

**TESTING SPECIFICATION
FOR CRYOGENIC BALL VALVES**

REF.NO.	BVTS0019	00
		REV.NO.
DATE	25. APR. 2008	
SHEET	01	OF 02



: PROCEDURE FOR CRYOGENIC TESTING :

- 1) DEGREASE THE VALVE COMPONENTS, DRY THEM AND ASSEMBLE THE VALVE IN A CLEAN AND DUST & GREASE FREE ENVIRONMENT. TIGHTEN BOLTS TO A PREDETERMINED TORQUE OR TENSION & RECORD THE VALUES.
- 2) MOUNT THE VALVE IN THE TEST RIG, TAKING CARE TO ENSURE THAT THE VALVE GLAND IS POSITIONED CLEAR OFF THE COLD BOIL-OFF GAS IN THE TOP OF THE TANK.
- 3) MAKE SUITABLE THERMOCOUPLE CONNECTIONS TO THE VALVE TO ENABLE VALVE BODY AND BONNET TEMPERATURE TO BE MONITORED THROUGHOUT THE TEST.
- 4) CARRYOUT AN " INITIAL SYSTEM PROVING TEST" AT THE MAXIMUM SEAT TEST PRESSURE AT AMBIENT TEMPERATURE USING HELIUM GAS TO ENSURE THAT THE VALVE IS IN A SUITABLE CONDITION FOR THE TEST TO PROCEED.
- 5) CARRYOUT THE SEAT TEST AT THE FULL SEAT RATED PRESSURE AND RECORD THE SEAT LEAKAGE.
- 6) MAINTAIN THE PURGING BY HELIUM GAS THROUGH THE TEST VALVE, THROUGHOUT THE COOLING OPERATION. COOL DOWN THE VALVE BY IMMERSING IT IN THE LIQUID NITROGEN TO A DEPTH SUCH THAT THE LEVEL OF LIQUID, COVERS ATLEAST THE TOP OF THE BODY/STUFFING BOX JOINT, FOR CRYOGENIC TESTING TEMPERATURE OF -196°C. IF THE CRYOGENIC TESTING TEMPERATURE IS -45°C, THE TEST VALVE IS NOT IMMERSED IN THE LIQUID NITROGEN. BUT THE TEST VALVE IS POSITIONED CLOSE TO THE LIQUID NITROGEN LEVEL IN THE TANK.
- 7) WHEN THE VALVE BODY & BONNET ATTAIN TEMPERATURE OF -196°C (-45°C FOR LTCS VALVES), SOAK THE VALVE FOR ATLEAST ONE HOUR , SO THAT THE TEMPERATURE OF BODY & BONNET STABILIZE AT CRYOGENIC TEST TEMPERATURE. CARRYOUT TEMPERATURE MEASUREMENTS BY MEANS OF THERMOCOUPLES TO ENSURE UNIFORM TEMPERATURE OF THE VALVE.
- 8) REPEAT THE INITIAL SYSTEM PROVING TEST AT THE TEST TEMPERATURE AT THE MAXIMUM SEAT RATED TEST PRESSURE.
- 9) OPEN AND CLOSE THE VALVE 20 TIMES. MEASURE THE OPENING / CLOSING TORQUES FOR THE FIRST AND LAST OPERATIONS.
- 10) SUBJECT THE VALVE TO SEAT PRESSURE TEST IN THE NORMAL FLOW DIRECTION OF THE VALVE. RAISE THE PRESSURE IN INCREMENTS AS GIVEN BELLOW.

NOMINAL PRESSURE - CLASS (PN)	INCREMENT IN bar
150 (20)	3.5
300 (50)	7.5
600 (100)	20.0

MEASURE AND RECORD SEAT LEAKAGE RATE AT EACH PRESSURE INCREMENT STAGE.

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- 11) WITH THE VALVE IN OPEN POSITION, CLOSE NEEDLE VALVE ON THE OUTLET SIDE OF THE TEST VALVE AND PRESSURIZE THE VALVE TO THE SEAT RATED TEST PRESSURE. MAINTAIN THE PRESSURE FOR 15 MIN. AND CHECK GLAND AND BODY / ENDPiece JOINT FOR LEAK TIGHTNESS. THERE SHALL BE NO VISIBLE LEAKAGES THROUGHOUT THE TEST DURATION.
- 12) RETURN VALVE TO THE AMBIENT TEMPERATURE AND CARRYOUT THE FOLLOWING OPERATIONS AND COMPARE THE RESULTS WITH READINGS TAKEN UNDER 5,8,9 & 10.
 - a) REPEAT THE PROVING TEST DESCRIBED IN 4. CARRYOUT SEAT TEST AT THE MAXIMUM SEAT RATED PRESSURE AS DESCRIBED IN 9 & 10. MEASURE ANY LEAKAGE THROUGH THE VALVE AND RECORD IT.
 - b) MEASURE AND RECORD VALVE OPENING AND CLOSING TORQUE, BODY / END PIECE JOINT BOLTING TORQUE AND GLAND BOLTING TORQUE.
- 13) AFTER COMPLETION OF TEST, DISMANTLE THE VALVE IN CLEAN AND DUST FREE ENVIRONMENT. CHECK FOR EASE OF DISMANTLING AND EXAMINE ALL COMPONENTS FOR WEAR AND DAMAGE.
- 14) TEST REPORT SHALL INCLUDE THE FOLLOWING.
 - a) CONDITIONS OF VALVE PARTS AFTER THE TEST.
 - b) LEAKAGE RATES.
 - c) RESULTS OF PROVING TESTS AT AMBIENT TEMPERATURE AND AT TEST TEMPERATURE.
 - d) OPENING AND CLOSING TORQUE AT AMBIENT AND TEST TEMPERATURE.
 - e) BODY / ENDPiece & GLAND BOLTING JOINT TIGHTENING TORQUE AT THE AMBIENT TEMPERATURE.
- 15) ACCEPTANCE CRITERIA
 - a) LEAKAGE THRO SEAT AT AMB TEMPR. AT FULL RATED PRESSURE SHALL NOT EXCEED $0.3\text{mm}^3/\text{SECOND} \times \text{DN}$.
 - b) LEAKAGE THRO SEAT AT THE TEST TEMPR. AT EACH PRESSURE STAGE SHALL NOT EXCEED $100\text{mm}^3/\text{PER SECOND} \times \text{DN}$.
 - c) THERE SHALL BE NO VISIBLE LEAKAGE DURING SHELL TEST AT THE TEST TEMPR. AT THE SEAT RATED PRESSURE FOR THE TEST DURATION OF 15 Min.

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