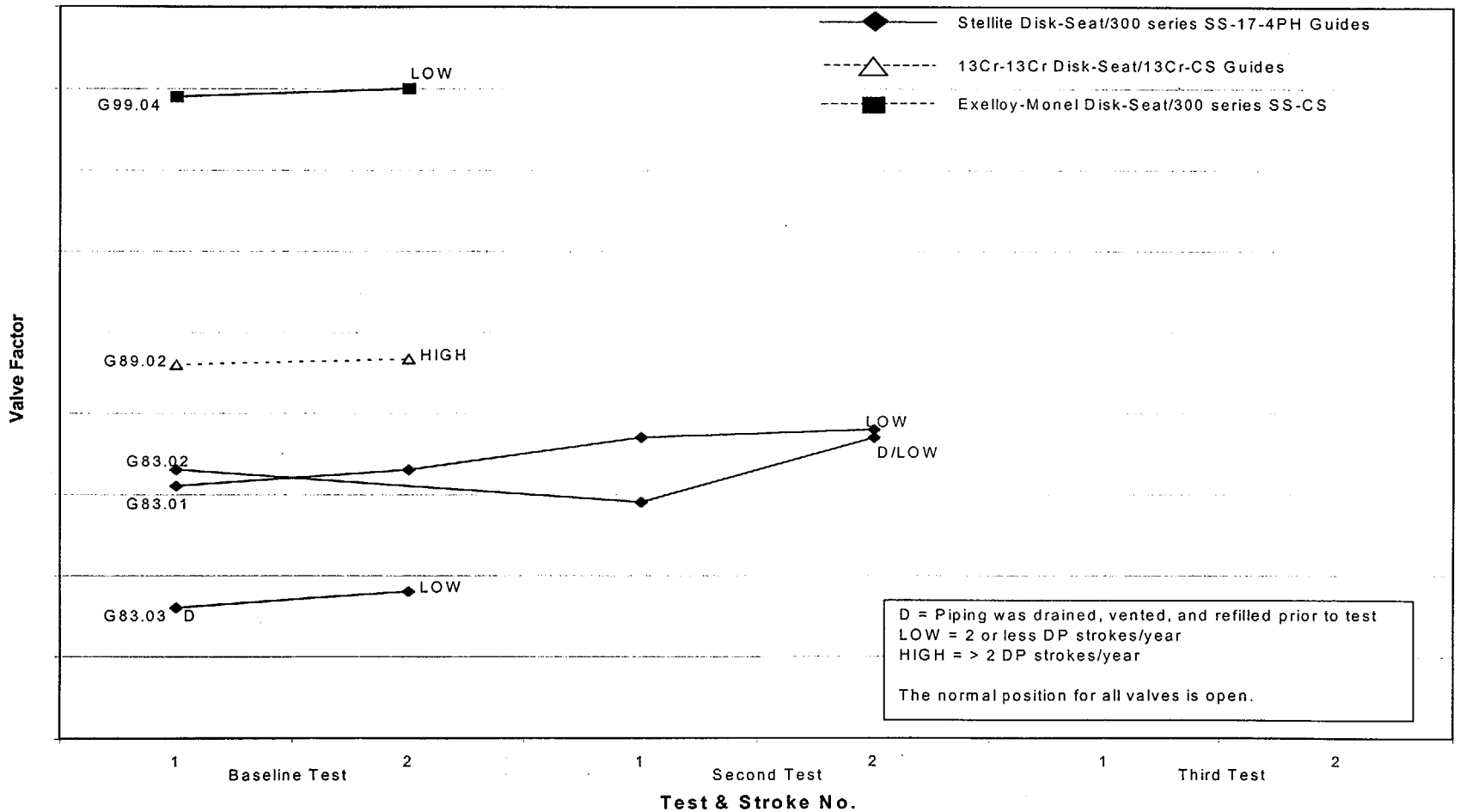
- "Other" guide materials in treated water
  - VF tends to increase between strokes during a DP test.
  - 1 new repeat test (G83.01) shows fairly constant VFs between the baseline and second tests

Progression of Closing Valve Factors at Initial Wedging - Other Guides in Treated Water



MPR

Progression of Opening Valve Factor at Maximum - Other Guides in Treated Water

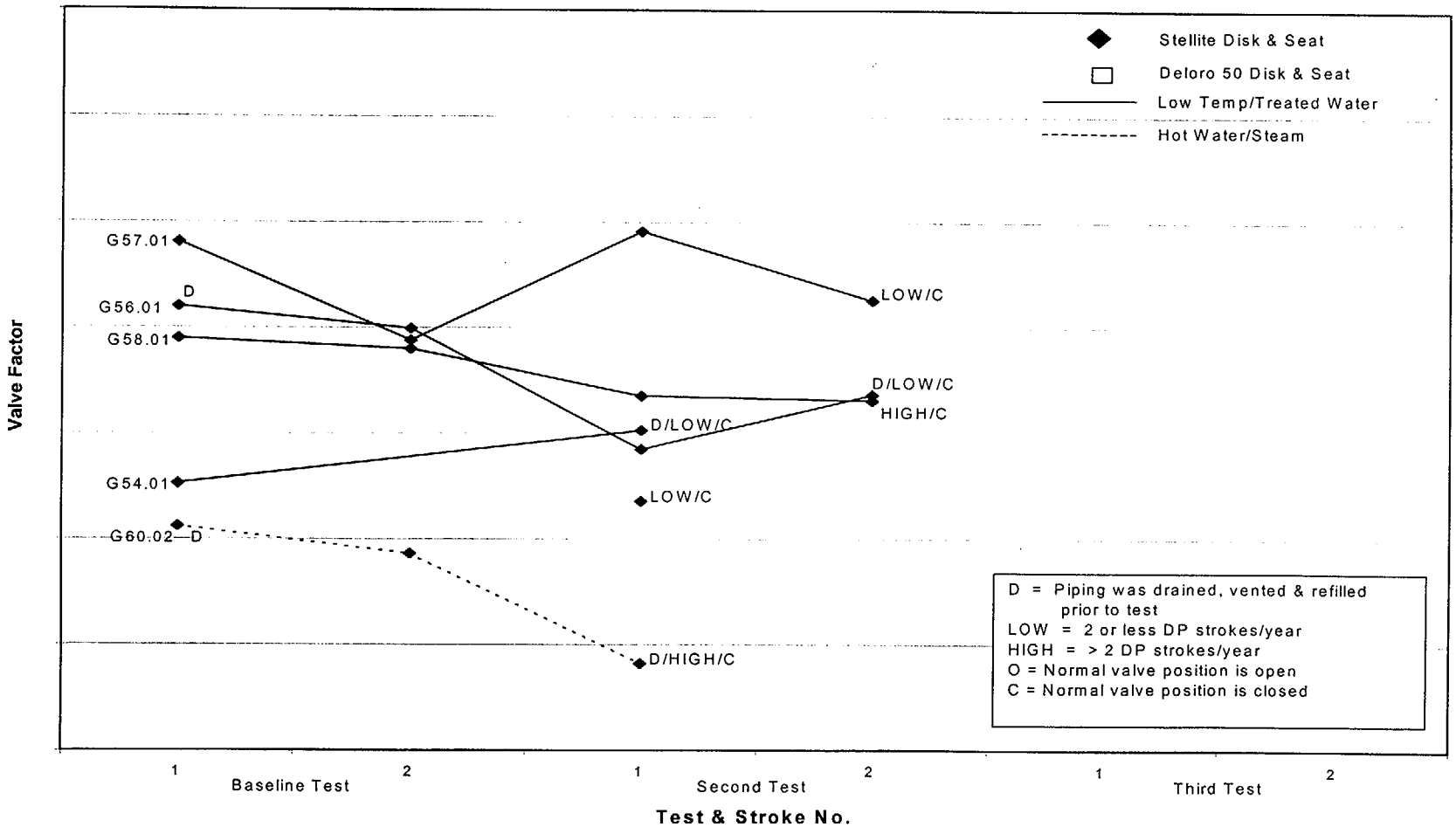


MPR

Gate Valve Test Results (cont'd)

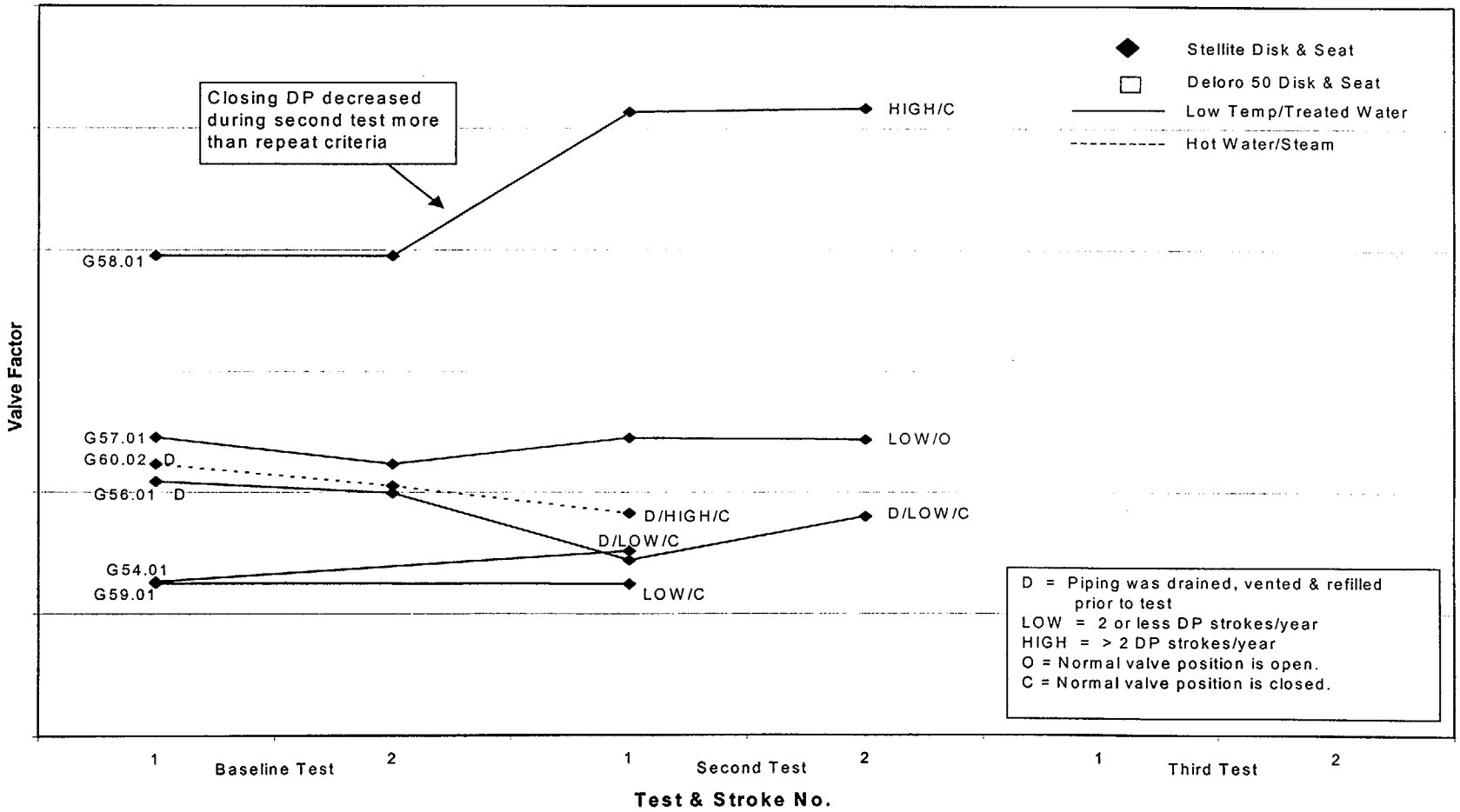
- Double Disk valves
  - Mixture of VF increases and decreases between strokes during a DP test
  - 4 new repeat tests (6 total) indicate small VF increases or decreases between baseline and second tests (1st stroke to 1st stroke)
  - 1 valve (G54.01) sees VF increases at all points, both open and close strokes; however, initial baseline VFs are low

Progression of Closing Valve Factor at Initial Wedging - Double Disk Valves (Repeat Tests)



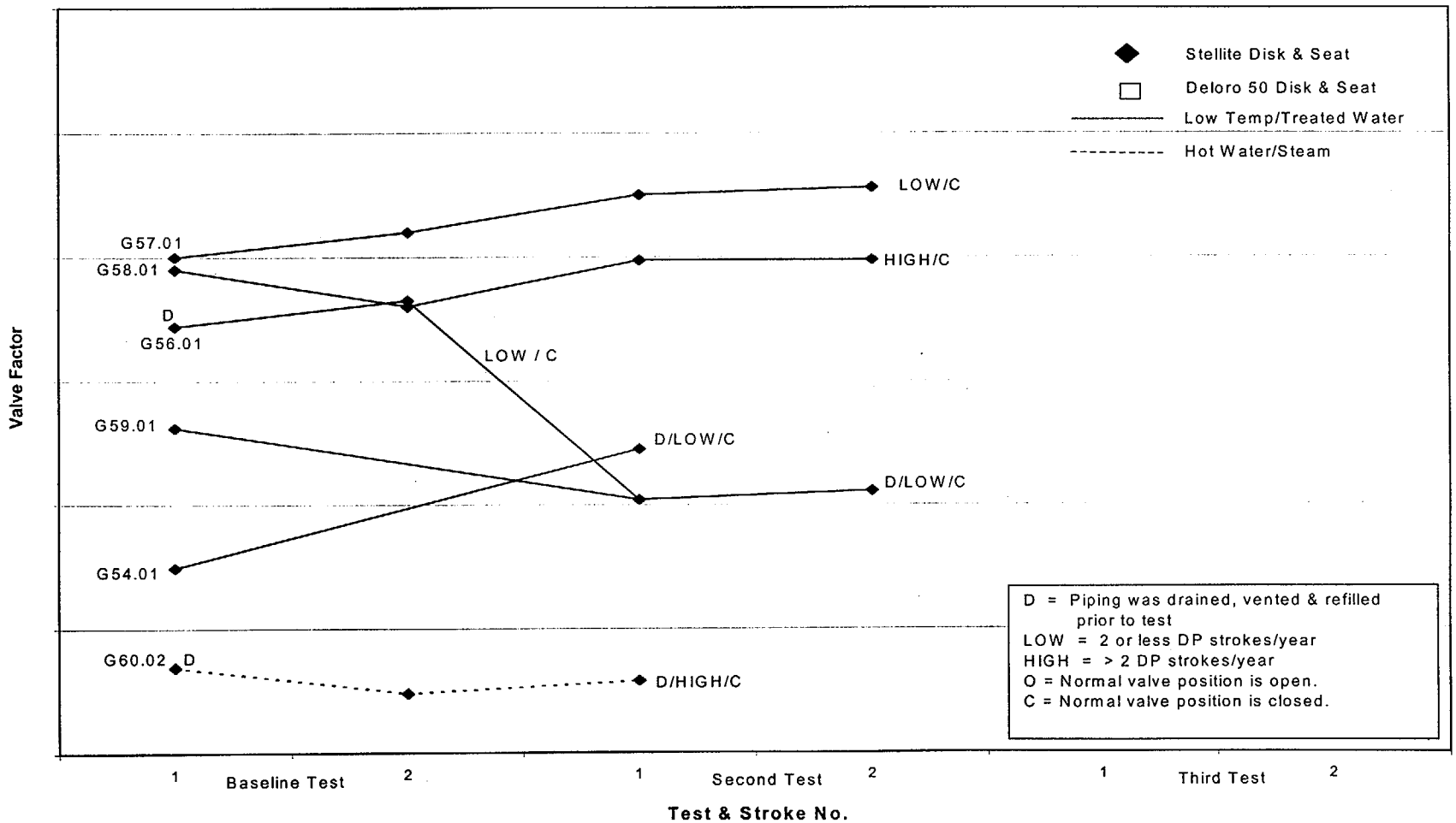
MPR

Progression of Closing Valve Factor at Maximum - Double Disk Valves (Repeat Tests)



MPR

Progression of Opening Valve Factor at Maximum - Double Disk Valves (Repeat Tests)

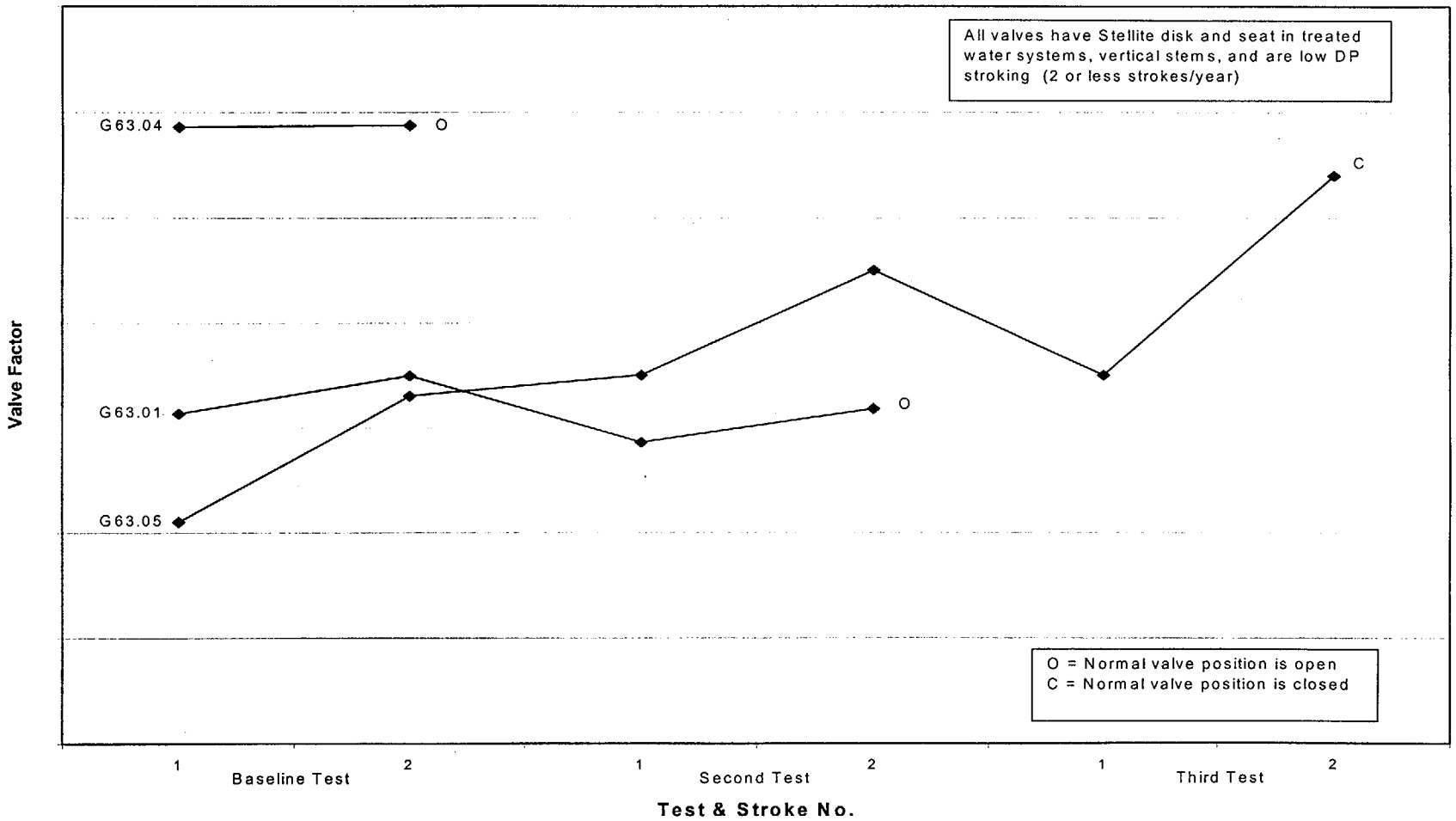


MPR

Gate Valve Test Results (cont'd)

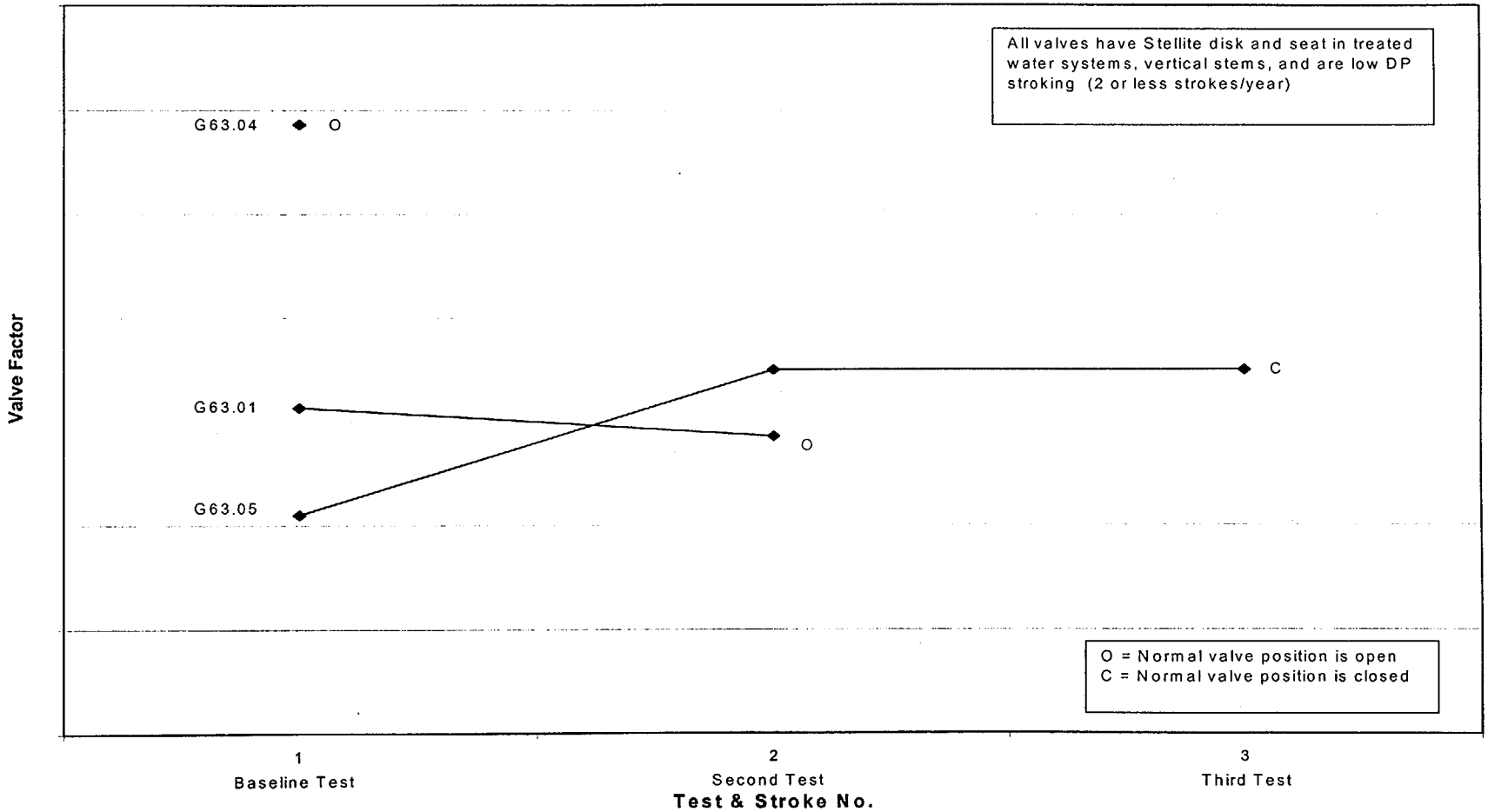
- Split wedge valves
  - VF tends to increase between strokes during a DP test
  - 2 new repeat tests (1 second, 1 third)
  - G63.05 (FN-01 valve) has all three tests complete; VF increases between tests (1st stroke to 1st stroke), but most significant increases tend to occur from stroking on the same day. ΔVF between baseline and second tend to be larger then ΔVF between second and third
  - G63.01 shows small VF decreases between tests (1st stroke to 1st stroke)

Progression of Closing Valve Factors at Initial Wedging - Split Wedge Gate Valves



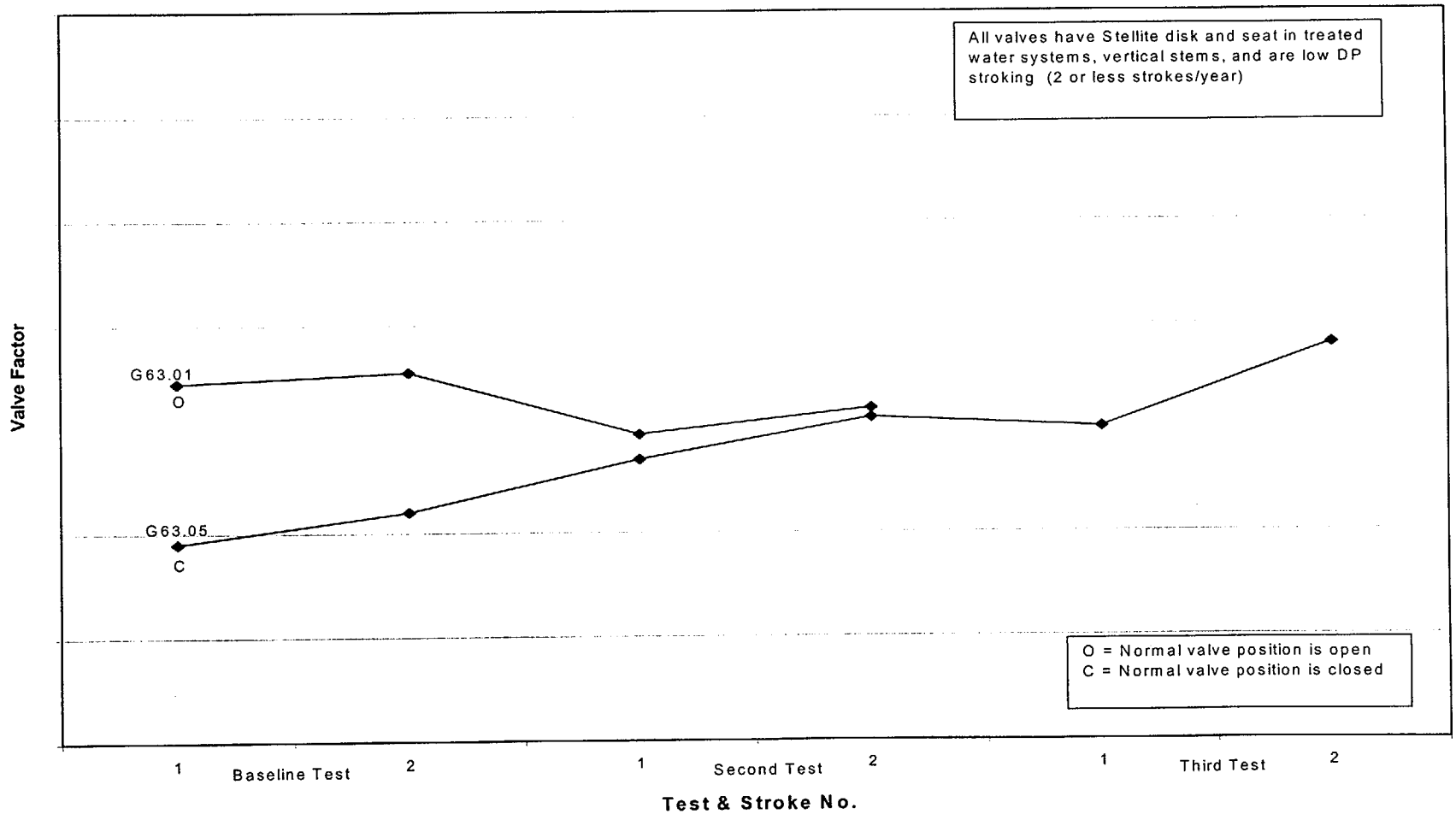
MPR

Progression of Closing Valve Factors (1st DP Stroke) at Initial Wedging -Split Wedge Gate Valves



MPR

Progression of Opening Valve Factors at Maximum-Split Wedge Gate Valves (Repeat Tests)

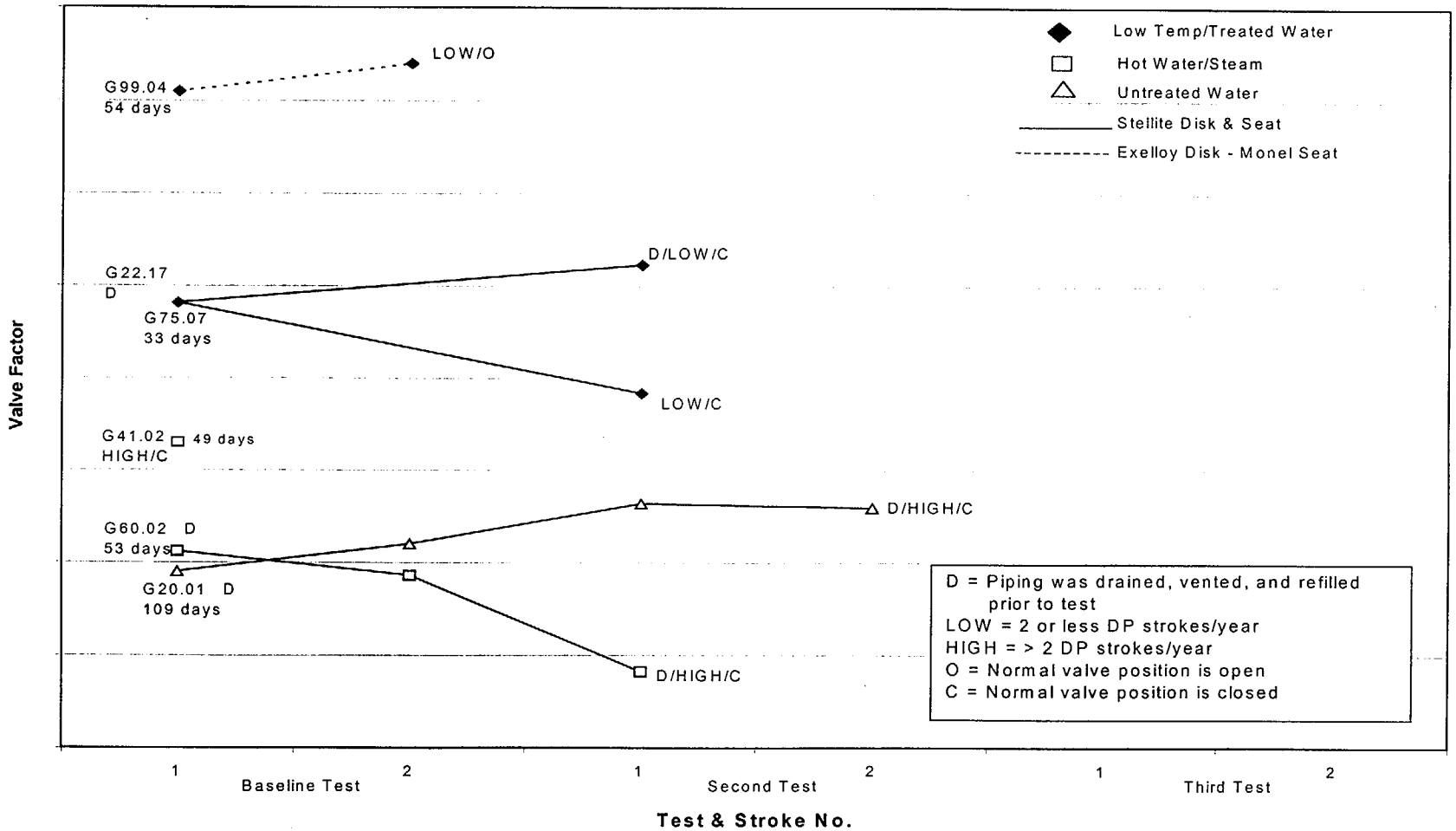


MPR

Gate Valve Test Results (cont'd)

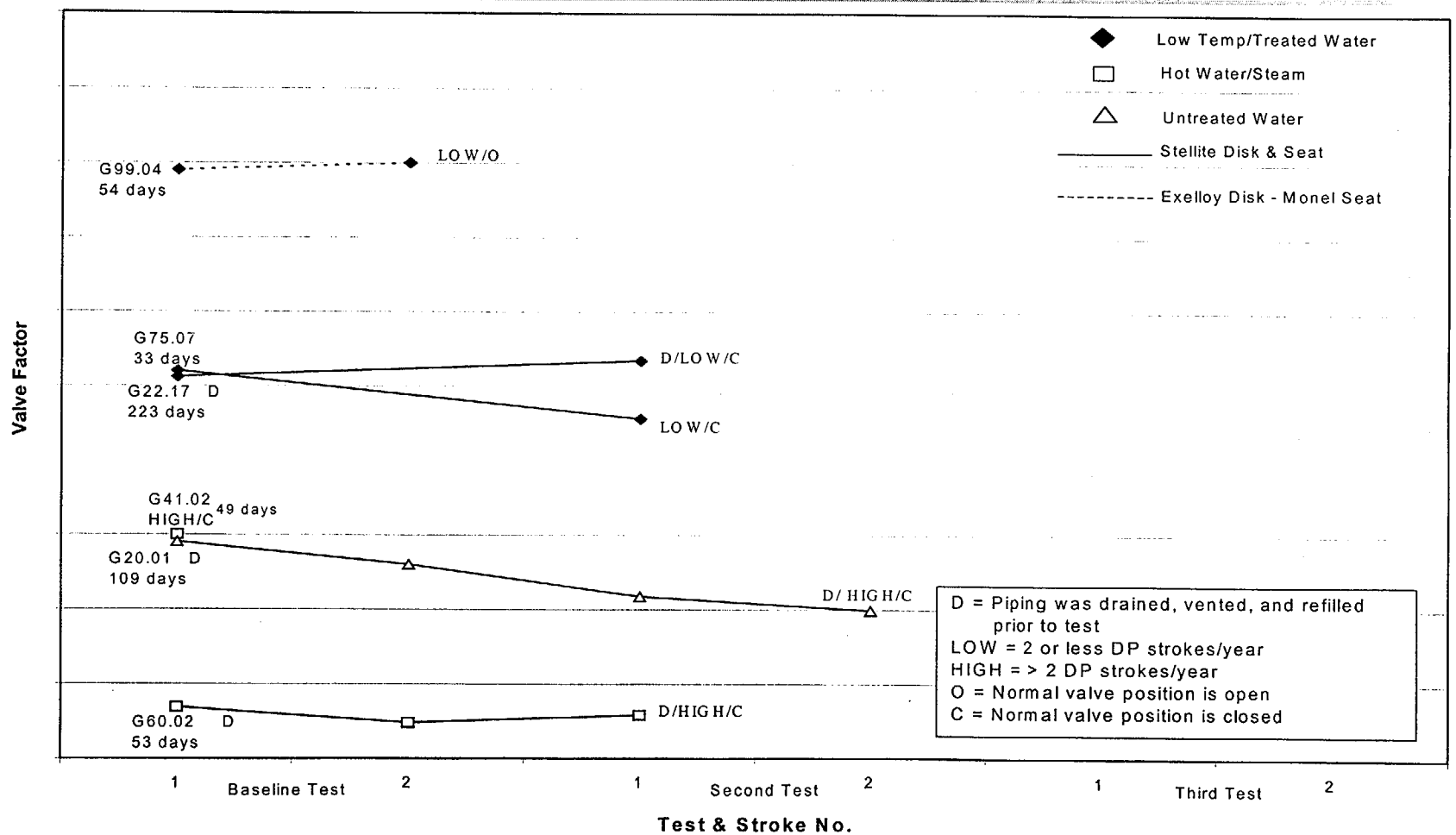
- DP Tests performed >30 days after Static Test
  - 6 valves had their baseline DP test performed >30 days after the baseline static test ; length of time ranged from 33-223 days
  - Only 3 of 6 valves received two DP strokes during baseline test
  - 4 of 6 have had repeat tests. 30 day criteria met in repeat tests
  - Based on limited data set, no indication of a "1st stroke effect" due to extended time between static and DP tests

Progression of Closing Valve Factor at Initial Wedging - DP Stroke > 30 days after Static Stroke



MPR

Progression of Opening Valve Factor at Maximum - DP Strokes > 30 days after Static Stroke

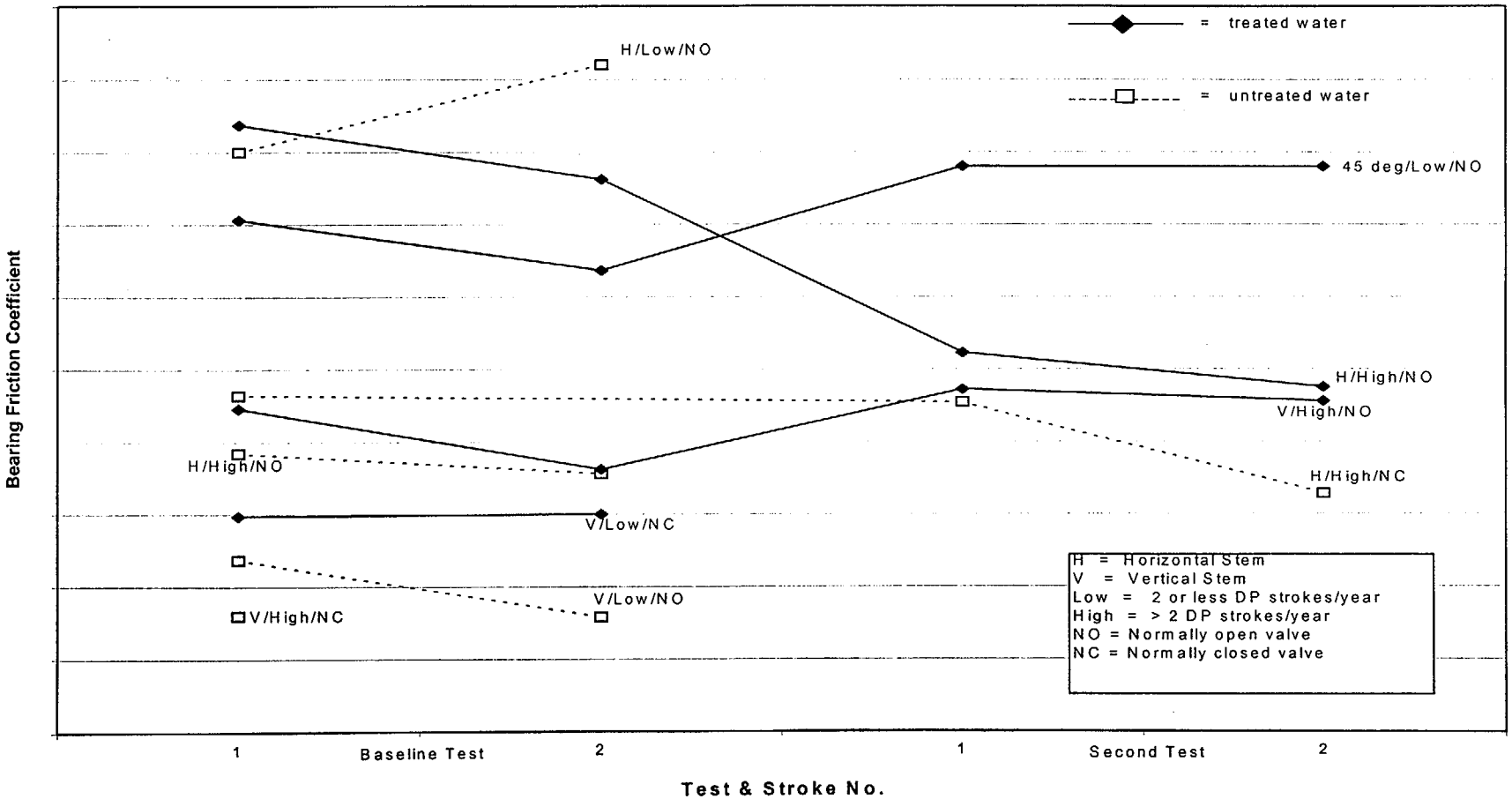


MPR

Butterfly Valve Results

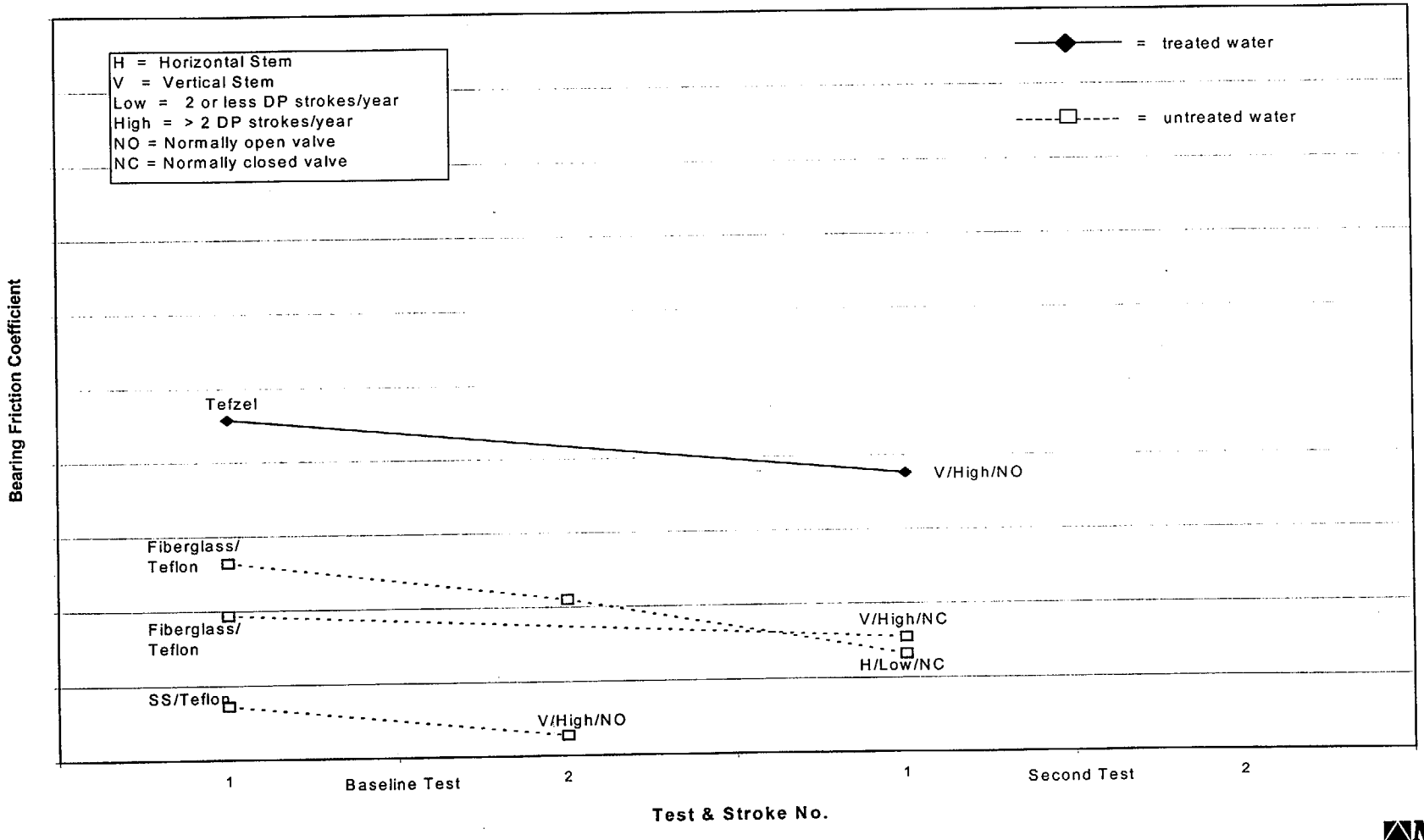
- Results divided by bearing material
- Bronze Bearings (no new repeat tests)
  - Bearing friction coefficient tends to slightly decrease between first and subsequent DP strokes during a DP test sequence.
  - Bearing friction coefficient tends to slightly increase or remain fairly constant between DP tests (1st stroke to 1st stroke)
- Non-Bronze Bearings (Fiberglass/Teflon, SS/Teflon, Tefzel)
  - Bearing friction coefficient tends to slightly decrease between first and subsequent DP strokes during a DP test sequence.
  - Bearing friction coefficient tends to slightly decrease between DP tests (1st stroke to 1st stroke)

Progression of Bearing Friction Coefficient for Butterfly Valves - Bronze Bearings



MPR

Progression of Bearing Friction Coefficient for Butterfly Valves - Non-Bronze Bearings

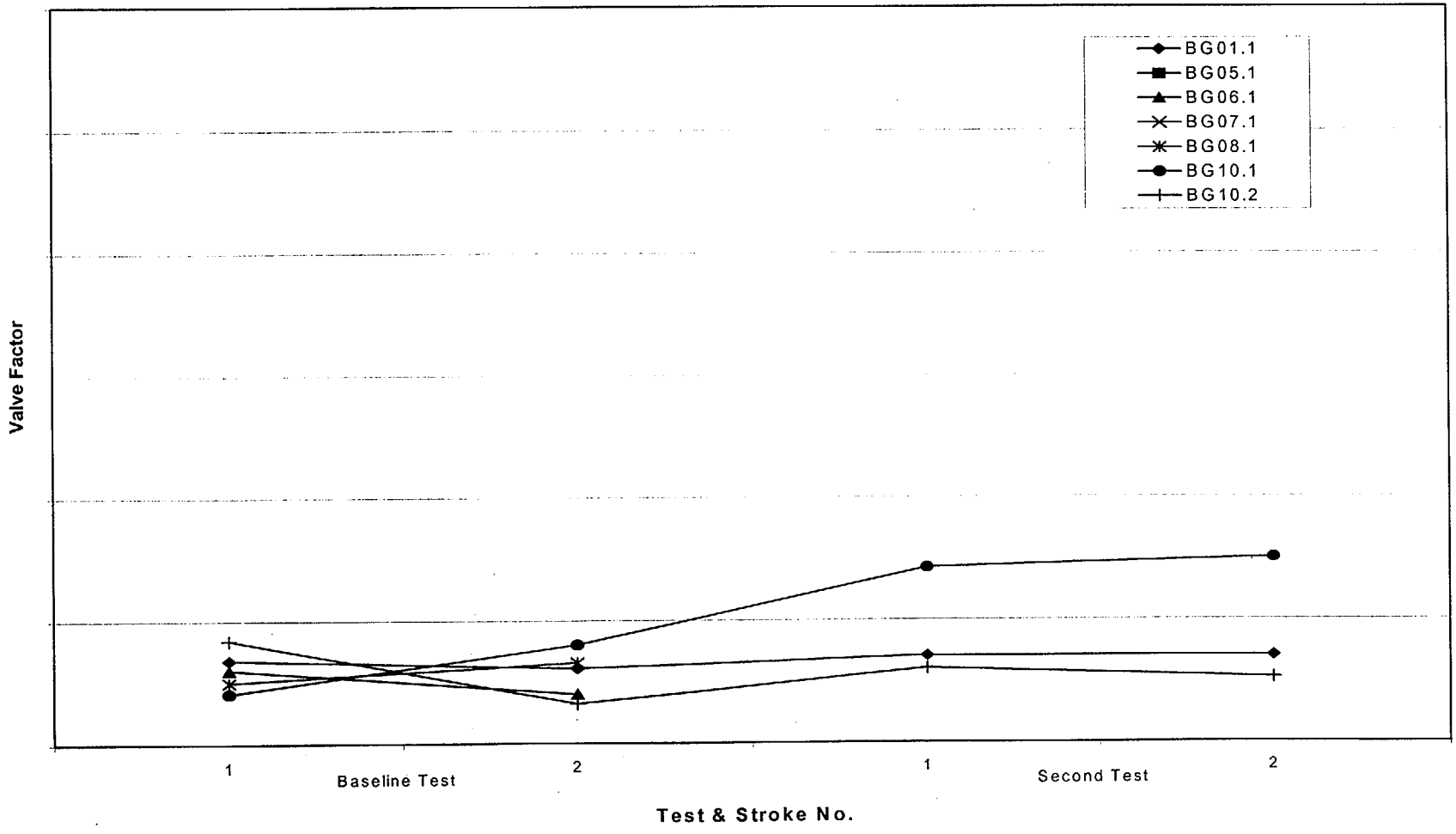


MPR

Balanced Disk Globe Valve Results

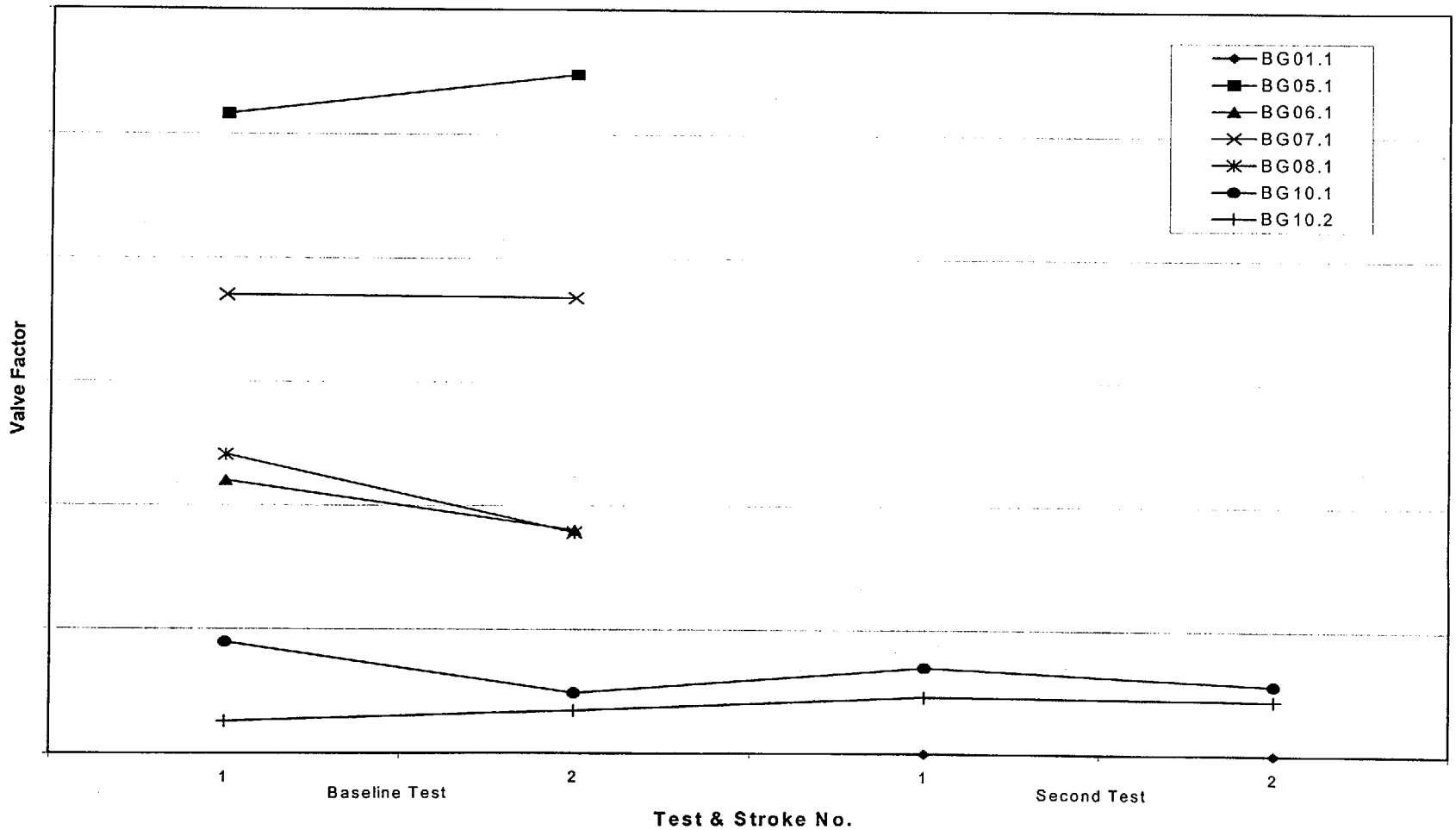
- Low thrust levels and low valve factors
- VFs tend to slightly decrease between strokes in a DP test
- 2 new repeat tests (3 total)
  - 2 valves show relatively constant valve factors between baseline and second tests at seating
  - 1 valve (BG10.1) shows small VF increase between baseline and second tests at seating
  - 2 repeat test at unseating show relatively constant valve factors between DP tests

Progression of Valve Factor for Balanced Disk Globe Valves at Seating



MPR

Progression of Valve Factor for Balanced Disk Globe Valves at Unseating

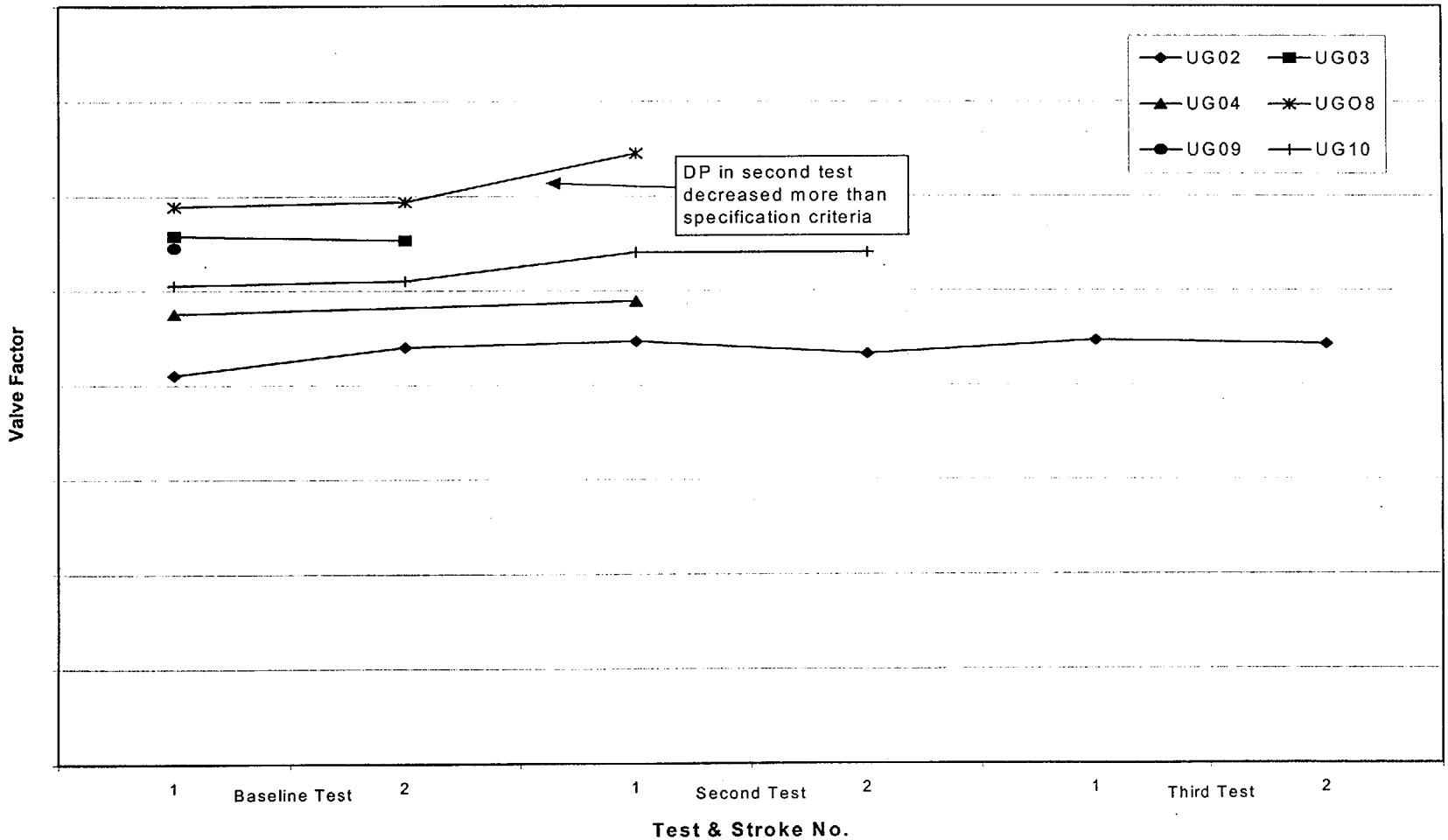


MPR

Unbalanced Disk Globe Valve Results

- "Normal" valve factors (near 1.0)
- Valve factors constant between subsequent DP strokes during DP Test
- 4 repeat tests - underseat water flow only
  - 3 valves show minor or no increase in seating VF
  - 1 valve (UG08) shows increase in seating VF between tests: DP decreased during second test more than specification criteria. Test results accepted on basis that third test will restore full DP.
  - 1 valve (steam flow) - not shown on plot. Different sensors used to measure stem thrust in tests; data do not appear comparable. We are still evaluating these data and resolving the issues with the plant.

Progression of Valve Factor for Unbalanced Disk Globe Valves at Seating (underseat flow)



MPR

Feedback to Program Participants

- Important Program issues and observations of valve test results are communicated back to plants via JOG Feedback Notices.
- Feedback Notice FN-01, Rev.1 issued April 1999 to communicate information on Aloyco split wedge gate valve with significant observed valve factor increase.
- Feedback Notice FN-02, Rev.0 issued October 1999 to address potential impact of under-filled matrix categories on Program coverage.
- Feedback Notice FN-03, Rev.0 issued February 2000 to address observed behavior of valve factors after valve disassembly.

Table 3-1: Gate Valve Test Matrix

JOG Test Matrix No	Reference	Manufacturer	Size (in)	Class (lb)	Disk Type	Disk Face Material	Seat Face Material	Disk Guide Face Material	Body Guide Face Material	Fluid	DP Strokes Per Year	Stem Orientation	As-Tested Valve Fac
G01.01	moved to G06.01												
G01.02		Velan	6	300	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	untreated water	0	Vertical	High
G06.01		Velan	12	150	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	untreated water	0	Horizontal	Low
G06.02		Velan	12	150	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	untreated water	0	Horizontal	Low
G08.01		Anchor/Darling	16	150	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	untreated water	4	Vertical	High
G08.02		Velan	8	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	untreated water	10	Vertical	High
G10.01		Anchor/Darling	18	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	untreated water	10	Horizontal	Low
G10.02		Anchor/Darling	18	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	untreated water	10	Horizontal	High
G10.03	replaced by G06.02												
G12.01		Velan	6	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	untreated water	0	Vertical	High
G15.01		Velan	12	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	untreated water	0	Horizontal	High
G15.02	moved to G10.03												
G17.01		Walworth	24	150	Solid Wedge	Stellite	Stellite	Stellite	Carbon steel	untreated water	1	Vertical	Low
G17.02		Walworth	20	150	Solid Wedge	Stellite	Stellite	Stellite	Carbon steel	untreated water	> 1	Vertical	Low
G20.01		Borg-Warner	4	300	Flexible Wedge	Stellite	Stellite	Carbon Steel	17-4 PH	untreated water	4	Vertical	
G22.01		Velan	6	150	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	treated/closed loop water	0	Horizontal	High
G22.02	moved to G27.14												
G22.03		Borg-Warner	8	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	1	Horizontal	High
G22.04	moved to G32.04												
G22.05	moved to G91.05												
G22.06	moved to G27.15												
G22.07		Anchor/Darling	12	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	Horizontal	Low
G22.08		Anchor/Darling	12	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	Horizontal	Low
G22.09		Walworth	10	150	Solid Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	treated/closed loop water	0	45 deg	Low
G22.10		Walworth	8	150	Solid Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	treated/closed loop water	0	45 deg	High
G22.11	moved to G99.07												
G22.12		Anchor/Darling	18	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water		Vertical	Low
G22.13	moved to G27.16												
G22.14		Anchor/Darling	18	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water		Vertical	High
G22.15	moved to G63.05												
G22.16	moved to G63.06												
G22.17		Anchor/Darling	18	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	reactor coolant water	0	20 deg	High
G22.18		Anchor/Darling	10	900	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	reactor coolant water	0	Horizontal	High
G22.19		Crane	14	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	120 deg	Low
G22.20		Crane	14	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	120 deg	Low
G22.21		Powell	24	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	reactor coolant water	2	Vertical	High
G22.22		Crane	24	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	reactor coolant water	2	Vertical	High

Table 3-1: Gate Valve Test Matrix

JOG Test Matrix No	Reference	Manufacturer	Size (in)	Class (lb)	Disk Type	Disk Face Material	Seat Face Material	Disk Guide Face Material	Body Guide Face Material	Fluid	DP Strokes Per Year	Stem Orientation	As-Tested Valve Fac
G22.23		Anchor/Darling	18	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	reactor coolant water	0	20 deg	High
G22.24		Walworth	10	150		Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water			
G27.01		Velan	6	150	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	treated/closed loop water	4	Horizontal	High
G27.02	moved to G92.02												
G27.03	moved to G89.02												
G27.04		Velan	3	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	16	Vertical	High
G27.05		Anchor/Darling	3	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	feedwater	6	Horizontal	High
G27.06		Velan	6	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	4	45 deg	Low
G27.07		Anchor/Darling	12	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	4	Horizontal	High
G27.08		Walworth	3	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	12	Horizontal	High
G27.09		Anchor/Darling	4	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	reactor coolant water	<50	Vertical	Low/High
G27.10		Anchor/Darling	4	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	20	Vertical	High
G27.11		Anchor/Darling	4	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	20	Horizontal	Low
G27.12	moved to G22.17												-
G27.13	replaced by G22.23												
G27.14		Velan	6	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	4	Horizontal	High
G27.15		Velan	12	150	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	8	Vertical	Low
G27.16		Anchor/Darling	4	600	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	21	105	High
G27.17		Powell	3	300	Solid Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	16	Horizontal	High
G27.18		Anchor/Darling	18	300	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	treated/closed loop water	10	Vertical	High
G32.01		Velan	6	150	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	treated/closed loop water	2	Vertical	
G32.02		Velan	8	150	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	treated/closed loop water	2	Vertical	
G32.03		Crane	16	300	Solid Wedge	Stellite	Stellite	Stellite	Carbon steel	treated/closed loop water	0	Horizontal	Low
G32.04		Velan	4	900	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	feedwater	0	Vertical	
G36.01		Anchor/Darling	3	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	steam	2	Vertical	Low
G36.02	moved to G22.21												
G36.03	moved to G22.22												
G36.04	moved to G41.07												
G41.01	moved to G27.18												
G41.02		Powell	10	900	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	steam	12	Vertical	Low
G41.03	moved to G27.17												
G41.04		Anchor/Darling	8	600	Flexible Wedge	Stellite	Stellite	Carbon steel	Carbon steel	steam	12	Vertical	High
G41.06		Anchor/Darling	8	600	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	steam	4	Horizontal	High
G41.07		Velan	4	600	Flexible Wedge	Stellite	Stellite	Carbon Steel	Carbon Steel	steam	12	Vertical	Low
G44.01	moved to G22.18												
G44.02		Walworth	4	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	treated/closed loop water	1	Vertical	Low
G44.03		Walworth	4	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	treated/closed loop water	1	Vertical	Low

Table 3-1: Gate Valve Test Matrix

JOG Test Matrix No	Reference	Manufacturer	Size (in)	Class (lb)	Disk Type	Disk Face Material	Seat Face Material	Disk Guide Face Material	Body Guide Face Material	Fluid	DP Strokes Per Year	Stem Orientation	As-Tested Valve Fac
G44.04		Powell	4	300	Solid Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0	Horizontal	High
G44.05		Powell	4	300	Solid Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0	Horizontal	High
G44.06		Powell	4	300	Solid Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0	Horizontal	Low
G44.07		Walworth	24	600	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	treated/closed loop water	0	Vertical	Low
G44.08		Walworth	12	600	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	treated/closed loop water	0	Vertical	Low
G44.09		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	0	Vertical	High
G44.10		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	0	Vertical	High
G44.11		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	1	Vertical	High
G44.12		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	1	Vertical	High
G44.13		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	1	Vertical	High
G44.14		Anchor/Darling	6	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	feedwater	1	Vertical	High
G44.15		Anchor/Darling	8	150	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0	Vertical	
G44.16	moved to G75.11												
G49.01		Anchor/Darling	6	300	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	treated/closed loop water	5<X<10	Vertical	Low
G49.02		Anchor/Darling	6	300	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	untreated water	12	45 deg	Low
G49.03		Anchor/Darling	4	900	Flexible Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	4	Vertical	Low
G52.01	moved to G44.16												
G54.01		Anchor/Darling	3	1500	Double Disk	Stellite	Stellite			treated/closed loop water	0	Vertical	Low
G54.02		Anchor/Darling	6	150	Double Disk	Stellite	Stellite			treated/closed loop water	0	Vertical	Low
G54.03		Anchor Darling	3	1500	Double Disk	Stellite	Stellite			reactor coolant	0	Vertical	Low
G55.01		Anchor/Darling	4	1500	Double Disk	Stellite	Stellite			reactor coolant water	10	Vertical	Low
G56.01		Anchor/Darling	4	1500	Double Disk	Stellite	Stellite			reactor coolant water	0	Vertical	Low
G56.02		Anchor/Darling	6	150	Double Disk	Stellite	Stellite			treated/closed loop water	0	Vertical	Low
G56.03		Anchor/Darling	4	1500	Double Disk	Stellite	Stellite			reactor coolant water	0	Vertical	Low
G57.01		Anchor/Darling	6	300	Double Disk	Stellite	Stellite			treated/closed loop water	1.5	Horizontal	High
G57.02		Anchor/Darling	8	300	Double Disk	Stellite	Stellite			reactor coolant water	0	45 deg	High
G57.03		Anchor/Darling	8	300	Double Disk	Stellite	Stellite			reactor coolant water	0	Vertical	High
G58.01		Anchor/Darling	4	300	Double Disk	Stellite	Stellite			treated/closed loop water	4	Vertical	High
G58.02		Anchor/Darling	8	150	Double Disk	Stellite	Stellite			untreated water	6	Vertical	Low
G59.01		Anchor/Darling	4	900	Double Disk	Stellite	Stellite			feedwater	0	Horizontal	High
G59.02		Anchor/Darling	6	300	Double Disk	Stellite	Stellite			reactor coolant water	0	Horizontal	High
G60.01		Anchor/Darling	10	600	Double Disk	Stellite	Stellite			steam	10	Vertical	
G60.02		Anchor/Darling	4	900	Double Disk	Stellite	Stellite			steam	12	Vertical	Low
G60.03		Anchor/Darling	4	600	Double Disk	Stellite	Stellite			steam	6	Horizontal	High
G60.04		Anchor/Darling	10	900	Double Disk	Stellite	Stellite			steam	8	Vertical	High
G63.01		Aloyco	6	150	Split Wedge	Stellite	Stellite	Stellite	300 series SS	treated/closed loop water	1.5	Vertical	Low
G63.02		Aloyco	6	300	Split Wedge	Stellite	Stellite			reactor coolant water	1	Horizontal	Low

Table 3-1: Gate Valve Test Matrix

JOG Test Matrix No	Reference	Manufacturer	Size (in)	Class (lb)	Disk Type	Disk Face Material	Seat Face Material	Disk Guide Face Material	Body Guide Face Material	Fluid	DP Strokes Per Year	Stem Orientation	As-Tested Valve Fac
G63.03		Crane-Aloyco	8	300	Split Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0	Vertical	Low
G63.04		Aloyco	6	150	Split Wedge	Stellite	Stellite		300 series SS	reactor coolant water	0	Vertical	High
G63.05		Crane-Aloyco	6	300	Split Wedge	Stellite	Stellite			reactor coolant water	0	Vertical	Low
G63.06		Crane-Aloyco	6	300	Split Wedge	Stellite	Stellite			reactor coolant water	0	Vertical	Low
G65.01		Aloyco	8	150	Split Wedge	Stellite	Stellite	300 series SS	Stellite	treated/closed loop water	0	Vertical	High
G65.02		Crane-Aloyco	8	300	Split Wedge	Stellite	Stellite	300 series SS	300 series SS	reactor coolant water	0		High
G69.01		Westinghouse	8	316	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	45 deg	Low
G69.02		Westinghouse	6	150	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	Vertical	Low
G69.03		Westinghouse	3	1500	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant water	1	Vertical	High
G69.04		Westinghouse	3	2035	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant water	1	Vertical	Low
G69.05		Velan	4	1500	Flexible Wedge	Stellite	Stellite	Stellite	Stellite	reactor coolant water	0	Vertical	Low
G69.06		Westinghouse	6	900	Flexible Wedge	Stellite	Stellite	Stellite	17-4PH	reactor coolant water	0.7	Vertical	High
G69.07		Westinghouse	3	2035	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant water	0	Vertical	Low
G69.08		Velan	12	300	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Vertical	Low
G69.09		Velan	6	1500	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Vertical	Low
G69.10		Velan	3	1500	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Vertical	Low
G69.11		Velan	3	1500	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Vertical	Low
G69.12		Westinghouse	10	300	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	Vertical	Low
G69.13		Anchor/Darling	12	900	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	reactor coolant water	0	Vertical	Low
G69.14		Velan	16	150	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	treated/closed loop water	0	Horizontal	Low
G73.01	moved to G69.12												
G73.02		Velan	4	1500	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	10	Vertical	High
G75.01		Westinghouse	8	1525	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	Vertical	High
G75.02		Westinghouse	8	316	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	45 deg	Low
G75.03		Westinghouse	4	900	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	0	Vertical	High
G75.04		Westinghouse	3	2035	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant water	1	Vertical	High
G75.06		Westinghouse	6	1525	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant water	0.7	Vertical	High
G75.07		Westinghouse	6	150	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	treated/closed loop water	1	Vertical	High
G75.08		Velan	12	300	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Vertical	High
G75.09		Westinghouse	3	2035	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	reactor coolant	0	Vertical	High
G75.10		Velan	16	150	Flexible Wedge	Stellite	Stellite	Stellite	Carbon steel	treated/closed loop water	0	Horizontal	High
G75.11		Velan	14	900	Flexible Wedge	Stellite	Stellite	Stellite	300 series SS	reactor coolant water	0	Horizontal	High
G79.01	moved to G69.13												
G79.02		Westinghouse	12	1525	Flexible Wedge	Stellite	Stellite	Stellite	17-4 PH	hot water	0	Vertical	High
G81.01		Ring-O	8	900	Flexible Wedge	Stellite	Stellite	Stellite	Stellite	steam	5<X<10	Vertical	High
G83.01		Borg-Warner	3	1500	Flexible Wedge	Stellite	Stellite	300 series SS	17-4 PH	treated/closed loop water	0	Horizontal	Low
G83.02		Borg-Warner	4	1500	Flexible Wedge	Stellite	Stellite	300 series SS	17-4 PH	treated/closed loop water	1	Horizontal	Low

Table 3-1: Gate Valve Test Matrix

JOG Test Matrix No	Reference	Manufacturer	Size (in)	Class (lb)	Disk Type	Disk Face Material	Seat Face Material	Disk Guide Face Material	Body Guide Face Material	Fluid	DP Strokes Per Year	Stem Orientation	As-Tested Valve Fac
G83.03		Borg-Warner	4	900	Flexible Wedge	Stellite	Stellite	316 Stainless Steel	17-4 PH	feedwater	0	Vertical	High
G84.01	moved to G83.03												
G85.01		Borg-Warner	4	1500	Flexible Wedge	Stellite	Stellite	300 series SS	17-4 PH	hot water	1	Horizontal	High
G88.01		Powell	8	150	Solid Wedge	13Cr	13Cr	Carbon steel	Carbon steel	treated/closed loop water	0	Horizontal	High
G88.02	moved to G89.03												
G89.01		Powell	8	150	Solid Wedge	13Cr	13Cr	Stainless Steel	Carbon steel	untreated water/treated	10	Vertical	Low
G89.02		Powell	4	300	Solid Wedge	13Cr	13Cr	13Cr	Carbon steel	treated/closed loop water	16	Vertical	Low
G89.03		Walworth	12	150	Solid Wedge	13Cr	13Cr	Carbon steel	Carbon steel	untreated water	4	Horizontal	
G90.01		Powell	8	150	Solid Wedge	13Cr	13Cr	Stainless Steel	Carbon steel	untreated water/treated	10	Vertical	Low
G91.01	moved to G22.19												
G91.02	moved to G22.20												
G91.03		Powell	4	150	Flexible Wedge	13Cr	Stellite	13Cr	Carbon Steel	treated/closed loop water	<2	Horizontal	High
G91.04		Crane	18	300	Solid Wedge	13Cr	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	Horizontal	High
G91.05		Powell	6	150	Solid Wedge	13Cr	Stellite	Carbon steel	Carbon steel	treated/closed loop water	0	Vertical	
G92.01		Powell	18	300	Flexible Wedge	13Cr	Stellite	Carbon steel	Carbon steel	reactor coolant water	12 - 15	Horizontal	High
G92.02		Walworth	18	300	Solid Wedge	13Cr	Stellite	Carbon steel	Carbon steel	treated/closed loop water	4	Horizontal	Low
G96.01		Crane	16	900	Flexible Wedge	Stellite	Stellite	Stellite	Malcolmized type 410	treated/closed loop water	0	70 deg	High
G96.02		Crane	16	900	Flexible Wedge	Stellite	Stellite	Stellite	Malcolmized type 410	treated/closed loop water	0	70 deg	Low
G98.01		Anchor/Darling	16	300	Double Disk	Deloro 50	Deloro 50			treated/closed loop water	0	Horizontal	Low
G99.01		Crane	3	300	Solid Wedge	410 Stainless St	Monel	Carbon steel	Carbon steel	treated/closed loop water	12	Vertical	High
G99.02		Crane	3	300	Solid Wedge	410 Stainless St	Monel	Carbon steel	Carbon steel	treated/closed loop water	12	Vertical	High
G99.03		Crane	6	600	Solid Wedge	Exelloy	Monel	300 series SS	Carbon steel	treated/closed loop water	0	Horizontal	Low
G99.04		Crane	6	600	Solid Wedge	Exelloy	Monel	300 series SS	Carbon steel	treated/closed loop water	0	Horizontal	High
G99.05		Crane	6	600	Solid Wedge	Exelloy	Monel	300 series SS	Carbon steel	treated/closed loop water	0	Horizontal	High
G99.06		Pacific	6	150	Flexible Wedge	12Cr	Monel	Carbon steel	Carbon steel	treated/closed loop water	0	Vertical	High
G99.07		Walworth	8	150	Solid Wedge	410 Stainless St	Monel	Carbon steel	Carbon steel	treated/closed loop water	1	Horizontal	Low

Table 3-2: Butterfly Valve Test Matrix

JOG Test Matrix No.	Reference	Manufacturer	Size (in)	Bearing Material	Fluid	Total Strokes Per Year	DP Strokes Per Year	Stem Orientation	Normal Position
B01.1		Clow	10	Bronze	untreated water	10	10	Horizontal	Open
B01.2		Clow	10	Bronze	untreated water	10	10	Horizontal	Open
B03.1	moved to B20.2								
B03.2		Clow	20	Bronze	untreated water	1	1	Horizontal	Open
B05.1	moved to B25.3								
B06.1		Crane/Flowseal	6	Bronze	untreated water	2	0	Vertical	Open
B07.1		Henry Pratt	30	Bronze	untreated water	8	8	Horizontal	Closed
B08.1		Contromatics	14	Bronze	untreated water	4	1	Horizontal	Closed
B09.1		ACE	20	Bronze/Graphite	untreated water	40	15	Vertical	Closed
B10.1		Henry Pratt	6-20	Bronze	untreated water			Vertical	Closed
B10.2	moved to B08.1								
B11.1		Contromatics	10	Bronze	treated/closed loop water	20	10	Horizontal	Open
B12.1		Fisher Controls	8	Bronze/Graphite	treated/closed loop water	4	2	Horizontal	Open
B12.2		Henry Pratt	12	Bronze	treated/closed loop water	4	4	Horizontal	Open
B13.1		Contramatics	10	Bronze	treated/closed loop water	10	10	Vertical	Open
B15.1		Henry Pratt	14	Bronze	treated/closed loop water	2	0	Vertical	Closed
B16.1		Henry Pratt	24	Fiberglass/Teflon	untreated water	16	12	Vertical	Closed
B16.2		Pratt	96	Fiberglass/Teflon	untreated water	12.3	12.3	Vertical	Open
B16.3		Henry Pratt	18	Nylatron	untreated water	4	4	Vertical	Open
B20.1		Henry Pratt	24	Fiberglass/Teflon	untreated water	2	2	Horizontal	Closed
B22.1		Henry Pratt	10	Fiberglass/Teflon	treated/closed loop water	8	8	Vertical	Open
B22.2		Henry Pratt	10	Fiberglass/Teflon	treated/closed loop water	8	8	Vertical	Open
B22.3		Jamesbury	16	Fiberglass/Teflon	treated/closed loop water	50	50	Vertical	Open
B22.4		Hills-Mccanna	16	Tefzel	treated/closed loop water	4	4	Vertical	Open
B24.1	moved to B22.4								
B25.1		Centerline	6-12	SS/Teflon	untreated water	4-8	4-8	Vertical	Closed
B25.2	replaced by G57.03								
B25.3		Allis-Chalmers	24	SS/Teflon	untreated water	5.5	5.5	Vertical	Open
B28.1		Centerline	20	SS/Teflon	untreated water			Vertical	Open
B29.1		Jamesbury	10	SS/Teflon	reactor coolant water	8	4	Horizontal	Closed
B30.1		Centerline	8-16	SS/Teflon	treated/closed loop water	1-4	1-4	Vertical	Open/Closed
B30.2		Henry Pratt	12	SS/Teflon	treated/closed loop water	6	0	Vertical	Open
B30.3		Jamesbury	12	SS/Polyethylene	treated/closed loop water	6	0	Vertical	Open
B30.4	moved to B29.1								

Table 3-3: Balanced Disk Globe Valve Test Matrix

17-Apr-00

JOG Test Matrix No	Manufacturer	Reference	Size (in)	Class (lb)	Disk Guide Material	Body Guide Material	Fluid	DP Strokes Per Year
BG01.1	Fisher Controls		4	900	Stellite	17-4 PH	feedwater	75
BG02.1		moved to BG01.1						
BG05.1	Fisher Controls		4	300	300 series Stainless Steel	400 series Stainless Steel	treated/closed loop water	6
BG06.1	Copes-Vulcan		10	150	400 series Stainless Steel	400 series Stainless Steel	untreated water	1
BG06.2	CCI		8	300	410 Stainless Steel	300 series Stainless Steel	reactor coolant water	1
BG07.1	Valtek		10	900	316 Stainless Steel	Bronze	feedwater	4
BG08.1	CCI		2	900	410 Stainless Steel	Carbon steel	feedwater	0
BG10.1	Copes-Vulcan		12	150	17-4 PH	Stainless Steel	untreated water	4
BG10.2	Copes-Vulcan		16	150	17-4 PH	Stainless Steel	untreated water	4

Table 3-4: Unbalanced Disk Globe Valve Test Matrix

JOG Test Matrix	Manufacturer	Size (in)	Class (lb)	Fluid
UG01	Valtek	16	300	feedwater
UG02	Fisher Controls	6	300	untreated water
UG03	Powell	4	600	feedwater
UG04	Anchor/Darling	18	300	reactor coolant water
UG05	Yarway	1.5	1500	reactor coolant water
UG06	Yarway	1.5	1500	reactor coolant water
UG07	Walworth	4	600	steam
UG08	Velan	2	1500	reactor coolant water
UG09	Anchor/Darling	18	300	suppression pool
UG10	Velan	2	1500	reactor coolant water
UG11	Velan	2	1500	reactor coolant water
UG12	Velan	2	1500	treated/closed loop water
UG13	Walworth	4	600	steam

Attachment 6

BWR OWNERS' GROUP DC MOTORS

PRESENTATION TO NRC

April 19, 2000

White Flint, MD

BRIAN BUNTE (ComEd)

BWROG VTRG CHAIRMAN

BWROG DC MOTORS

PRIMER

- <u>Issue</u>: Motor speed/output affected by stem load, supplied voltage and winding temperature.
- <u>Potential Impact:</u>
  - Longer MOV stroke times
  - Lower motor output (torque), thus lower valve thrust

BWROG DC MOTORS

NOTABLE EVENTS SINCE LAST BRIEF

- Oct 99: Draft 1 of report issued to VTRG for review (Limitorque on distribution for advance review); ~ 180 utility comments received.
- Dec 99: VTRG Telecon with MPR to discuss utility Draft 1 comments; MPR addressed all comments.
- Feb 00: Draft 2 of report issued to VTRG for review (Limitorque on distribution with official request for review/endorsement); ~ 20 additional comments received; VTRG-MPR discussed/addressed at Feb VTRG meeting.
- Mar 00: Final BWROG Report (Rev 0) issued to utilities (Limitorque on distribution).

BWROG DC MOTORS

NRC INTERFACE

- Have kept NRC briefed on program status:
  - Apr 99 & Oct 99 JOG PV-NRC Status Meetings
  - Aug 99 & Dec 99 EOC-NRC Management Meetings
  - Planned Jul 00 NRC/ASME Pump and Valve Symposium
- NRC has supported BWROG schedule and is interested in reviewing the final report.

BWROG DC MOTORS

SCHEDULE

- Final BWROG Report issued: Week of March 6
- Primary Representative Report Approval: Week of March 27
- Executive/Prime Rep Letters: Week of April 10
- Anticipated Limitorque Review/Endorsement: Summer 2000
- Anticipated NRC-BWROG meeting to discuss: July 2000?