



Project: --

Client: **Flowserve Flow Control (UK) Ltd., England**

Office: **Chennai**

Clients Order Number: **Signed Request for Services Signed by Audco India Ltd.,
dt. 03.03.2006**

Date: **13 March 2006**

Order Status: **Incomplete**

Inspection Dates

First: **13 March 2006**

Final: **13 March 2006**

This certificate is issued to **Flowserve Flow Control (UK) Ltd.**, to certify that the undersigned Surveyor to Lloyd's Register Asia did, at their request, attend their **MANAPAKKAM** works of **Audco India Limited**, on **13 March 2006** for the purpose of witnessing **Fire Test** on the following valve in accordance with **ISO 10497-2004 & API 607 5th Edition**.

Description:

Item : **WORCESTER F44 SERIES FLOATING BALL VALVE
ENDS SCREWED; SIZE : 2" (50mm); Class : 300**

Valve Sl. No. : **A00156**

Drg. No. : **F-44-1220-008 Rev.C**

As per the specification, the range of valves qualified is as under:

Size : **2" & below, 2 1/2", 3", 4"**



Pressure Class : **Cl.300, Cl.400, Cl.600.**

Enclosed manufacturer's Fire Test Report No.FFC-FBV/004 dated 13.03.2006 duly endorsed for test results.

Note: This certificate has been issued to **Flowserve Flow Control (UK) Ltd.** England at the request of the client **Audco India Ltd., Chennai**

Conclusion:

The results obtained during the Fire test were found to be in compliance to the requirements of the aforementioned specifications.

C.RAJU
Surveyor to Lloyd's Register Asia

A member of the Lloyd's Register Group

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FIRE TEST REPORT

| | | | |
|---------------------------------|--|--------------------|-----------------------|
| VALVE TYPE | : Floating Ball Valve | TEST REPORT NO | : FFC-FBV / 004 |
| SIZE (DN,NPS) | : DN 50 mm (2 inch) | DATE | : 13/03/06 |
| CLASS / PN RATING | : CLASS 300 (PN 40) | TEST VENUE | : Audco India Ltd |
| END CONNECTION | : Screwed | | : Chennai 600089 |
| GENERIC MATERIAL OF CONSTRUCTIO | : Stainless steel | ITEM ID | : A00156 |
| GENERIC SEAT MATERIAL | : Virgin PTFE | VALVE GA DRAWING | : F-44-1220-008 Rev-C |
| GLAND PACKING | : Flexible graphite | PATTERN | : Reduced bore |
| FIRE TEST SPECIFICATION | : ISO 10497- 2004 & API 607 5 th Edition | VALVE PRODUCT CODE | : F44-6666TZSEPSEP |
| | | WOECHESTER | : F44 Series valves |

READINGS:

| DETAILS | Test Pressure (bar) | Test Duration (min) | SIGHT GAUGE | | TOTAL QTY (ml) | QTY Thro Relief (ml) | LEAKAGE (ml) | |
|--|---------------------|---------------------|---|-----------|----------------|----------------------|-------------------|--------------------|
| | | | Calibration | | | | Through Valve (c) | External a - (b+c) |
| | | | 1 mm = 20 ml | | | | | |
| | | | INITIAL (i) | FINAL (f) | | | | |
| Burn Period | 2 | 30 | 385 | - | - | - | - | |
| Cool Down Period | 2 | 10 | - | 415 | - | - | - | |
| Burn & Cool Down | 2 | 40 | 415 | 408 | - | - | - | |
| SEAT TEST(low pressure) | 2 | 5 | - | - | - | - | - | |
| Operational Test (Against Differential Pressure) | | | Fully opened against differential pressure of 38.2 bar , Operation was smooth | | | | | |
| External Leak (High pressure) | 38.2 | 5 | - | - | - | - | 185 | |

Time required for valve to cool to 100°C: 6 minutes
 Valve rated pressure 51 bar at 75 % it is 38.2bar

PERFORMANCE:

| DETAILS | LEAK RATE (ml / min) | |
|---|------------------------|-----------|
| | Actual | Allowable |
| Through Leakage - During Burn Period | NIL | 200 |
| External Leakage - During Burn and Cool-down Period | NIL | 50 |
| Through Leakage (low Test Pressure) - After cool down | NIL | 80 |
| Operation of Test Valve After Fire Test - Against Differential Pressure | Smooth | |
| External Leakage (High Test Pressure) - Open Position | 37.0 | 200 |

All thermocouples , Temperature Recording Instruments and Pressure Monitoring Devices were verified to be with valid calibration.

Temperature readings taken during test are attached.

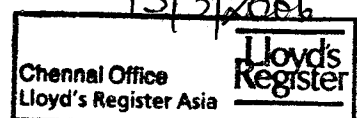
CONCLUSION : The Valve performance was normal throughout the tests and met the specification requirements fully. Fire test valve has passed all the required hydro static , air type production tests

QUALIFICATION :

| | |
|---------------------|--|
| Size | 50 & below; 65;80;100 / (2 & below;21/2;3;4 inch) |
| Pressure Rating | 300;400;600 (PN 40;63;100.) |
| Valve Pattern | FULL BORE , REDUCED BORE |
| Seat material | FILLED PTFE; PTFE |
| Body End Connection | SCREWED;BUTTWELD; FLANGED |

| | |
|--------------------------------|------------------------|
| TEST CONDUCTED BY : AIL | |
| N Thankappan | <i>N. Thankappan</i> |
| R Muruganantham | <i>R Muruganantham</i> |

| |
|--|
| TEST WITNESSED BY : Lloyds Registrar asia |
| C.Raju |



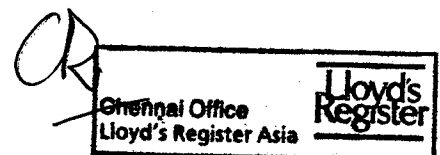
FIRETEST LOG SHEET
 DN-50 FFC- FLOATING BALL VALVE
 Pressure Rating : Class 300

Stainless steel

REPORT NO-004
 DATE: 13/03/06

| Time in min | Test Pressure in bar | ChannelTemp in Deg C | | | | | | Average of Body & stem calorimeter is greater than 650° c | Average of Body & stem flame is greater than 750° c |
|-------------|----------------------|----------------------|------------------|--------------------|--------------------|------------|------------|---|---|
| | | Stem calorimeter | Body calorimeter | Body thermo couple | Stem thermo couple | Body flame | Stem flame | | |
| 0.0 | 2.0 | 37 | 36 | 38 | 36 | 36 | 37 | NA | NA |
| 0.5 | 2.0 | 40 | 40 | 60 | 80 | 45 | 51 | NA | NA |
| 1.0 | 2.0 | 80 | 80 | 180 | 504 | 520 | 480 | NA | NA |
| 1.5 | 2.0 | 397 | 490 | 412 | 734 | 981 | 1025 | NA | TRUE |
| 2.0 | 2.0 | 413 | 498 | 420 | 732 | 981 | 1025 | NA | TRUE |
| 2.5 | 2.0 | 413 | 505 | 420 | 732 | 981 | 1024 | NA | TRUE |
| 3.0 | 2.0 | 476 | 551 | 419 | 737 | 977 | 1023 | NA | TRUE |
| 3.5 | 2.0 | 525 | 586 | 622 | 740 | 969 | 1016 | NA | TRUE |
| 4.0 | 2.0 | 526 | 619 | 624 | 749 | 973 | 1016 | NA | TRUE |
| 4.5 | 2.0 | 529 | 642 | 624 | 754 | 970 | 1014 | NA | TRUE |
| 5.0 | 2.0 | 508 | 664 | 623 | 756 | 975 | 1018 | NA | TRUE |
| 5.5 | 2.0 | 530 | 678 | 623 | 756 | 975 | 1017 | NA | TRUE |
| 6.0 | 2.0 | 540 | 691 | 622 | 765 | 972 | 1017 | NA | TRUE |
| 6.5 | 2.0 | 500 | 701 | 615 | 765 | 973 | 1012 | NA | TRUE |
| 7.0 | 2.0 | 525 | 711 | 566 | 761 | 968 | 1011 | NA | TRUE |
| 7.5 | 2.0 | 530 | 717 | 573 | 763 | 969 | 1009 | NA | TRUE |
| 8.0 | 2.0 | 545 | 721 | 571 | 765 | 963 | 1006 | NA | TRUE |
| 8.5 | 2.0 | 603 | 724 | 568 | 765 | 971 | 1013 | TRUE | TRUE |
| 9.0 | 2.0 | 620 | 726 | 572 | 774 | 960 | 1001 | TRUE | TRUE |
| 9.5 | 2.0 | 698 | 730 | 576 | 784 | 970 | 1016 | TRUE | TRUE |
| 10.0 | 2.0 | 701 | 730 | 579 | 786 | 970 | 1016 | TRUE | TRUE |
| 10.5 | 2.0 | 703 | 731 | 586 | 785 | 970 | 1011 | TRUE | TRUE |
| 11.0 | 2.0 | 714 | 735 | 590 | 781 | 964 | 1009 | TRUE | TRUE |
| 11.5 | 2.0 | 722 | 739 | 589 | 782 | 965 | 1005 | TRUE | TRUE |
| 12.0 | 2.0 | 722 | 739 | 587 | 788 | 965 | 1009 | TRUE | TRUE |
| 12.5 | 2.0 | 717 | 742 | 579 | 788 | 967 | 1006 | TRUE | TRUE |
| 13.0 | 2.0 | 717 | 744 | 571 | 780 | 960 | 994 | TRUE | TRUE |
| 13.5 | 2.0 | 717 | 745 | 573 | 776 | 973 | 1007 | TRUE | TRUE |
| 14.0 | 2.0 | 718 | 752 | 590 | 778 | 968 | 1009 | TRUE | TRUE |
| 14.5 | 2.0 | 719 | 752 | 591 | 780 | 968 | 1009 | TRUE | TRUE |
| 15.0 | 2.0 | 720 | 755 | 592 | 788 | 958 | 996 | TRUE | TRUE |
| 15.5 | 2.0 | 721 | 757 | 594 | 788 | 965 | 998 | TRUE | TRUE |
| 16.0 | 2.0 | 722 | 757 | 598 | 788 | 962 | 1008 | TRUE | TRUE |
| 16.5 | 2.0 | 772 | 759 | 597 | 788 | 963 | 1009 | TRUE | TRUE |
| 17.0 | 2.0 | 724 | 760 | 596 | 787 | 962 | 1009 | TRUE | TRUE |
| 17.5 | 2.0 | 724 | 760 | 596 | 796 | 962 | 1003 | TRUE | TRUE |
| 18.0 | 2.0 | 725 | 760 | 600 | 796 | 966 | 1007 | TRUE | TRUE |

N. J. Thappa



| | | | | | | | | | |
|------|-----|-----|-----|-----|-----|------|------|------|------|
| 18.5 | 2.0 | 726 | 762 | 601 | 803 | 976 | 1012 | TRUE | TRUE |
| 19.0 | 2.0 | 728 | 764 | 601 | 814 | 968 | 1009 | TRUE | TRUE |
| 19.5 | 2.0 | 730 | 768 | 600 | 811 | 959 | 998 | TRUE | TRUE |
| 20.0 | 2.0 | 729 | 768 | 600 | 787 | 944 | 996 | TRUE | TRUE |
| 20.5 | 2.0 | 729 | 767 | 598 | 775 | 948 | 983 | TRUE | TRUE |
| 21.0 | 2.0 | 727 | 763 | 600 | 784 | 949 | 997 | TRUE | TRUE |
| 21.5 | 2.0 | 729 | 763 | 600 | 784 | 949 | 985 | TRUE | TRUE |
| 22.0 | 2.0 | 729 | 761 | 600 | 783 | 945 | 985 | TRUE | TRUE |
| 22.5 | 2.0 | 726 | 758 | 598 | 782 | 929 | 977 | TRUE | TRUE |
| 23.0 | 2.0 | 724 | 758 | 590 | 782 | 929 | 992 | TRUE | TRUE |
| 23.5 | 2.0 | 724 | 755 | 596 | 798 | 944 | 992 | TRUE | TRUE |
| 24.0 | 2.0 | 724 | 757 | 589 | 787 | 938 | 989 | TRUE | TRUE |
| 24.5 | 2.0 | 723 | 753 | 590 | 792 | 916 | 989 | TRUE | TRUE |
| 25.0 | 2.0 | 722 | 752 | 594 | 793 | 946 | 994 | TRUE | TRUE |
| 25.5 | 2.0 | 720 | 770 | 595 | 792 | 946 | 993 | TRUE | TRUE |
| 26.0 | 2.0 | 722 | 772 | 600 | 796 | 950 | 994 | TRUE | TRUE |
| 26.5 | 2.0 | 723 | 768 | 610 | 795 | 958 | 995 | TRUE | TRUE |
| 27.0 | 2.0 | 721 | 775 | 615 | 796 | 960 | 996 | TRUE | TRUE |
| 27.5 | 2.0 | 720 | 772 | 620 | 799 | 979 | 998 | TRUE | TRUE |
| 28.0 | 2.0 | 718 | 771 | 628 | 800 | 985 | 995 | TRUE | TRUE |
| 28.5 | 2.0 | 720 | 773 | 640 | 802 | 980 | 996 | TRUE | TRUE |
| 29.0 | 2.0 | 725 | 770 | 642 | 805 | 993 | 1000 | TRUE | TRUE |
| 29.5 | 2.0 | 728 | 774 | 645 | 810 | 995 | 1005 | TRUE | TRUE |
| 30.0 | 2.0 | 730 | 780 | 650 | 815 | 1000 | 1010 | TRUE | TRUE |

Average of stem calorimeter & body calorimeter should reach 650° C with in 15 minutes & to be maintained.

Average of stem flame & body flame should reach 750° C with in 2 minutes & to be maintained.

Body thermocouple shall maintain 590° C for atleast 5 minutes- maintained

Stem thermocouple shall maintain 650° C for atleast 15 minutes-maintained

N:Thapa

