



## White Paper

# Tilted Disc® Check Valve Hydrostatic and Cycle Test Report

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**HYDROSTATIC AND CYCLE TESTING OF  
20 INCH TILTED DISC CHECK VALVE  
VAL-MATIC MODEL NO. 9820**

**Prepared For:**

**Val-Matic Valve and Mfg. Corp.**

**Prepared By:**

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**October 1982**

# Tilted Disc® Check Valve Hydrostatic and Cycle Test Report

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## 1.0 SUMMARY AND CONCLUSIONS

Testing of the 20 inch tilted disc check valve consisted of a series of hydrostatic and cycle tests. Test specifications are summarized in Section 2.0. These specifications were developed based on Standard Practice paper SP-61 of the Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. and American Water Works Association Standard C508-82 for Swing Check Valves.

All tests were performed at the manufacturing facilities of Val-Matic Valve and Mfg. Corp. The valve testing was performed in October 1982 and was witnessed in its entirety by Bruce E. Burris, who is a registered Professional Engineer in the state of Illinois.

Data obtained from testing of the 20 inch tilted disc check valve can be summarized as follows:

### Hydrostatic Tests

#### Shell Test

| Cycle Test Interval | Specification | Results |
|---------------------|---------------|---------|
| 0                   | No Leakage    | No      |
| 5,000               |               | Leakage |
| 50,000              |               |         |
| 100,000             |               |         |
| 150,000             |               |         |
| 200,000             |               |         |
| 250,000             |               |         |

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## Seat Tests

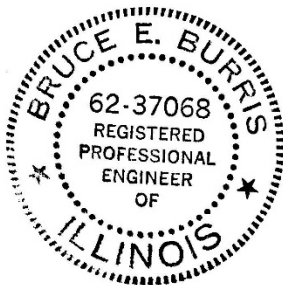
### Seat Test @ 150 psig

| Cycle Test Interval  | Specification       | Results          |
|----------------------|---------------------|------------------|
| 0                    | 1 fluid oz/hr/inch  | No leakage       |
| 100,000              | of nominal valve    | .4 oz. per hr.   |
| 150,000 <sup>2</sup> | size <sup>1</sup> . | 3.0 oz. per hr.  |
| 200,000 <sup>2</sup> | 20" valve = 20 oz.  | 8.0 oz. per hr.  |
| 250,000              | leakage per hour.   | 13.8 oz. per hr. |

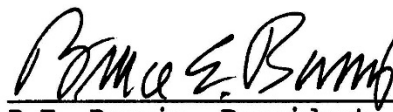
### Seat Test @ 16 Inches of Water Column

| Cycle Test Interval | Specification | Results         |
|---------------------|---------------|-----------------|
| 0                   | None          | .75 oz. per hr. |
| 5,000               | Applicable    | .20 oz. per hr. |

It is, therefore, concluded that the 20 inch tilted disc check valve has met all applicable specifications.



Prepared By:

  
B.E. Burris, President  
ASCON Engineers, Inc.

- Notes:
- 1.) Per American Water Works Association Swing Check Valve Standard C508-82 for new valve.
  - 2.) Data interpolated.

## 2.0 TEST SPECIFICATIONS

### 2.1 Hydrostatic Test Specifications

#### Shell Test

The shell of the assembled 20 inch valve shall be given a hydrostatic pressure test at 300 psig. There shall be no leakage through the castings or joints of the assembled valve for a period of 180 seconds.

#### Seat Test

The assembled check valve shall be given a hydrostatic pressure test with the disc closed and pressure applied to the downstream end while the inlet end is open to atmosphere. Test pressure shall be 150 psig. Maximum permissible leakage shall be 1 fluid oz/hr/inch of nominal valve size<sup>1</sup>.

### 2.2 Cycle Test Specifications

The 20 inch tilted disc check valve shall be cycle tested while in a horizontal position to duplicate the actual valve operating position. The end flanges shall be fitted with blind flanges and the valve shall be filled with water to a level sufficient to wet the contact surfaces. A mechanical device shall be attached to the disc via linkages. This device will be motor driven and will lift the disc from the closed position to the fully open position. Once the disc reaches the open position and contacts the body stops, the over-travel of the cycling device will be taken up by a spring.

Notes: 1.) Per American Water Works Association Swing Check Valve Standard C508-82 for new valve.

When the drive linkage reaches the apex of the up-stroke, the mechanical drive will disengage and allow the disc to fall by gravity to the closed position.

The cycle shall be repeated for a total of 250,000 cycles. The pivot pins will be lubricated prior to the beginning of the cycle test and at 5,000 cycle intervals thereafter.

Upon completion of the cycle test, the valve seating will be wiped clean and re-tested for seat leakage as described in the Hydrostatic Test Specifications. The maximum allowable leakage rate shall not exceed the rate of 1 fluid oz/hr/inch (20 inch valve = 20 oz. total leakage) of nominal valve size<sup>1</sup>.

## **2.3 Pressure Gage Calibration**

The pressure gage used in the 20 inch tilted disc check valve testing was a U.S. Gage 1404 with a pressure range of 0-600 psi. On October 15, 1982, the above gage was calibrated and certified by Master Gauge Company of Chicago, Illinois to an accuracy of 0.25 percent.

## **3.0 HYDROSTATIC TESTING**

### **3.1 Seat Test**

For the seat test, the assembled 20 inch valve was tested in the vertical position.

Notes: 1.) Per American Water Works Association Swing Check Valve Standard C508-82 for new valve.



Prior to testing, the disc was manually pulled to an open position and allowed to fall by gravity to the closed position.

A blind flange, with two 1 inch valve fittings, was then installed on the downstream end of the 20 inch valve. One of the fittings served as the source which supplied the 150 psig water pressure. The other 1 inch fitting and valve served to vent the excess air and water present during the filling process and was subsequently closed. On this same fitting, the pressure gage discussed in Section 2.3, was mounted to document the pressure during the hydrostatic test.

The 150 psig water pressure was generated by a Sprague Model S-216-C air-driven hydraulic pump.

The assembled valve was then lifted and held in place by a fork lift truck. The opening at the inlet end was left open to atmosphere while a hydrostatic pressure of 150 psig was applied to the downstream end. Prior to starting the test, the valve unit was wiped and blown dry.

Resulting leakage rates were monitored for a period of 1 hour at the pressure of 150 psig. After several minutes of testing at the pressure of 150 psig, it soon became apparent that no significant amount of leakage would result.



At this point, clean paper was positioned underneath the valve and the area was closely observed during the hour test period. No leakage, whatsoever, was observed during the 150 psig - 1 hour hydrostatic test.

At this time, permission was requested from the manufacturer to conduct a similar test at the line pressure of the city water supply. This was suggested to represent a slightly more critical test from the leakage standpoint since the disc would have less pressure to force the disc up against the seat.

Before this test was begun, all line pressure was removed from the downstream side of the valve and then the unit was brought up to a line pressure of 45 psig. After the valve was wiped and blown dry, the test was begun. Only after 15 minutes of testing at 45 psig was a single drop of leakage observed. The test was concluded at 15 minutes.

A further extension of the seat test was suggested and subsequently agreed upon by the manufacturer. For this test all line pressure was removed, leaving only the pressure due to approximately 16 inches of water column above the middle position of the valve disc. Due to the low hydraulic head on the disc and seat, the leakage was originating along the entire perimeter of the disc. For this reason, a plastic cone was fabricated for the test to collect the leakage.

The seat test at 16 inches of water column was run for 10 minutes with an observed leakage rate of 0.75 oz.

## **3.2 Shell Test**

The assembled 20 inch valve was installed in a vertical position on the test rig. A block of wood was positioned between the disc and seat to fix the valve in the partially open position. This allowed a hydrostatic pressure of 300 psig to reach all interior surfaces of the valve. The same blind flange described in Section 3.1 was installed on the downstream side of the valve to supply the 300 psig water pressure called for in the specification.

The 300 psig water pressure was generated by a Sprague Model S-216-C air-driven hydraulic pump. A pressure of 300-305 psig was maintained throughout the 3 minute hydrostatic test.

No leakage through the castings or joints was observed during the 180 second hydrostatic test.

## **4.0 CYCLE TESTING**

### **4.1 Cycle Test Apparatus**

The Cycle Test Apparatus is driven by a 1/8 hp variable speed DC motor with a gear reducer and speed controller. The valve disc is cycled through the closed to fully open position by a linkage designed to lift until the apex of the up-stroke is reached.

The linkage then disengages to allow the disc to fall by gravity to the closed position. The time for the mechanism to complete one complete cycle was measured to be 4.6 seconds.

A 5-digit counter was installed on the assembly which is tripped at the completion of every cycle. The whole assembly is bolted to the inspection port on the downstream side of the 20 inch valve.

Prior to the beginning of the cycle testing, the cycle was observed through several cycles to verify that the mechanism was lifting to the full open position and that it was allowing the disc to come to a full closed position. A disc position indicator, located on the side of the 20 inch valve, further verified proper travel of the disc through the complete cycle.

## **4.2 Cycle Testing**

After having been satisfied that the testing mechanism was putting the valve disc through the proper cycle, blind flanges were installed on the inlet and downstream ends of the valve. With the 20 inch valve in a horizontal position, the interior of the valve was filled with enough water to wet the pivot pins.

The counter was set to zero and the cycle test was begun. With the cycle test in process, it was again confirmed that the full open and full closed position was being attained by the disc.

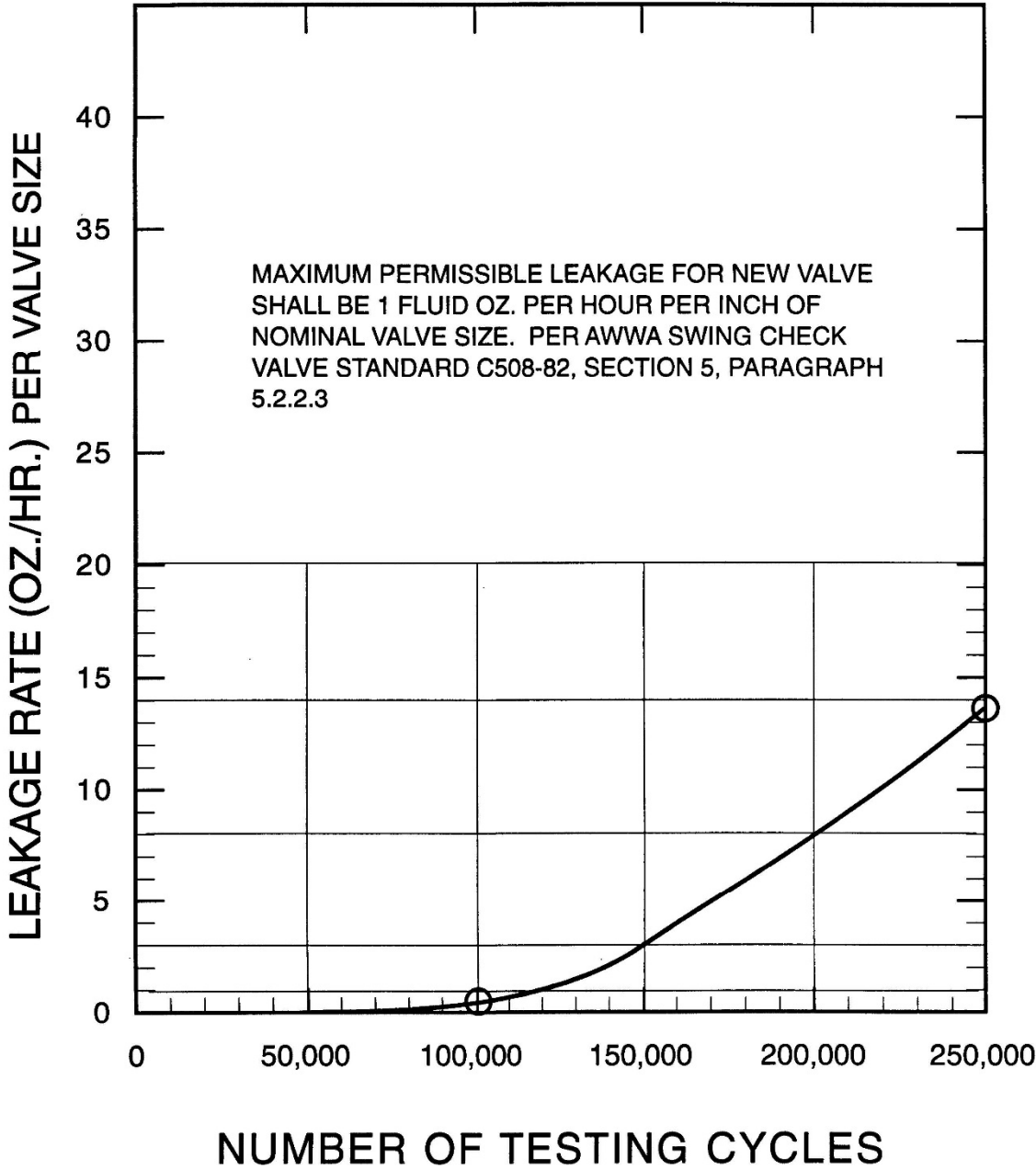
Confirmation was achieved by listening for the sound of the disc hitting the stops at the full open position and the visible action of the linkage bar at the closed position.

The cycle testing was allowed to run for a total of 250,000 cycles. The pivot pins were lubricated prior to beginning the cycle test and at 5,000 cycle intervals thereafter.

At the completion of the cycle test, the valve seating was wiped clean and inspected for wear. After 250,000 cycles of testing there was no appreciable wear of the disc or seat.

Immediately following the above 250,000 cycle inspection, the 20 inch valve was re-tested for seat leakage following the identical procedure as described in Section 3.1. Resulting leakage rates were monitored for a period of 1 hour at the pressure of 150 psig. During the 1 hour period only several drops were observed to fall into the graduated cylinder.

Seat leakage rates at a pressure of 45 psig and 16 inches water column were a few drops in 10 minutes and 0.20 oz. in 10 minutes, respectively.



|  |  |
|--|--|
| <div>LEAKAGE RATE</div> <div>20 INCH TILTED DISC CHECK VALVE</div> <div>VAL-MATIC MODEL NO. 9820</div> | <div>ASCON ENGINEERS</div> <div>DEERFIELD ILLINOIS 60015</div> <div></div> <div></div> <div></div> <div></div> |
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## *Disclaimer*

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